



# Reference Document **2018** including the Annual Financial Report

# TABLE OF CONTENT

Key figures	4		
<b>1. PRESENTATION OF EDF GROUP</b>	<b>7</b>	<b>5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK</b>	<b>277</b>
1.1 History and development of the Company	8	5.1 Operating and financial review	278
1.2 Organisation of the Group	10	5.2 Subsequent events	310
1.3 Group strategy	12	5.3 Changes in market prices in January and February 2019	311
1.4 Description of the Group's activities	18	5.4 Outlook	312
1.5 Legislative and regulatory environment	85		
1.6 Research & development, patents and licences	102	<b>6. FINANCIAL STATEMENTS</b>	<b>313</b>
1.7 Commercial properties	109	6.1 Consolidated financial statements	314
<b>2. RISK FACTORS AND CONTROL FRAMEWORK</b>	<b>111</b>	6.2 Statutory Auditors' Report on the consolidated financial statements	430
2.1 Risks to which the Group is exposed	112	6.3 Financial statements	433
2.2 Control of Group risks and activities	128	6.4 Statutory Auditors' Report on the financial statements	490
2.3 Dependency factors	136	6.5 Table of results for the last five fiscal years	493
2.4 Legal proceedings and arbitration	138	6.6 Dividend policy	494
2.5 Insurance	145	6.7 Significant change in the financial or trading position	495
<b>3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES</b>	<b>149</b>	6.8 Information relating to the allocation of funds raised through Green Bonds issued by EDF	495
3.1 EDF's commitments in the area of sustainable development	150	<b>7. GENERAL INFORMATION ABOUT THE COMPANY AND ITS CAPITAL</b>	<b>501</b>
3.2 EDF's Corporate Social Responsibility Goals	158	7.1 General information about the Company	502
3.3 Other areas of the sustainable development policy	180	7.2 Incorporation documents and articles of association	502
3.4 Further human resources considerations	195	7.3 Information regarding capital and share ownership	505
3.5 Ethics, compliance, tax transparency	206	7.4 Market for the Company's shares	511
3.6 Sponsorship	213	7.5 Related-party transactions	512
3.7 Non-financial rating	214	7.6 Material contracts	515
3.8 Appendices and correspondence tables	215	<b>8. ADDITIONAL INFORMATION</b>	<b>517</b>
3.9 Reporting system and methodology	223	8.1 Person responsible for the Reference Document and the Certification	518
3.10 Report by one of the Statutory Auditors, appointed as independent third party	233	8.2 Auditors – Statutory Auditors	519
<b>4. CORPORATE GOVERNANCE</b>	<b>237</b>	8.3 Documents available to the public - LEI	519
4.1 Corporate Governance Code	238	8.4 Financial communication calendar	519
4.2 Members and functioning of the Board of Directors	240	8.5 Concordance tables	520
4.3 Bodies created by Executive Management	269	Glossary	528
4.4 Conflicts of interest, absence of convictions of the members of the administrative bodies and Executive Management, contracts for services	271		
4.5 Shareholding by Directors and trading in EDF securities by corporate officers and executives	272		
4.6 Compensation and benefits	273		
4.7 Report by the Statutory Auditors, prepared in accordance with Article L. 225-235 of the French Commercial Code, on the Report of the Board of Directors on Corporate Governance	276		

# REFERENCE DOCUMENT 2018

The present Reference Document contains all information required for the Annual Financial Report.

**39.8**

million customer sites

**584.0TWh**

of electricity generated worldwide

**90%**

carbon-free generation

A key player in the energy transition, EDF group is an integrated energy company, active in all areas of the business: generation, transmission, distribution, trading, energy supply and energy services. As a global leader in low-carbon energy, the Group has developed a diversified generation mix based on nuclear power, thermal energy, hydropower and other renewable energies.

**BE THE ENERGY FOR CHANGE.**



The French language version of the Reference Document was filed with the Autorité des Marchés Financiers (French Financial Markets Authority or AMF) on 15 March 2019, in accordance with Article 212-13 of its General Regulations. It may be used in connection with a financial transaction if accompanied by an offering memorandum approved by the AMF. The Reference Document has been prepared by the issuer and its signatories are liable for its content. However, the version of the Reference Document issued in French as mentioned above is the only binding version. The English language version is provided solely for the convenience of English speaking readers. All possible care has been taken to ensure that the translation is an accurate presentation of the original. However, in all matters of interpretation, views or opinion expressed in the original language version of the document in French take precedence over the translation.

Pursuant to Article 28 of EC Regulation no. 809/2004 of the European Commission, the following information is included by reference in this Reference Document:

- EDF group's consolidated financial statements for fiscal year-ended 31 December 2017 (prepared in accordance with international accounting standards) and the related statutory auditors' report, respectively presented in Chapters 6, sections 6.1 (pages 296 to 408) and 6.2 (pages 409 to 412) of the EDF group 2017 Reference Document;
- EDF group's consolidated financial statements for fiscal year-ended 31 December 2016 (prepared in accordance with international accounting standards) and the related statutory auditors' report, respectively presented in Chapters 6, sections 6.1 (pages 319 to 436) and 6.2 (pages 437 to 438) of the EDF group 2016 Reference Document;
- the EDF group's operating and financial review for fiscal year-ended 31 December 2017, presented in Chapter 5 (pages 260 to 291) of the EDF group's 2017 Reference Document;
- the EDF group's operating and financial review for fiscal year-ended 31 December 2016, presented in Chapter 5 (pages 268 to 301) of the EDF group's 2016 Reference Document;

Copies of this Reference Document are available free-of-charge at EDF's registered office (22-30 avenue de Wagram – 75382 Paris Cedex 08) and on its website (<http://www.edf.fr>), as well as on the AMF website (<http://www.amf-france.org>).

# 2018

## KEY FIGURES

**34.7**

million electricity  
customer sites

**5.1**

million gas customer sites

**9.2GW**

Wind and solar  
net installed capacity

**68.8TWh**

EDF group renewable  
electricity generation  
including hydropower

**457.8TWh**

EDF group nuclear generation

**€13bn**

Framatome backlog

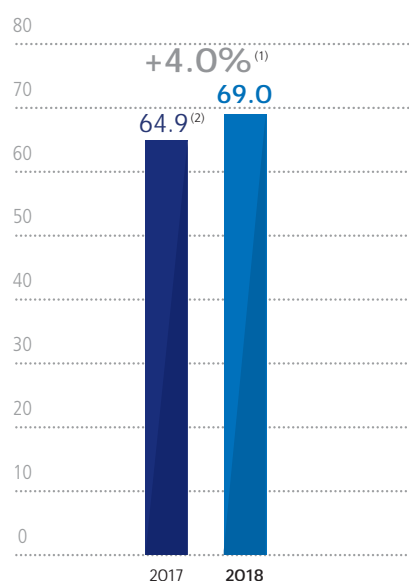
**100%**

Group assets disposal plan  
fully delivered at end 2018

**€1.1bn**

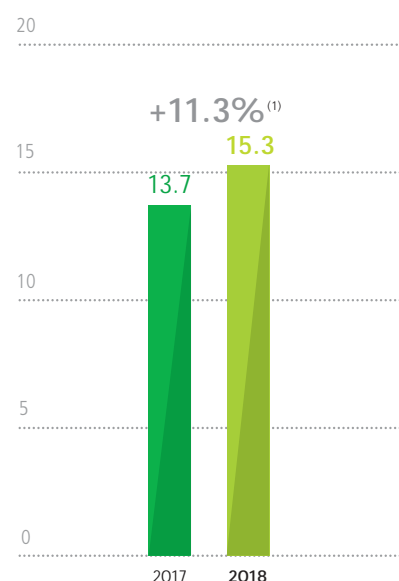
Cash flow excl. Linky,  
New developments  
& Group assets disposal plan

### → Sales In billions of euros



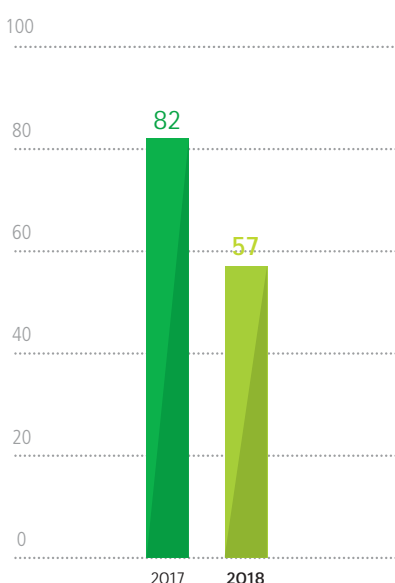
(1) Organic change at constant scope and exchange rates.  
(2) 2017 data restated according to IFRS 15.

### → EBITDA In billions of euros

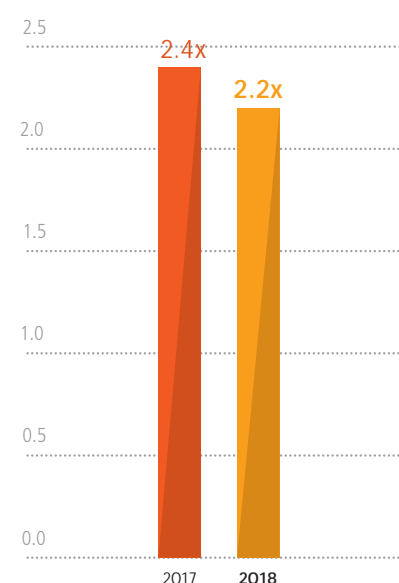


(1) Organic change at constant scope and exchange rates.

### → Group CO<sub>2</sub> emissions In g/kWh

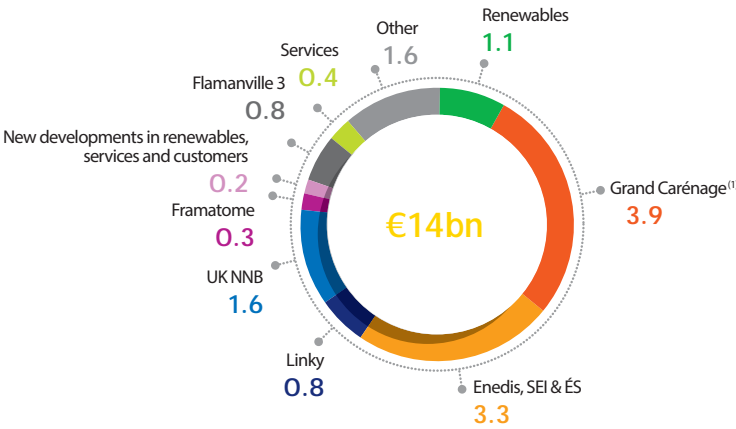


### → Net financial debt/EBITDA



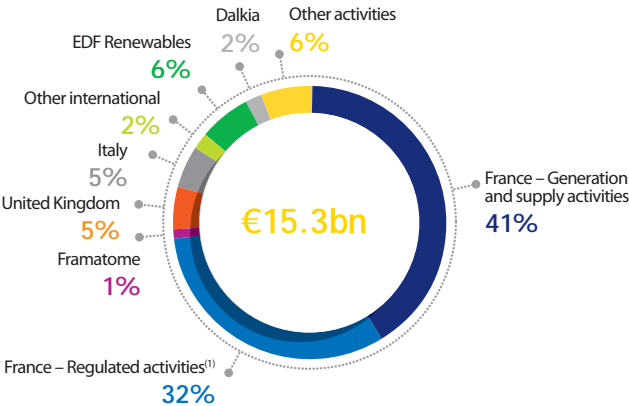


➔ **Net investments excluding Group disposal plan**  
in billions of euros



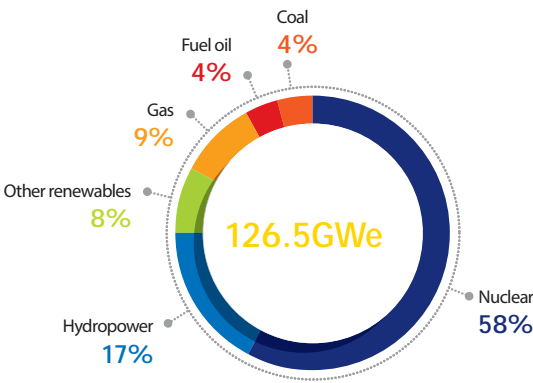
(1) Nuclear maintenance France.

➔ **Breakdown of EBITDA**  
in billions of euros

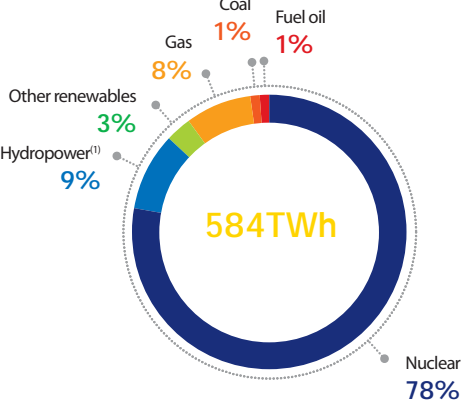


(1) Regulated activities: Enedis, ES and island activities; Enedis, an independent EDF subsidiary as defined in the French energy code.

➔ **Installed capacity**  
in GWe



➔ **Electricity generation**  
in TWh



(1) Hydro generation including pumped volumes.  
NB: The values correspond to the expression to the first decimal or integer closest to the sum of the precise values, taking into account rounding.

In this Reference Document (the "Reference Document"), unless otherwise stated, the terms **"Company"** and **"EDF"** refer to Électricité de France SA, and the terms **"EDF group"** and **"Group"** refer to EDF and its subsidiaries and affiliates.

In addition to the information contained in this Reference Document, investors should carefully consider the risk factors described in chapter 2 ("Risk factors and control framework"). These risks, or one of these risks, could negatively impact the Group's business, position, financial results or outlook. Furthermore, other risks not yet identified or considered as material by the Group, could have the same negative impact, and investors could consequently lose all or part of their investment in the Company.

This Reference Document also contains information relating to the markets in which the EDF group operates. This information has been taken from surveys carried out by external sources. Given the rapid changes affecting the energy sector in France and throughout the world, it is possible that this information could prove to be erroneous or no longer up-to-date on the filing date of this Reference Document or thereafter. The Group's activities may therefore evolve in a manner different to that described in this Reference Document, and the declarations or information presented in this document may prove to be erroneous.

Forward-looking statements in this Reference Document, specifically in section 1.3 ("Group Strategy"), could also be impacted by risks, uncertainties and other factors that may cause the future income, performance and achievements of the Group to differ significantly from the objectives expressed and suggested. These factors may include changes in the economic and commercial environment, in regulations, as well as factors set forth in chapter 2 ("Risk factors and control framework").

Pursuant to French and European legislation, RTE and Enedis, regulated subsidiaries managed independently within the meaning of the French Energy Code, respectively responsible for the transmission and distribution of electricity within the EDF group, are not allowed to communicate certain information they gather while conducting their activities to other Group entities, including its Management. Similarly, certain data specific to Generation and supply activities cannot be communicated to the entities responsible for transmission and distribution. This Reference Document has been prepared by the EDF group in compliance with these rules. For the sake of brevity, further references in this Reference Document made to RTE and Enedis will not always specify their independent nature as within the meaning of the French Energy Code.

A glossary of the main technical terms is provided at the end of this Reference Document.



# 1. PRESENTATION OF EDF GROUP

<b>1.1 HISTORY AND DEVELOPMENT OF THE COMPANY</b>	<b>8</b>
<b>1.2 ORGANISATION OF THE GROUP</b>	<b>10</b>
1.2.1 EDF organisational chart	10
1.2.2 Intra-Group contracts	12
<b>1.3 GROUP STRATEGY</b>	<b>12</b>
1.3.1 Environment and strategic challenges	12
1.3.2 Priorities of the CAP 2030 strategy	14
1.3.3 Investment policy	17
<b>1.4 DESCRIPTION OF THE GROUP'S ACTIVITIES</b>	<b>18</b>
1.4.1 Electricity generation activity	18
1.4.2 Sales and supply activities in France	46
1.4.3 Optimisation activities for EDF in France	50
1.4.4 Transmission and distribution activities in France	51
1.4.5 International activities	59
1.4.6 Energy services and other activities	78
<b>1.5 LEGISLATIVE AND REGULATORY ENVIRONMENT</b>	<b>85</b>
1.5.1 EDF as a public undertaking	85
1.5.2 Public service in France	85
1.5.3 Electricity market legislation	86
1.5.4 Gas market legislation	92
1.5.5 Public electricity distribution concessions in France	93
1.5.6 Regulations applicable to the environment, nuclear power, health, hygiene and safety in France	93
1.5.7 Regulations on wholesale energy markets	101
<b>1.6 RESEARCH &amp; DEVELOPMENT, PATENTS AND LICENCES</b>	<b>102</b>
1.6.1 R&D organisation and key figures	102
1.6.2 R&D priorities	104
1.6.3 International business and partnerships	107
1.6.4 Intellectual property	109
<b>1.7 COMMERCIAL PROPERTIES</b>	<b>109</b>
1.7.1 Service-sector real estate assets – EDF and Enedis in France	109
1.7.2 Employer participation in the construction effort	109
1.7.3 Subsidised loans for home ownership	109

## 1.1 HISTORY AND DEVELOPMENT OF THE COMPANY

In the context of nationalisation of gas and electricity sectors, the Act of 8 April 1946 created EDF as a State-owned industrial and commercial establishment (EPIC) and created a special status for the personnel of the electric and gas industries (IEG). The law nevertheless left in existence a certain number of non-nationalised distributors (DNN) and local distribution companies (ELD).

The years 1946 to 2000 were marked by the development of the Group's industrial base. Initially, there was a fleet of thermal generation facilities using coal and then fuel oil, as well as hydropower facilities, in particular with the construction of the dams at Tignes in 1952 and Serre-Ponçon in 1960. In 1963, EDF commissioned the first commercial-scale nuclear generation unit at Chinon (70MW), the first of a series of six generation units of the Uranium Natural Graphite Gas (UNGG) family, the construction of which continued until 1972. The oil crises of 1973 and 1979 led to accelerated replacement of thermal power with nuclear power. In 1969, the UNGG family was abandoned in favour of the Pressurised Water Reactor (PWR) family, which was used for new power plants.

In the beginning of the 1990s, EDF embarked on a significant expansion abroad in particular with the acquisition of London Electricity (which was renamed EDF Energy on 30 June 2003) in December 1998. This policy was pursued in 2001 with the acquisition of 20% of EnBW (a stake that was successively raised to 45.01% by 2005) and with the acquisition of equity interests in the Italian company Edison by the IEB consortium (63.8%), in which EDF holds a stake of 18.03%, and in 2002, with the acquisition of EPN Distribution Plc. and Seeboard Plc., two England-based distribution companies.

In France, the major development in recent years has been the liberalisation of the market pursuant to European regulations. In February 1999, sites where electricity consumption exceeded 100GWh per year, i.e. 20% of the market, became entitled to choose their supplier. The eligibility threshold was then progressively lowered, opening thus 30% of the market in May 2000, then 37% in February 2003, and 69% in July 2004, due to the liberalisation of all of the market for non-household customers. Since July 2007, the market has been fully liberalised, including for residential customers.

At the same time, the structures necessary for a competitive market to function effectively were set up. The French Electricity Regulation Commission, which became the Energy Regulation Commission (*Commission de régulation de l'énergie* or CRE) was created in May 2000. That same year, in order to guarantee non-discriminatory access to all operators in the market, EDF created Réseau de Transport d'Électricité (which became a subsidiary<sup>(1)</sup> of EDF in 2005 under the name RTE EDF Transport, and which has been renamed RTE Réseau de Transport d'Électricité), responsible for managing the high voltage and very high voltage public electricity transmission network. In 2000, the Group formed the trading company, EDF Trading, with the trading specialist Louis Dreyfus. It became a wholly-owned subsidiary of EDF in 2003. In 2001, Euronext and various industrial and financial operators in the electricity market, including EDF, created Powernext, the French electricity exchange. In 2001, as a condition for authorising EDF's acquisition of a stake in EnBW, the European Commission required EDF to set up a system of power supply capacity auctions (Virtual Power Plants or VPP) to facilitate access to the market for competitors. In 2003, the EDF group sold its stake in Compagnie Nationale du Rhône to Suez (now Engie).

On 20 November 2004, pursuant to the Act of 9 August 2004, EDF became a French limited company (*société anonyme*) with a Board of Directors.

In 2005, EDF and A2A SA (formerly AEM SpA) entered into agreements for a joint takeover of Edison following the launch of a tender offer. The EDF group has pursued a strategy of refocusing on Europe and sold its controlling interest in its subsidiaries Edenor and Light and its assets in Mexico.

EDF filed for an initial public offering in November 2005 through the issue of 196,371,090 new shares and the sale by the French State of over 34.5 million shares it held in the Company to employees and former employees of EDF and of certain EDF subsidiaries. Subsequently, on 3 December 2007, the French government sold an additional 45 million of its shares.

In late 2006, EDF Renouvelables (ex-EDF Énergies Nouvelles), a 50%-owned subsidiary of EDF group, filed for an initial public offering.

Since 1 January 2008, EDF's distribution business has been conducted by Enedis<sup>(2)</sup> (previously ERDF), a subsidiary of EDF to which the distribution business was contributed pursuant to the Act of 7 December 2006 on the energy sector.

In 2008-2009, the EDF group became a major player in the revival of nuclear power internationally, by creating a joint venture with the Chinese utility CGN, acquiring British Energy, one of the largest energy companies in the United Kingdom, and acquiring nearly half of the nuclear assets of US-based Constellation Energy. EDF also acquired a 51% stake in the Belgian company EDF Luminus, and subsequently raised its stake in EDF Luminus to 63.5% in 2010.

EDF finalised in 2010 the sale of its British distribution networks to the Cheung Kong group of Hong Kong and, in 2011, it completed the sale of its interest in EnBW to the German state of Baden-Württemberg.

In 2011, EDF confirmed its positioning as a key player in the field of power generation using renewable energies by increasing its stake in EDF Renouvelables to 100% by way of a simplified alternative cash or exchange tender offer, followed by a squeeze-out of minority shareholders.

In 2012, after more than seven years of a strategic partnership with A2A, EDF took over Edison, one of the key players in the Italian electricity market, the fourth largest market in Europe. This transaction was carried out as part of the Group's gas strategy, which relies on Edison's expertise at all stages of the gas chain.

In 2014, EDF has delegated to Exelon, the leading American nuclear operator, the operational management of the five nuclear reactors owned by CENG, held by EDF (49.99%) and Exelon (50.01%). Furthermore, EDF took over all of Dalkia's lines of business in France, including the Citelum group, and Veolia took over the Dalkia group's international business. Finally, F2i, Edison and EDF Énergies Nouvelles created the third largest Italian operator in the renewable energy sector, owned by F2i (70%) and a holding company (30%) owned by Edison and EDF Renouvelables.

In 2015, EDF and China General Nuclear Power Corporation (CGN) entered into a non-binding strategic investment agreement relating to the construction and the operation of the Hinkley Point C nuclear power plant in Somerset. This partnership has been approved on 28 July 2016 by EDF's Board of Directors. The contractual documentation was signed on 29 September 2016.

(1) RTE, transmission network operator, independently managed within the meaning of the French Energy Code.

(2) Enedis is an independently managed subsidiary within the meaning of the provisions of the Energy Code. For the sake of readability, reference will simply be made in the rest of the document to Enedis, without systematically specifying that it is a fully independent subsidiary, within the meaning of the provisions of the Energy Code



In 2015 and 2016, EDF and AREVA SA signed two non-binding memoranda of understanding for the acquisition by EDF of the exclusive control of AREVA NP <sup>(1)</sup>, as well as an overall strategic and industrial partnership. In accordance with the terms of these memoranda, a contract setting out the terms of the acquisition by EDF of the exclusive control over an entity ("New NP"), a fully owned subsidiary of AREVA NP, was signed on 15 November 2016. The transaction was completed on 31 December 2017; New NP, renamed Framatome, is now 75.5% owned by EDF, together with Mitsubishi Heavy Industries (19.5%) and Assystem (5%). Framatome combines industrial, design and supply activities for nuclear reactors and equipment, fuel assemblies and installed base et services, and has around 14,000 employees. In addition, Edvance was created in June 2017, a dedicated company, 80%-owned by EDF and 20%-owned by Framatome, which combines the activities of the two companies relating to design (basic and detailed design) and construction (supply, assembly and start-up) of the nuclear island and the instrumentation and control of new reactors in France and abroad.

On 30 March 2017, EDF completed a cash share issue with preferential subscription rights of a gross amount (including issue premium) of €4,018 million, i.e. the issue of 632,741,004 new shares with a par value of €6.35 each. The French State contributed €3 billion, i.e. 75% of the share issue. This share issue was a success, totalling around €4.9 billion. Market share was thus subscribed up to 185.9%.

On 31 March 2017, EDF sold a 49.9% indirect equity interest in RTE to Caisse des Dépôts and CNP Assurances. EDF also sold EDF Polska's assets and 100% of EDF Démasz (Hungary).

To complete its disposal plan, EDF finalised, on 30 October 2018, the sale of its equity holding in Dunkerque LNG, company operating the Dunkirk LNG terminal, followed by the sale of a portfolio of over 200 office and business premises to Colony Capital on 28 November 2018.

1.

(1) This entity is called indifferently "New NP" or "New AREVA NP" or Framatome in this Reference Document.

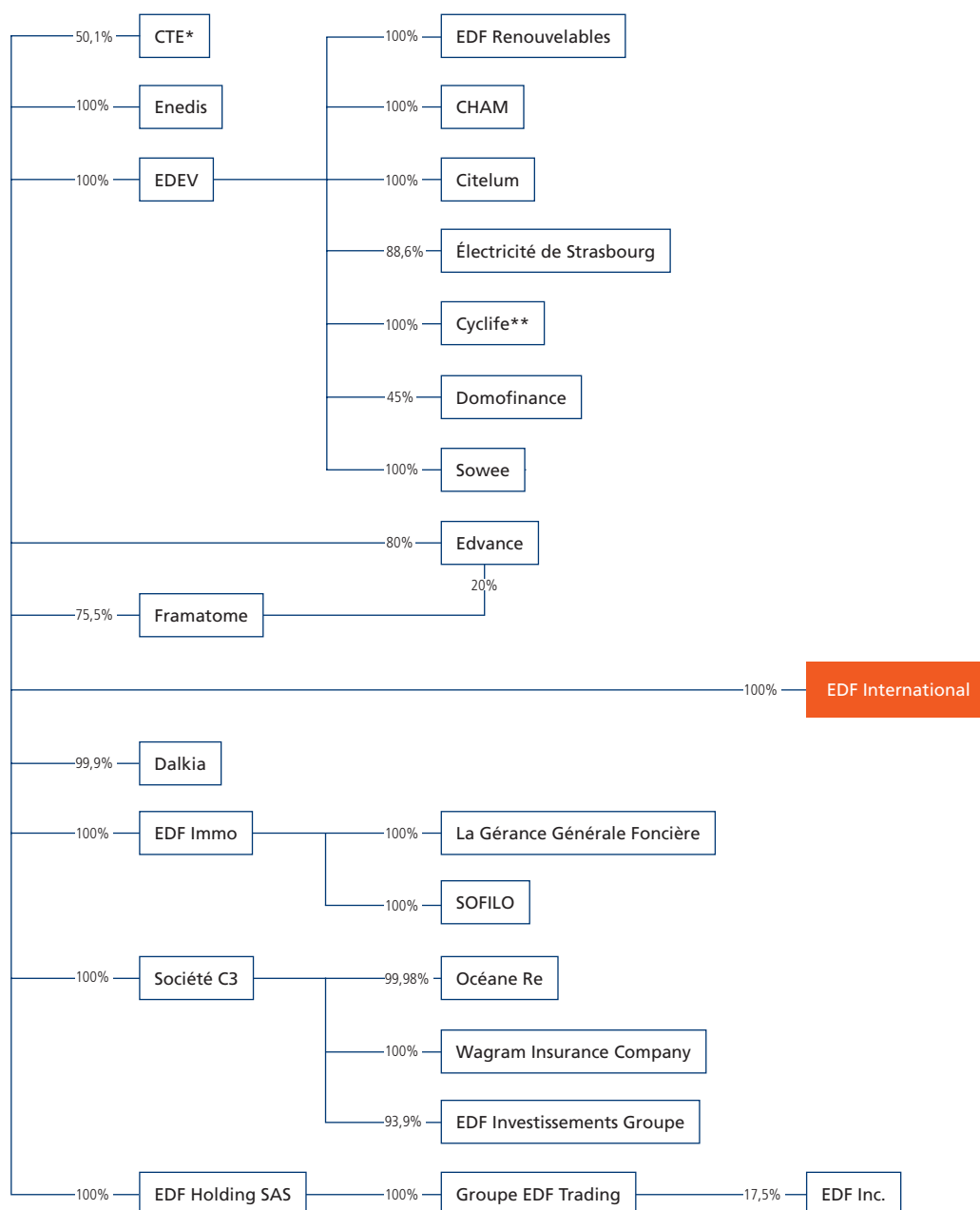
# 1. PRESENTATION OF EDF GROUP

## Organisation of the Group

## 1.2 ORGANISATION OF THE GROUP

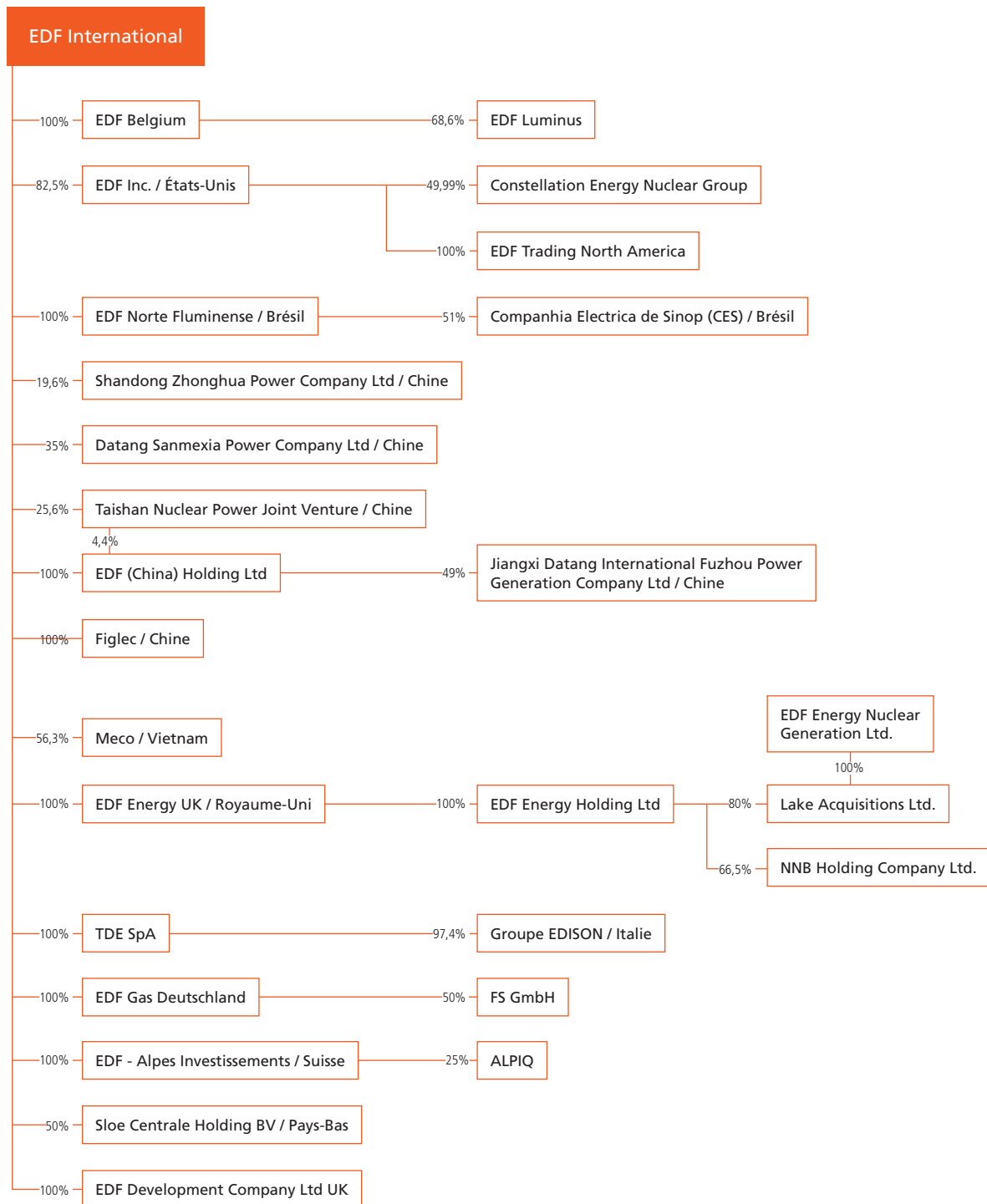
### 1.2.1 EDF ORGANISATIONAL CHART

A simplified organisational chart for the Group, as of 31 December 2018, is presented below. The percentages for each entity correspond to the ownership interest in capital. The companies or groups of companies within the Group's scope of consolidation are indicated in note 51 to the consolidated financial statements for the year ended 31 December 2018.



\* Coentreprise de Transport d'Électricité « CTE » (ex C25), company holding RTE shares.

\*\* In particular acquisition of SOCODEI



### 1.2.2 INTRA-GROUP CONTRACTS

The information on the regulated agreements and commitments referred to in Article L. 225-38 of the French Commercial Code is stated in the Statutory Auditors' special report, which is reproduced in section 7.5.5 to this Reference Document and section 7.5.4 mentions agreements signed with Framatome that no longer fall within the scope of the aforementioned Article L.225-38.

### Financial flows between EDF and its subsidiaries

In addition to the financial flows relating to the cash pooling agreements mentioned below, financial flows between EDF and its subsidiaries are also related to the distributions of dividends within the Group. In 2018, EDF received a total of €2,753 million in dividends from its consolidated subsidiaries.

Other financial flows between EDF and its subsidiaries correspond mainly to loans, asset transfers and guarantees made by the parent company of the Group for the benefit of certain subsidiaries.

The financing relationship between the EDF group and its subsidiaries<sup>(1)</sup>, as laid down in EDF's "financing, cash and financial risk control" policy of May 2017, is based on the following principles:

- debt and equity financing by EDF's internal financing entities and by EDF Investissements Groupe (a company based in Belgium);
- centralised management of interest rate and exchange rate risk.

In addition, the nuclear fuel purchases are managed centrally by EDF SA, including the purchases intended for its subsidiary EDF Energy.

With regard to financial flows related to fees paid by subsidiaries, contracts for the supply of intra-group services have been concluded with the main subsidiaries under the scope of consolidation since 2012. EDF may also be required to provide specific services to certain subsidiaries or entities outside the Group. In addition, following EDF brand development work, the Company has set up licensing agreements with subsidiaries that use the EDF brand.

### Cash pooling agreements entered into between EDF and its subsidiaries <sup>(2)</sup>

The cash pooling system set up by EDF centralises all the cash positions of its subsidiaries and thus optimises the Group's liquidity. Cash pooling consists of grouping all the cash balances of subsidiaries at the level of the parent company. It includes certain French and international subsidiaries. It does not include RTE.

The cash pooling system in place for companies of the EDF group is defined under cash agreements. Bilateral agreements between EDF and each subsidiary define the specific conditions for each arrangement (remuneration of balances, etc.).

At international level, subsidiaries participating in the system enter into a framework agreement, whereby EDF serves as the Cash Centre.

EDF also centralises all the currency flows from its French subsidiaries.

### Insurance

EDF and its subsidiaries <sup>(3)</sup> have entered into accession protocols in order for the latter to benefit from the insurance coverage provided for by the Group's insurance programs.

## 1.3 GROUP STRATEGY

### 1.3.1 ENVIRONMENT AND STRATEGIC CHALLENGES

The fight against climate change, by curbing greenhouse gas emissions, has entered a crucial phase with a view to limiting global warming to +2°C.

Given that energy accounts for most CO<sub>2</sub> emissions worldwide, it is crucial to gradually reduce the use of fossil fuels as energy sources in order to meet the climate target. To this end, the two major levers of actions are: lowering energy consumption by developing energy efficiency solutions and increasing the use of carbon-free energy sources, *i.e.* renewable energies - thermal (wood, biomass) or electric (hydro, photovoltaic or wind) - and nuclear energy.

Today, electricity accounts for only about 20% of energy consumed worldwide. Thus, uses currently covered by fossil fuels must be replaced by carbon-free energy solutions, first and foremost electric power solutions. Given that electric power solutions are very often seen by consumers as being synonymous with energy efficiency, they contribute to the joint objective of reducing energy consumption and moving away from fossil fuels for transport, buildings and industry: heat pumps as a replacement for fuel-oil or gas boilers, electric vehicles as replacement for combustion-powered vehicles.

With the Clean Energy and Climate Change Packages, the European Union has set itself ambitious goals for 2020 and 2030.

France's focus is on the fight against climate change. It has reaffirmed its goal through its Climate Plan which aims to achieve carbon neutrality by 2050.

In this respect, France – which already has low carbon intensity electrical facilities – is a step ahead of its major European neighbours. This low carbon and competitive

mix must be preserved in the long term, drawing on the complementary relationship between renewable and nuclear energy.

However, the current business models of electricity producers are under pressure due to the market and European regulatory context, although significant investments are still required to maintain existing assets, and in the longer term, to renew generation facilities:

- commodity prices (oil, gas, coal) are highly volatile and are expected to remain so in spite of the abundance of carbon and the growth of shale gas production. They remain very sensitive to geopolitical tensions, changes in economic growth, adverse climatic and technical conditions;
- the price of CO<sub>2</sub> is directly dependent on the applicable regulations. In Europe, the emissions quota system currently in place does not ensure a minimum CO<sub>2</sub> price;
- the electricity market price depends directly on the above factors and impacts the breakeven point of electricity generation plants;
- when commodities and CO<sub>2</sub> prices are low, the market price for electricity goes down, even more so as demand for electricity in Europe is sluggish. For example, over the first eight months of 2018, demand in EDF's four main European markets increased by 1% compared with 2017. Moreover, significant subsidised production capacities are connected to the network due to energy transition policies, thereby also impacting prices;
- since 2016, commodities prices have increased, allowing the market price for electricity in France for the year N+1 to cross the €50/MWh mark in 2018, for the first time since 2013;

(1) Framatome was integrated on all these aspects in 2018.

(2) Framatome was integrated to these agreements in 2018.

(3) Framatome is currently being incorporated.



- however, there is no guarantee that any of these parameters will remain at the current level, as evidenced for example by the sharp fluctuations in the price of European CO<sub>2</sub> emissions licences, which fluctuated between €/t and €25/t in 2018.

In contrast with Europe, electricity consumption is rising fast in emerging markets, especially in Asia. This is to the benefit of electricity producers in these regions with forecasts <sup>(1)</sup> of around +200TWh p.y. in China between 2017 and 2040 (2.3% p.y. on average) and +51TWh p.y. in Africa (3.9% p.y.), versus +9TWh p.y. in the European Union (+0.3% p.y.).

In Europe, France and the UK are developing low carbon energy independence policies, primarily built around a mix combining energy efficiency, renewable and nuclear energies. Thus, the UK, which must undertake a major renewal of its electricity generation facilities, has adopted the Climate Change Act and established a market model consistent with this policy (Carbon Price Floor, Contracts for Difference, capacity market, etc.). In France, electricity is also used as a decarbonisation catalyst, and the Law of 17 August 2015 on Energy Transition and Green Growth sets a ceiling of 63.2GW of installed nuclear capacity in France. Given the evolving demand and export capacities this capacity suits the development of renewable energies in the energy mix. Capacity markets are also being developed, in particular in France, the United Kingdom <sup>(2)</sup> and Belgium.

The agreement reached in Paris at the 21<sup>st</sup> session of the Conference of Parties (COP 21) confirms the effort being made to combat climate change and the ramping up of energy transitions beyond Europe. This agreement, which was ratified by 168 countries as well as the European Union, came into force on 4 November 2016. The One Planet summit organised in Paris in December 2017 helped to mobilise funds and resulted in commitments in favour of the fight against global climate change.

In France, the energy transition law for green growth adopted in August 2015 sets out several medium and long term objectives relating to greenhouse gas emissions, energy consumption and the energy mix in France. This law led to the drawing up of a national low carbon strategy and a multi-year energy programme (PPE) to manage these targets. The PPE defines the orientations and action priorities of public authorities for managing all the different energy forms for five-year periods. The first PPE covered the periods 2016-2018 and 2019-2023.

In 2017 and 2018, the new PPE was developed for the periods 2019-2023 and 2024-2028 bringing together several players. Against this backdrop, the government further committed to the National low carbon strategy by adopting the goal of carbon neutrality by 2050. From October 2017 to January 2018, 24 workshops were organised by the government to revise the PPE. From March to June 2018, a public debate was organised by the "Commission nationale du débat public" (French national public debate commission). The government then presented the main thrusts of the draft PPE on 27 November 2018 and the full draft on 25 January 2019. This document restates that the French energy targets relate to the reduction of energy consumption, by focusing on lowering the consumption of high-carbon energies and replacing carbon energies by carbon-free energies. It states that electricity is a decarbonisation lever for a number of uses. In particular, it sets the following targets:

- reduction of greenhouse gas emissions to 277Mt CO<sub>2</sub> in 2023 and to 227Mt CO<sub>2</sub> in 2028;
- decrease in the primary consumption of fossil fuels of 20% in 2023 and 35% in 2028 compared with 2012;
- development of renewable energies (consumption of renewable heat of 196TWh in 2023 and a range of between 218 and 247TWh in 2028; installed capacity of renewable electricity in France of 74GW in 2023 and a range of between 102 and 113GW in 2028);
- development of electric vehicles (1.2 million private electric cars on the road in 2023);
- end to the sale of new greenhouse gas emission vehicles in 2040;
- 500,000 energy efficient home renovations every year.

It sets as its objective for 2035 a share of 50% nuclear power in the French energy mix, with the closure of 14 reactors by 2035, two of which are the Fessenheim reactors, and 2 to 4 other reactors shutting down by 2028: two reactors to close in the second period of the PPE, in 2027 and in 2028, subject to complying with the security of supply requirement; furthermore, if certain conditions relating to

electricity prices and the development of the European electricity market are met, of two additional reactors could close by 2025-2026, based on a decision to be taken in 2023. The text also provides for the closure by 2022 of electric power generation plants that are exclusively coal-fired.

For the long term, the PPE project states that it is important to maintain the capacity to build new nuclear reactors based on national industrial capacities and technology. By mid-2021, the government will conduct a working programme with the nuclear sector relating to the industrial capacity, a de-risking programme of the new EPR 2 reactor model proposed by EDF, the valuation of the cost of this reactor, a review of the financing options of a programme for new reactors for the French electricity system and the necessary actions for the approval by the European Commission of the programme's financing mechanism and implementation.

Moreover, the government will propose the details of a new regulation for the existing nuclear fleet to protect consumers against market price increases beyond 2025 while giving EDF the financial capacity to ensure the economic sustainability of the generation facilities to meet the needs of the PPE in the event of low prices. This outlook as well as the nuclear fleet's development path confirm the relevance of the major overhaul programme ("*Grand Carénage*") of the nuclear fleet (excluding Fessenheim) undertaken by EDF.

The PPE project will be subject to consultations in the 1<sup>st</sup> half of 2019 and the decree should be published in the course of 2019.

Customers are looking to increasingly take ownership of their consumption, and local communities of their energy policy. These new expectations are forcing energy producers to come up with new solutions and new, more decentralised models, facilitated by innovations in telecommunications and digital technologies and the emergence of new uses, including electric vehicles.

The electricity sector is thus changing more than ever, at the centre of medium and long term societal and technological trends. Against this backdrop and given this outlook, European electricity producers have scaled back their investments in their traditional activities, focussing them on targeted segments, in particular renewable energy and low carbon solutions, international growth areas, networks, supply to customers, storage and services.

Thus, the EDF group has set out its CAP 2030 strategic priorities in response to this context and the need to contribute to the scenario limiting global warming to +2°C (see section 1.3.2 "Priorities of the CAP 2030 strategy"). The EDF group must remain the champion of very low carbon generation by gradually changing its generation mix to tackle the challenges of energy transition. The Group's decarbonisation strategy is detailed in chapter 3 of this document.

EDF is investing in innovative technologies and in electricity storage to support energy transition. EDF has thus announced plans for the development of photovoltaic power, electric mobility and electricity storage.

EDF leverages its key assets, namely its customer portfolio and its regional involvement, to ensure the successful implementation of energy transition.

All of these activities contribute to positioning the EDF group as the leader in energy transition. Indeed:

- the competitive advantage of the existing nuclear fleet, the leadership in hydropower and in the development of other renewable energies (wind, solar), investments in innovative technologies, such as storage, give it the means to tackle, over the long-term and in a complementary manner, the challenges of an energy mix with an increasing share of renewable energies, available at all times and at the best cost;
- investments in electricity grids are vital to the development of renewable energies and the decarbonisation of practices;
- the customer portfolio and regional involvement are key assets in the effective implementation of carbon-free energy practices and energy efficiency solutions.

With its focus on major industrial issues, EDF has, since its creation, carried out public service missions and public service obligations. As a responsible player, it has included long-term industrial, social and regional dimensions in its strategic decision-making, in addition to economic performance. These include, in particular, solidarity, combating fuel poverty, respect for people, responsibility and ethics in the conduct of business.

Therefore, in a particularly difficult market context, the EDF group is working hard to pursue its CAP 2030 strategy in order to be able to finance its priority developments.

(1) Sources: AIE, World Energy Outlook November 2018, and Eurostat for France, United Kingdom, Italy and Belgium.

(2) See section 1.4.5.1.1 "United Kingdom – Strategy".

### 1.3.2 PRIORITIES OF THE CAP 2030 STRATEGY

To be a responsible and efficient electricity producer that champions low carbon growth: this is the goal of the EDF group, driven by the CAP 2030 strategy. This is broken down into three priorities:

- proximity to customers and local communities;
- low carbon generation by rebalancing the mix between nuclear and renewable energy;
- international expansion.

Several strategic workshops have been conducted since 2015, translating each of these three strategic priorities.

This goal will also be achieved through a transformation programme based on simplification, innovation and digital technology, accountability and performance, human ambition and skills.

As a part of CAP 2030, the EDF group has made a commitment to six Corporate Responsibility Goals (see section 3.1 "EDF's commitments in the area of sustainable development"). In particular, engaged in combating global warming with one of the lowest carbon generations in Europe, EDF took the commitment in 2018 to reduce its direct CO<sub>2</sub> emissions by 40% by 2030 (with a target of 30 million tonnes in 2030 compared with 51 million tonnes in 2017) and to be in keeping with the goal of carbon neutrality by 2050.

#### 1.3.2.1 Proximity to customers and local communities

In order to support customers and local communities in their energy transition, the EDF group aims to create new competitive decentralised solutions, new customised low-carbon energy services and smart grids, based on three levers:

##### The development of energy efficiency solutions and new digital services for its customers

EDF deploys and develops its "EDF Solutions énergétiques" brand, created in 2017, to promote its range of solutions offered by its specialised subsidiaries (Dalkia, Citelum, IZIVIA, Edelia, Netseenergy, Fenice). Low-carbon heating networks, smart lighting, waste recovery, electric mobility: the range is complementary, innovative and meets the new challenges of local communities and businesses alike. For example, at the local level, with the Citelum's intelligent platform MUSE®, the "Dijon Métropole" urban area will benefit from the centralised management of all its equipment and public services. In Belgium, the consortium led by Citelum with EDF Luminus, DIF and CFE was awarded a Public Private Partnership for the smart lighting of major motorways in Wallonia.

As for residential customers, the EDF group offers and continues to develop a range of digital energy services, marketed in France and in the "core European countries" (United Kingdom, Italy, Belgium). For example in 2016, the launch of Sowe (a subsidiary offering innovative connected home products and solutions, that was further diversified in 2017 and 2018) reflects the EDF group's commitment to meeting the new expectations of its customers, especially with regard to sustainable wellbeing in the home. Existing offerings and customer relations will also continue to be enriched by new digital technologies and features, facilitated in particular by smart meter systems deployed in several countries.

##### Support to the development of new efficient uses of electricity to replace fossil fuels (electric mobility, self-consumption, heat pumps, low carbon housing, etc.)

The EDF group aims to be a key player in self-consumption in the French market and is highly committed to the development of electric mobility with the announcement

on 10 October 2018 of its Electric Mobility Plan, which sets out concrete targets for four of the Group's markets (France, United Kingdom, Italy and Belgium). Electricity storage is a key area of innovation for energy transition. The Group's Electricity Storage Plan, announced on 27 March 2018, provides for the development of 10GW of new storage facilities in the world by 2035 (6GW of large-scale storage, 4GW of dispersed storage), increasing the Group's storage capacity by then to 15GW.

##### R&D and innovation

The EDF group is intensifying research and development in storage, solar energy, electric mobility, smart electricity systems and sustainable local energy solutions (smart cities).

It is also increasing its innovation efforts to meet the expectations of its customers and offer solutions and services adapted to the new consumption patterns and based on increasingly digital means of communication. These efforts contribute to the development of the Group's projects. With "EDF Pulse Expansion", an incubator for in-house and external projects, EDF is testing and exploring new business sectors, creating new growth drivers for the Group and offering customers a new range of innovative products and services.

Lastly, the deployment of the Linky<sup>(1)</sup> smart meters, the development of renewable energies and electric mobility, and the emergence of cities actively involved in their local energy choices, are putting distribution networks at the forefront of the transformation of the electricity system. The distributor thus plays a key role as facilitator of the energy transition. In this respect, Enedis and EDF have established with the national federation of licensing authorities (FNCCR) and the association France Urbaine, a new draft concession contract for the public distribution of electricity and the supply of electricity at regulated tariffs, in order to modernise relations with the concession contracting authorities. This contract integrates regional changes and the energy transition, while retaining the principles of the French concessionary model: public service, regional solidarity and nationwide optimisation.

#### 1.3.2.2 Very low carbon generation: nuclear and renewable energies

EDF's nuclear facilities are already giving France a major lead compared to its neighbours in terms of curbing greenhouse gas emissions, while still ensuring a highly competitive electricity cost.

To remain the leader in very low carbon electricity generation, the EDF group is intensifying the development of renewable energies while ensuring the safety, performance and competitiveness of the existing nuclear facilities and New Nuclear investments.

##### Consolidation of the asset base

Achieving the very low carbon generation goal starts with the consolidation of the hydropower and nuclear asset base:

- EDF regularly invests in hydropower concessions in order to combine economic, energy and environmental performance, and will propose solutions to strengthen hydropower generation;
- EDF is investing in order to obtain approval to continue the operation, under the highest safety conditions, of the French nuclear fleet beyond 40 years, now that its economic and carbon competitiveness has been demonstrated. In this context, EDF has undertaken the "Grand Carénage" programme of continued operation, without prejudice to approvals which will be granted on a unit-by-unit basis by the ASN (French Nuclear safety authority) after each ten-year inspection. In the United Kingdom, investments are also being made to extend the operating life of the entire UK nuclear fleet. Lastly, the EDF group continues to invest in preparations for the decommissioning of the nuclear fleet and for waste management in France and the United Kingdom.

(1) Linky is a project carried out by Enedis, the distribution network operator, managed independently. For the sake of brevity, all further mentions of Linky in the rest of the document do not specify that it is a project led by Enedis.

## Development of renewable energies and New Nuclear

At the same time, the EDF group is actively pursuing its development in renewable energies (with the objective of doubling the installed capacity of the Group's ENR and hydropower fleet from 28GW in 2014 to 50GW in 2030) and in New Nuclear.

With regard to renewable energy, the new means developed will be essentially onshore and offshore wind power, solar energy and hydropower. In December 2017, EDF announced the Solar Plan: a development plan of solar energy, aimed at installing 30GW of solar power in France between 2020 and 2035. The development of these assets outside France is undertaken in line with the EDF group's international strategy. In this respect, the Group strengthened in 2018 its integration in the renewable energy industry by developing new projects, not only in France, but also in the United States, the UK, Germany, Middle East, Brazil, Chile, India and China (see section 1.4.1.5.3 "EDF Renewables").

As regards New Nuclear, the main issues are:

- the commissioning of Flamanville 3 and of Taishan in China (the 1<sup>st</sup> unit of which was commissioned in December 2018);
- the building and operation of two EPR reactors at Hinkley Point, for which the final contracts were signed on 29 September 2016 by EDF, CGN and the British Government;
- the integration of Framatome, 75.5% owned by EDF since 31 December 2017 (see section 1.1 "History and development of the Company");
- the preparation of the reactors of the future with the EPR 2 project (as a follow-up to the New Model EPR project), conducted jointly with Framatome; in particular, the working programme with the French government, aimed at reaching the decision to launch, if appropriate, a programme to build new nuclear reactors in France;
- the development of the EPR for the export market (in particular, in India).

## Development of a carbon-free hydrogen offer

Lastly, EDF, actively involved in the hydrogen field, mainly with its R&D, is preparing to develop a competitive carbon-free hydrogen offer in the medium term, primarily for industrial and heavy mobility customers, which are sectors difficult to decarbonise. To this end, an industrial partnership and equity investment agreement was signed in 2018 with McPhy, a specialist in production equipment (by electrolysis), storage and distribution of hydrogen (investment of €16 million by "EDF Pulse Expansion").

### 1.3.2.3 International expansion

The EDF group wants to be a key player in the energy market in France and in its core countries in Europe (United Kingdom, Italy, Belgium) by playing a role in energy security, the enhancing of economic competitiveness and the European economy low carbon transition, in line with public policies.

The Group is also expanding outside Europe, by pursuing three long-term objectives:

- to position itself through an industrial and commercial presence in cross industries in three additional countries/geographical areas (including South America, Western and Central Africa, the Middle-East, India);
- to channel its investment choices with a view to contributing to the global energy transition and develop new businesses on a commercial basis;
- to significantly increase its international business (outside Europe) by 2030.

EDF is thus deploying a targeted approach in geographic terms and steering its investment choices by giving priority to low carbon generation projects, in particular hydraulic, wind and solar generation projects as well as energy services and engineering activities. It is expanding storage capacities and developing gas production projects in areas where these are key factors for energy transition, in line with the Group's CO<sub>2</sub> path. Micro-grids, small adapted grids with a high renewable content for areas that are isolated, are also being explored in particular thanks to the MASERA demonstrator built in Singapore.

### 1.3.2.4 Transformation

Health and safety, digital and new work practices, responsibility and simplification, skills and the recognition model are the five major levers of the Group's transformation.

The Group adapts its managerial practices by streamlining its organisations and *modus operandi*, as illustrated by a number of concrete examples since 2016 (introduction of fixed numbers of working days for managers, boosting career paths and promoting internal mobility and promotional training, streamlining and simplification of Group policies, etc.) and other more recent examples, such as the digital signature of contracts and the simplification of financial reporting. In 2018, EDF also signed a new global agreement on Corporate Social Responsibility ("CSR agreement") which includes improvements in favour of diversity and other societal improvements to the benefit of Group employees.

Moreover, the promotion of innovation, based on experiments ("labs" and co-construction platforms with customers) and on an open innovation programme will contribute to this transformation. The creation of EDF Nouveaux Business, a department in charge of "new businesses", has complemented the skills EDF is gradually developing in order to meet the challenges in this field. It will use the levers of incubation, investment in external start-ups (through the Electranova funds) and technological partnerships (see section 1.4.6.1.3 "EDF Pulse Expansion").

The digital transformation involves employees and internal *modus operandi*, customer relations and the management and design of industrial assets. The creation at end 2016 of a Transformation and Operational Efficiency Department, which combines the Group's activities relating to information systems, purchasing, real estate and shared services, reflects the Group's desire to speed up in this field. Since several years, the EDF group has placed the focus of digital transformation at the strategic level and has carried out an in-depth review of its internal organisation and training.

In the field of data, the Group has adopted a data management policy and set up a "data analytics" plant for nuclear, thermal and renewable electricity generation, with the pooling of expertise, inaugurated in April 2018.

Performance improvement has always been a priority for the EDF group. The current economic and financial context further increases the urge for such improvement. The Group is strengthening control of its costs to bring them into line with its environment. The approach is adjusted depending on the scopes involved (cross-disciplinary functions, operating entities, etc.) and a number of projects have already produced results in terms of reduction of operating expenses, optimisation of the working capital requirement and improved management (cash-based management, project management team, cyber-security management), with the aim of enhancing the competitiveness of support activities and giving businesses performance levers.

Lastly, "Let's Talk Energy", a collective intelligence initiative to support transformation, was initiated in the first half of the year to harness the intelligence of EDF employees towards the construction of the Group's medium and long term scenarios. In the context of the debate on energy in France, this initiative will be continuing (see section 3.2.5.5 "Listening to employees and talking about energy").

### 1.3.2.5 Sustainable development

As part of its CAP 2030 strategic plan, EDF has made a commitment to corporate responsibility, in connection with the UN's new sustainable development programme (2015-2030), through six Corporate Responsibility Goals (see section 3.1 "EDF's commitments in the area of sustainable development"). The Group has committed to presenting annual results that lay down a roadmap for the Group's businesses and subsidiaries to serve a profitable and responsible development:

- climate change: going beyond the requirements of the +2°C goal set by COP 21 by further reducing the Group's CO<sub>2</sub> emissions, which are already at remarkably low levels compared to the Group's main European counterparts;

- human development: incorporating the best practices of industrial groups in the field of human development: health & safety, gender equality and internal promotions;
- energy poverty: offering all fragile populations information and solutions to support them in their energy consumption and help them assert their rights;
- energy efficiency: innovating through digital energy efficiency solutions so that customers can optimise their consumption;
- dialogue and consultation: organising systematically and worldwide an initiative of dialogue and consultation which is transparent and open for each new project;
- biodiversity: launching a positive approach to biodiversity, not merely being aware of or decreasing the impacts of our activities, in order to have a positive effect.

### 1.3.2.6 Research & Development to support energy transition

Research & Development (R&D) has a crucial role to play in developing low carbon solutions, all the while reinforcing the safe and economically efficient operation of existing and future facilities. See section 1.6 "Research & development, patents and licences".

### 1.3.2.7 CAP 2030 success factors

CAP 2030 enables the Group to develop a portfolio of assets focused on low carbon, renewable and nuclear energy, services for customers, decentralised energy solutions.

The key success factors of CAP 2030 are:

- the expansion of the range of offers and exemplary customer relations;
- the management of major projects, in particular the new models for nuclear reactors, the "Grand Carénage" programme or the development of Nuclear New Build in the United Kingdom;
- the selectiveness of investments in projects;

- cost control;
- the transformation of the Group's modus operandi and the commitment of all.

In this context, the implementation of the Group's performance plan announced on 22 April 2016 is well under way at end-2018:

- a reduction in operating expenses <sup>(1)</sup> of €0.96 billion from 2015 to 2018, with target savings of €1.1 billion from 2015 to 2019;
- an asset disposal plan of approximately €10 billion between 2015 and 2020, already achieved in 2018;
- strengthening of the balance sheet *via* a capital increase totalling €4.0 billion and the option of dividend payment in shares in respect of financial years 2015-2016-2017, chosen by the State in particular (cumulative €5 billion).

The Group is pursuing its investment programme in line with its CAP 2030 strategy (see section 1.3.3 "Investment Policy").

Moreover, the Group is continuing the work on its modus operandi through its transformation programme, "accountability, simplification and innovation/digital technology":

- structuring of the Group's operations into 20 Business Units, and overhauling of management indicators;
- professionalisation of project managers, with the setting up of an external certification programme;
- simplification of some processes: purchasing, training, reporting, etc.;
- development of innovation, with the creation of new services in start-up mode supported and financed by "EDF Pulse Expansion" (see section 1.4.6.1.3 "EDF Pulse Expansion"), support for participative innovation, with more than 30 places of innovation throughout the Group and the internal and external EDF Pulse Awards;
- deployment of a digital strategy: cultural transformation with the new season of the "Y Project" (participation of 30 young people), increasing use of collaborative tools and structuring to harness data to support customers, and to optimise maintenance and operating costs.

(1) At comparable scope and exchange rates. At constant pension discount rates. Excluding change in the operating expenses of the service activities.



### 1.3.3 INVESTMENT POLICY

#### 1.3.3.1 Investments in 2018

The Group continued its programme of gross operating investments for a total amount of €16.2 billion in 2018, versus €14.7 billion in 2017. Some of these investments are considered as development investments that will generate cash flows in a longer term (see also section 5.1.5.1.2 "Net cash flow used in investing activities").

Total net investments excluding disposal plan were €14.0 billion in 2018.

- These include the new developments items for €3.1 billion in 2018 (mainly Linky for €0.8 billion and the British Nuclear New Build for €1.6 billion).
- Aside from new developments, net investments excluding strategic disposals amounted to €10.9 billion in 2018. They correspond mainly to nuclear maintenance for €3.9 billion, Flamanville 3 project for €0.8 billion, regulated activities in France and island systems (excluding Linky) for €3.3 billion (connections, modernisation of the mainland and island network), and lastly to renewables (€1.1 billion) and services (€0.4 billion).

Asset disposals represent €1.9 billion in 2018 and include the disposal of the stake in the Dunkirk LNG terminal for €1.5 billion. The Group's disposal plan, which reached a cumulative total of €10 billion at end-2018, has consequently been completed.

#### 1.3.3.2 Investment programme

In the short and medium term, the Group aims to:

- complete major industrial projects such as the Flamanville 3 EPR in France as well as the smart meters in France (Linky), representing capital expenditure of respectively €10.9 billion <sup>(1)</sup> and €4.0 billion <sup>(2)</sup> (see respectively sections 1.4.1.2.1 "Flamanville 3 EPR project" and 1.4.4.2.4 "Future challenges");
- continue investing in Nuclear New Build in the UK in order to complete the Hinkley Point C project for a total cost upon completion of £<sub>2015</sub>19.6 billion <sup>(3)</sup> for 100% of the project (see section 1.4.5.1.2.5 "Nuclear New Build Division"). The Group is also continuing its studies of the Sizewell project;

- continue its "Grand Carénage" industrial programme for nuclear power in France for an investment of about €<sub>2013</sub> 45 billion over the period 2014-2025 (see section 1.4.1.1.2 "Operation and technical performance of the nuclear fleet");
- intensify its investments in renewable energies in France and internationally, with a gross investment in renewables above €2 billion per year over the 2017-2020 period, and develop its installed capacities in solar power; the Group announced the launch on 11 December 2017 of the Solar Plan, to be mainly financed through partnerships;
- continue with the turnover of Edison's assets, which started firstly with the disposal of its Head Office in Milan and the disposal of a portfolio of gas assets in 2017, and secondly with the acquisition in 2018 of the customer portfolio of Gas Natural (GNVI) and the services company Zephyro;
- develop 10GW of new electricity storage facilities in the world by 2035, in addition to the 5GW already operated by the Group, with the announcement on 27 March 2018 of the Electricity Storage Plan. EDF is also boosting its capacity for Research and Development and for innovation in this field in order to support the rapid development of storage technologies;
- become the leading electricity company in clean electric mobility from 2022 in four large markets (France, United Kingdom, Italy and Belgium), with the launch on 10 October 2018 of the Electric Mobility Plan, which is based on an ecosystem of innovative players through strategic partnerships.

With respect to the here above Flamanville 3, Linky, Hinkley Point C and "Grand Carénage" projects, as well as the investments in renewable energies, the firm commitments made by the Group on the acquisitions of tangible and intangible assets are set out in note 46.1.2.1 of the notes to the consolidated financial statements as at 31 December 2018.

Lastly, as part of its CAP 2030 strategy, the Group will selectively target new development projects in addition to those already initiated, in line with its policy and financial constraints: EPR 2 projects, British Nuclear New Builds, new renewable energy projects, as well as international equity investments.

Given its financial constraints, the Group will whenever possible, use partnerships to finance its new projects.

(1) 2015 euro cost of the construction of Flamanville 3, excluding interim interest.

(2) The programme completion costs were reviewed downward, from €4.5 to 4.0 billion for the period 2014-2021, after taking into account prices of the latest contracts signed for equipment (meters and concentrators) and for installation services.

(3) Excluding interim interest and the currency effect compared with a benchmark project exchange rate of £1 = €1.23.

### 1.4 DESCRIPTION OF THE GROUP'S ACTIVITIES

The EDF group is an integrated energy company active in all electricity businesses: nuclear, renewable and thermal generation, transmission (through RTE <sup>(1)</sup> an entity accounted for using the equity (method), distribution (through Enedis <sup>(2)</sup>), sales and marketing, efficiency and energy services, and energy trading. It is the leading player in the French electricity market and holds strong positions in Europe (mainly in the United Kingdom (UK), Italy and Belgium), which makes it one of the world's leading electric energy companies and a renowned gas player. It is also present in the design and manufacture of equipment and fuel for nuclear reactors, and in related services (activity carried out by Framatome).

With a global installed net generation capacity of 126.5GWe <sup>(3)</sup> as at 31 December 2018, generating 584TWh worldwide, the Group has one of the largest generation fleets in the world. Among the ten largest global power suppliers, it produces the smallest amount of CO<sub>2</sub> per kilowatt-hour <sup>(4)</sup> generated thanks to the share of nuclear, hydro and other renewable energies in its generation mix.

The EDF group supplies energy and provides services to 39.8 million customer sites <sup>(5)</sup> worldwide (of which 29.7 million in France) including:

- to 34.7 million customers <sup>(6)</sup> in electricity, of which 28.2 million in France;
- to 5.1 million customers <sup>(7)</sup> in gas, of which 1.5 million in France.

The Group is thus implementing an integrated model for the joint operational management of its portfolio of assets upstream (generation and procurement of energy and fuels) and downstream (wholesale and retail) to guarantee supply of energy to its customers through the best possible management of operational and market risks and with a view to maximising gross margin.

#### 1.4.1 ELECTRICITY GENERATION ACTIVITY

In mainland France, the electricity generation activities are split across the Nuclear and Thermal Fleet Department and the Renewable Energy Division. In addition to

these two departments, the Engineering and New Nuclear Project Department is responsible for the development projects for the Group's new nuclear generation assets, in France and abroad. Each of these three departments has all the expertise and performance drivers required to operate the leading European electricity generation fleet and ensure its development and sustainability, and offer their technical and industrial expertise to the whole Group in these three areas.

#### Strengths of the generation fleet

The Group's generation fleet has significant strengths:

- a competitive generation mix with low variable generation costs <sup>(8)</sup>;
- a variety of means of generation, which enable adequate coverage of EDF's downstream portfolio needs (end users, sales to alternative suppliers, sales on the wholesale markets, etc.). Use of the fleet's various components is managed by giving priority, at any given time, to the generation type offering the lowest variable costs: run-of-river hydropower plants are used for base generation; nuclear plants, because of their low variable generation costs, are used for base and mid-merit generation; adjustable hydropower generation (coming from dams) complemented by energy transfer pumping stations (STEP) <sup>(9)</sup> and thermal fleet are used for mid-merit and peak generation;
- a significant standardised fleet of nuclear facilities, for which EDF provides full control over their entire life cycle. Moreover, EDF is working towards extending the operating lifespan of its power plants and improving their technical performance;
- a fleet generating at 90% without CO<sub>2</sub> emissions due to the predominance of nuclear and hydropower generation facilities, in an increasingly restrictive environmental regulatory context;
- a geographical position at the junction of electricity exchanges between the continental platform and the electric peninsulas (Italy, Spain and the UK).

(1) RTE, transmission network operator, independently managed within the meaning of the French Energy Code.

(2) Enedis is an independently managed subsidiary within the meaning of the provisions of the Energy Code.

(3) Source: EDF. Figures calculated according to consolidation accounting rules.

(4) Source: comparison based on data published by these ten groups.

(5) Customers are counted at the end of 2018 per site; a customer can have 2 delivery points: one for electricity and another one for gas.

(6) The number of electricity sites at end-2017 was 35.9 million, of which 29.4 in France (EDF excluding ES and overseas departments).

(7) The number of gas sites at the end-2017 was 4.7 million, of which 1.5 in France (EDF excluding ES and overseas departments).

(8) Variable generation costs correspond to all costs that vary directly with the amount of energy generated. Variable costs for electricity generation are mainly fuel costs.

(9) EDF operates 5GW of STEP in France and its engineering is referenced to the tune of 30GW abroad (e.g.: Israel, Chile).

## Composition and specifications of the installed fleet

### EDF fleet in mainland France

With a total installed generation capacity of 89.4GW in mainland France <sup>(1)</sup> at 31 December 2018, EDF has the largest generation fleet in Europe, accounting for nearly 8.4% of the total installed capacity in the main European countries (the 35 member areas of ENTSO-E – European Network Transmission System Operators for Electricity – that includes Germany, Italy and Spain <sup>(2)</sup>).

In 2018 in mainland France, EDF's generation fleet produced 443.3TWh excluding pumped storage hydropower, and 450.6TWh including pumped storage hydropower.

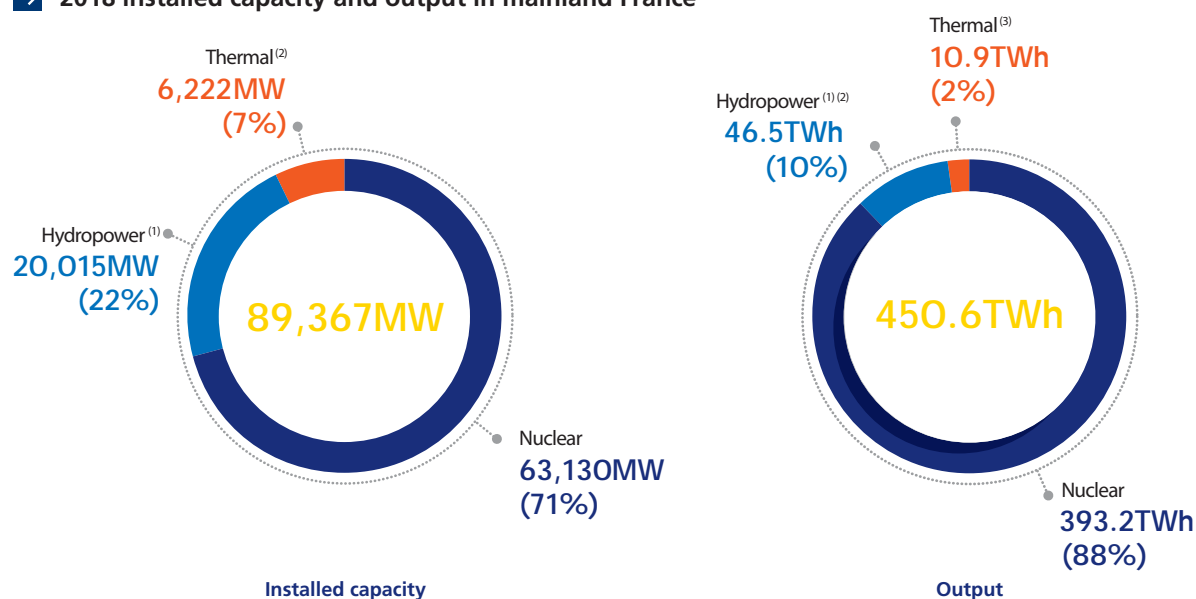
At 31 December 2018, the capacity of EDF's generation fleet was mainly composed of:

- 58 nuclear units based on pressurised water reactors (PWR) (a unit is defined as a generation unit including a reactor, steam generator, a turbine, a generator,

the related equipment and the buildings that house them). These units have electrical power capacities varying from 900MW to 1,500MW and are spread out over 19 sites, with an average age of 33 years (see section 1.4.1.1 "Nuclear power generation in France");

- 20 functioning thermal units, with an average age of around 20 years (see section 1.4.1.4 "Thermal generation in mainland France");
- 433 hydropower plants, with an average age of 74 years <sup>(3)</sup> (see section 1.4.1.5.1 "Hydropower generation in France");
- and other hydropower plants owned by Group subsidiaries: SHEMA group (100%) and CERGA (owned 50/50 with the German electricity company EnBW) which represent a total installed capacity of approximately 140MW in 2018.

### → 2018 installed capacity and output in mainland France



Expressed in megawatts of maximum capacity linked to the network.

(1) Excluding Corsica and overseas departments, 437MW in 2018.

(2) Excluding Corsica and overseas departments, 1,621MW in 2018.

(3) Excluding Wind generation capacity of 12MW and including tidal generation capacity of 240MW.

(1) Excluding Corsica and overseas departments, representing 1.7TWh in 2018.

(2) Generation including pumped storage consumption: the electricity consumption needed for the operation of pumped storage power plants (STEP) amounted to 7.3TWh in 2018, resulting in net hydropower generation (including pumped storage consumption) of 39.2TWh, and including generation from the tidal power on the Rance river of 0.5TWh.

(3) Excluding Corsica and overseas departments, 4.2TWh in 2018.

### Other geographic areas and subsidiaries

At the end of 2018, the Group also has an installed capacity for electricity generation of 37.1GW (with 133.4TWh of electricity generated in 2018):

- through EDF Renewables (see section 1.4.1.5.3 "EDF Renewables") with a consolidated installed capacity of 8GW and output of approximately 15TWh;
- through overseas departments' Island Energy Systems with an installed capacity of 2GW and output of approximately 6TWh in 2018 (see section 1.4.4.3 "Island Energy Systems");

- through EDF Energy in the UK with an installed capacity of 14GW and nearly 70TWh generated in 2018 (see section 1.4.5.1 "United Kingdom");
- through Edison in Italy with an installed capacity in electricity of 6GW and nearly 20TWh generated in 2018 (see section 1.4.5.2 "Italy");
- in the rest of the world with a consolidated installed capacity of 4GW and output of 18TWh (see section 1.4.5.3 "Other international");
- through contribution from Dalkia (see section 1.4.6.1.1 "Dalkia"), excluding heat generation, with an installed capacity in electricity of 2GW and output of 4TWh in 2018.

(1) Excluding Corsica and French overseas departments.

(2) Calculation based on the ENTSO-E statistics for the year 2017, as the statistics for the year are only available on 30 April of the following year

(3) Arithmetic mean.

### 1.4.1.1 Nuclear power generation in France

The electricity generated by EDF in France from its fleet of nuclear power plants represented 88.7% of its total electricity generation in 2018 excluding pumped storage hydropower.

#### 1.4.1.1.1 EDF's nuclear fleet in France

EDF's PWR model is divided into three series of available electrical power:

- a 900MW series consisting of 34 units of approximately 900MW (for a total power capacity of 30,770MW) with an average age of 37 years;

- a 1,300MW series consisting of 20 units of approximately 1,300MW (for a total power capacity of 26,370MW) with an average age of 30 years;

- the N4 series, which is the most recent with an average age of 18 years, consisting of 4 units of approximately 1,500MW (for a total power capacity of 5,990MW);

for a total of 58 units spread over 19 sites owned by EDF, and constituting a total authorised capacity of 63,130MW as at 31 December 2018. With an average age of approximately 33 years for an estimated technical operating lifespan of over 40 years, EDF's nuclear fleet is about average compared to the fleets installed worldwide.

The commissioning and most recent ten-year inspection (VD) dates for these units as of end-2018 are as follows:

Units	Year of industrial commissioning	Most recent ten-year inspection	Next ten-year inspection	Units	Year of industrial commissioning	Most recent ten-year inspection	Next ten-year inspection
Fessenheim 1	1978	2009	n/a	Gravelines 6	1985	2018	VD4
Fessenheim 2	1978	2011	n/a	Cruas 3	1984	2014	VD4
Bugey 2	1979	2010	VD4	Cruas 4	1985	2016	VD4
Bugey 3	1979	2013	VD4	Chinon B3	1987	2009	VD3
Bugey 4	1979	2011	VD4	Chinon B4	1988	2010	VD3
Bugey 5	1980	2011	VD4	Paluel 1	1985	2016	VD4
Dampierre 1	1980	2011	VD4	Paluel 2	1985	2018	VD4
Gravelines 1	1980	2011	VD4	Paluel 3	1986	2017	VD4
Gravelines 2	1980	2013	VD4	Paluel 4	1986	2008	VD3
Tricastin 1	1980	2009	VD4	Saint-Alban 1	1986	2017	VD4
Tricastin 2	1980	2011	VD4	Flamanville 1	1986	2018	VD4
Dampierre 2	1981	2012	VD4	Saint-Alban 2	1987	2018	VD4
Dampierre 3	1981	2013	VD4	Flamanville 2	1987	2008	VD3
Dampierre 4	1981	2014	VD4	Cattenom 1	1987	2016	VD4
Tricastin 3	1981	2012	VD4	Cattenom 2	1988	2018	VD4
Tricastin 4	1981	2014	VD4	Nogent 1	1988	2009	VD3
Gravelines 3	1981	2012	VD4	Belleville 1	1988	2010	VD3
Gravelines 4	1981	2014	VD4	Belleville 2	1989	2009	VD3
Blayais 1	1981	2012	VD4	Nogent 2	1989	2010	VD3
Blayais 2	1983	2013	VD4	Penly 1	1990	2011	VD3
Blayais 3	1983	2015	VD4	Cattenom 3	1991	2011	VD3
Blayais 4	1983	2015	VD4	Golfec 1	1991	2012	VD3
Saint-Laurent 1	1983	2015	VD4	Cattenom 4	1992	2013	VD3
Saint-Laurent 2	1983	2013	VD4	Penly 2	1992	2014	VD3
Chinon B1	1984	2013	VD4	Golfec 2	1994	2014	VD3
Cruas 1	1984	2015	VD4	Chooz B1	2000	2010	VD2
Chinon B2	1984	2016	VD4	Chooz B2	2000	2009	VD2
Cruas 2	1984	2018	VD4	Civaux 1	2002	2011	VD2
Gravelines 5	1985	2017	VD4	Civaux 2	2002	2012	VD2

EDF first-generation design plants have been gradually shut down and are currently being decommissioned (see section 1.4.1.1.6 "Decommissioning of nuclear power plants").

#### Generation allocation contracts

In the 1970-80's, EDF developed, industrial cooperation with European operators in the nuclear industry, in the form of generation allocation contracts backed by units of the EDF French nuclear fleet.

In its fleet, EDF has twelve generating units participating in the contracts (up to 1.5GW) with the following European energy companies:

- Fessenheim 1-2: EnBW (17.5%) and the Swiss electricity group CNP (15%) (this last contract ended on 31 December 2017);
- Cattenom 1-2: EnBW (5%);
- Bugey 2-3: Électricité de Laufenbourg <sup>(1)</sup> (17.5%);
- Tricastin 1 to 4: Electrabel <sup>(2)</sup> (12.5%);
- Chooz B1-B2: EDF Luminus, EDF subsidiary in Belgium (3.3%).

(1) Axpo Group.

(2) Engie Group.



The purpose of these generation allocation contracts is to make available to each partner the proportion of energy generated actually due to him, based on the share of the capacity allocated to him – in return for payment of their share of the construction costs, annual operating costs (including upstream and downstream fuel costs), local taxes and taxes specific to nuclear energy, and the costs relating to decommissioning. In these transactions, the partners have shared with EDF the industrial risks in the development of the fleet and assume the risks linked to performance concerning the current operation of the power plants. On the other hand, they have no operational role.

Furthermore, EDF signed a second type of generation allocation contract relating to a pool of power plants (totalling approximately 2GW) under which EDF makes available to its partners a share of the electricity determined by the level of availability of all or part of a standard fleet, applied to the capacity share reserved to the partners for the units concerned. These contracts mainly concern the following power plants:

- Chooz B1-B2 (N4 initial series unit): Electrabel (21.7%);
- Cattenom 3-4: Électricité de Laufenbourg (7.8%) and CNP (21.8%).

#### 1.4.1.1.2 Operation and technical performance of the nuclear fleet

Nuclear power is a means of generation whose variable cost, mainly fuel-related costs, is low since it represents less than 30% of operating costs<sup>(1)</sup>. The main competitive levers of the nuclear fleet in its operating phase are thus the amount of generated energy and the optimisation of fixed operating and maintenance costs. The levers relating to the fuel cycle are further discussed in section 1.4.1.1.4 "The nuclear fuel cycle and related issues".

#### Operation methods of the nuclear fleet

##### Generation cycle and planned outages

To reconcile the challenges linked to the strong variations in seasonal consumption in France, due to its strong temperature sensitivity, the availability of maintenance resources and the efficient use of reactor fuel, EDF has now adopted generation cycles of 12 and 18 months for its fleet. At the end of 2018, this breakdown was as follows:

- 28 units of the 900MW series have an operating cycle of approximately 12 months;
- 6 units of the 900MW series, 20 units of the 1,300MW series and 4 units of the N4 (1,450MW) series have an operating cycle of approximately 18 months.

At the end of these operating cycles, shutdown periods are programmed in order to replace a fraction of the fuel loaded in the core and perform maintenance work.

Two types of planned outages are alternated at the end of each generation cycle:

- an ordinary shutdown for refuelling, for a standard period of approximately 35 days, during which unloading spent fuel and reloading new fuel is the main operation performed; although light maintenance or periodic testing may also take place during this type of outage;
- a partial inspection for refuelling and maintenance for which the standard period<sup>(2)</sup> lasts approximately 70 days.

Every ten years, the power plant is shut down for a standard period of approximately 110 days in order to carry out a ten-year inspection. This length of time varies according to the works and maintenance programme, as well as the series concerned. The programme for a ten-year inspection includes the following:

- unloading of spent fuel and reloading of fresh fuel, as at each outage;
- hydropower tests of the primary coolant system, a leak test of the containment, and inspection work of the reactor's pressure vessel;
- modification work, associated with ten-year safety re-evaluations;

- other specific maintenance operations, in particular renovation or replacement of major components.

At the end of the ten-year inspection, the ASN decides whether to approve the restart of the reactor and then issues technical prescriptions setting the conditions for continuing operation.

#### Operation of EDF's nuclear fleet

Nuclear generation resources, owing to their low variable cost are first used for base-load generation, immediately after run-of-river hydropower and other unavoidable renewable energies, as well as the energy purchased under buying obligations from decentralised energy producers. Variations in energy consumption over one year (summer-winter, day-night) and the currently restricted fluidity of wholesale markets due to limited interconnections on the borders lead nuclear energy to be used also for mid-merit generation. High variations in seasonal consumption in France and its major variation during winter months require that planned nuclear fleet outages be concentrated between April and October. The 2003 heat wave highlighted the consequences of very strong warming of rivers, especially on the conditions for operating "riverside" units. The scheduling of unit outages was therefore reviewed to reduce the number of outages of "seaside" units in July and August to encourage these units to continue operating as much as possible since cooling capacities are less dependent on weather conditions.

#### Generation and technical performance

The nuclear fleet produced 393.2TWh in 2018, up 14.1TWh compared to that of 2017.

Nuclear generation expressed in annual energy corresponds to a load factor rate referred to as "Kp" for the French nuclear fleet (defined as the ratio of energy generated to the maximum theoretical energy, or the energy generated if the installed capacity were operated year-round). This rate is obtained by multiplying two coefficients ( $Kp = Kd \times Ku$ ):

- the availability factor ("Kd") (the available energy<sup>(3)</sup> as a percentage of the theoretical maximum energy, or the energy generated if the installed capacity were operated year-round). The Kd depends on outage durations, and is therefore impacted by standard durations and the work programme to be performed;
- a utilisation factor, "Ku" (energy generated compared to energy available). The Ku factor reflects environmental, regulatory and social constraints, supply of system services and optimisation implemented by EDF (fuel and modulation).

In 2018, the Kp factor reached 71.1%, on a slight increase compared with that of 2017 (68.55%). This results from a Kd of 76.5%, lower than in 2017 (77.1%) and a Ku of 92.8%, higher than in 2017 (88.92%).

In 2018, generation performance was affected by exceptional damages and large generation incidents (costing around 12.5TWh), longer-than-expected outages (costing around 5TWh) and environmental constraints (costing around 2TWh). The outage extensions experienced in 2018 were caused in equal measure by maintenance and operational quality issues, technical failures and project management deficiencies. Performance losses related to unplanned outages rose from a rate of 3.26% in 2017 to 3.7% in 2018 because of several exceptional incidents. Without these, the rate of unplanned outages would have been 3%. These figures do not undermine the maintenance strategy implemented in 2007 to renovate and replace major components which has brought the overall rate of unplanned outages down to 30% since 2009.

The main technical incidents that impacted generation in 2018 are:

- continuing and finalising activities to restart the Paluel 2 reactor after the fall in late March 2016 of a worn-out steam generator in the Paluel 2 reactor building, when it was being replaced during the reactor's third ten-year inspection. The primary coolant system passed the hydropower test performed on 20 April 2018 and the ASN (French Nuclear safety authority) officially authorised the criticality of the Paluel No. 2 reactor on 13 July 2018. Paluel 2 was returned to the network on 23 July 2018;

(1) Operating costs are defined as follows: fuel costs (including downstream expenses in the fuel cycle), operating expenses (purchases and external services, employee expenses) and maintenance costs (expenses and investments). They do not include investments related to construction or decommissioning expenses.

(2) Standard durations represent optimised and realistic reference durations by outage types. They take into account the feedback from past outages. Outage planned durations fluctuate around these standard durations, depending on the work programme to be performed.

(3) Available energy is equal to the maximum theoretical energy less generation losses due to technical reasons inherent to power plants, such as planned outages, unplanned outages due to failure or safety requirements, and performance of regulatory tests.

- continuation of investigating quality discrepancies in some of the manufacturing records for forged parts (the records are said to be "crossed" or "uncrossed") at AREVA NP's Creusot Forge plant. The comprehensive review of the manufacturing records of the components installed on the nuclear reactors in operation gives rise to a summary report for each reactor. This report is sent to the ASN for examination at the latest two months before the restart of the reactor following its planned statutory outage. As is the case before each restart of a reactor, the ASN then issues its decision on the authorisation to restart. End-2018, summary reports for the 58 reactors in operation were sent to the ASN within the prescribed time periods. At end-January 2019, 54 reactors had obtained the green light from the ASN to restart confirming the operational safety of the concerned components.

Following the processing of these irregularities on forged parts, EDF, in accordance with the ASN's decision No. 2017-DC0664 of 15 December 2017, extended the quality review of documents to files on parts moulded at the Creusot Loire plant. None of the anomalies identified during the examination of the 504 manufacturing files concerned compromises the integrity of the equipment and their operational safety. A summary report was sent to the ASN at the end of 2018.

As regards the specific case of No. 3 steam generator in Fessenheim 2, with regard to which an irregularity was found in 2016 in the forging record of the lower part and for which a comprehensive analysis report was sent to the ASN in early July 2017 with the results of the programme of additional tests conducted in autumn 2016, a meeting of the permanent experts' group was held on 27 February 2018 resulting in a favourable opinion on returning the Fessenheim 2 steam generator in question to operation. On 12 March 2018, ASN lifted its suspension of the pressure test certificate of a steam generator installed on Fessenheim reactor 2, considering that the anomaly did not compromise its serviceability and that its compliance with the regulations was thus demonstrated. On 23 March, the Fessenheim site received criticality authorisation for reactor 2. It was returned to the network on 9 April 2018:

- examination and treatment of the damage to the thermal sleeves (mechanical part under the vessel head of reactors) found at the end of 2017 on the Belleville 2 reactor. Following a study of the extent of the damage observed, a repair record was drawn up and implemented at Belleville 2. It therefore restarted on 12 April 2018 and checks were carried out on the other reactors of the Fleet during the planned unit outages. For certain 1,300MW reactors, inspections showed that repairs were necessary on the current unit outages, leading to extensions of these outages. Overall in year 2018, this had a total impact of about 10TWh. All reactors will have been checked by the end of April 2019;
- the early preventive cleaning of Dampierre 4 steam generators, for which preventive inspections were carried out during the planned unit outage revealed that the clogging was worse than expected on spacer plates 5 of the 3 steam generators.

EDF has also continued its structuring process to guarantee the compliance of the equipment of its nuclear facilities. EDF has thus presented to the ASN an action plan so as to prioritise and arrange for the treatment of anomalies taking into account safety issues. Its implementation involves all nuclear power plants and national engineering units.

### Investment programme for the existing nuclear fleet in France

EDF's industrial strategy is to operate the existing nuclear fleet well beyond 40 years under the best conditions of nuclear safety (integrating, in particular, post-Fukushima modifications), of environmental safety and protection, which requires to keep on performing significant maintenance operations over the

2014-2025 period. The "*Grand Carénage*" programme was implemented, so that the Group can integrate, with its industrial partners, the significant amount of work to be done on the fleet.

On 22 January 2015, EDF's Board of Directors approved in principle a major overhaul programme (the "*Grand Carénage*") aimed at refurbishing the French nuclear fleet, enhancing reactor safety and, if conditions allow, continuing their operation. The authorised investment amount stood at a maximum of €<sub>2013</sub> 55 billion (€60 billion in current euros) in total over the 2014-2025 period for the 58 reactors currently operating <sup>(1)</sup>.

For the existing nuclear fleet, the programme covers both usual maintenance spending and investments required to extend the lifespan of equipment (replacement of the steam generators, VD4 900, VD3 1300).

The optimisation work undertaken since (reductions and postponements) led to a downward revision of the overall cost of the programme to €<sub>2013</sub> 45 billion (or €48 billion in current euros) over the 2014-2025 period. This revision is largely a result of continued optimisation efforts regarding the adopted technical solutions and component replacement strategies and greater precision in their application by integrating the capacities of the industrial base, which enabled certain expenses to be postponed. A date for the closure of the Fessenheim plant before its fourth ten-year inspection was also taken into account.

By dint of these industrial measures, around €<sub>2013</sub> 6 billion (or €7.5 billion in current euros) in costs was reduced and around €<sub>2013</sub> 3.8 billion (or €4.7 billion in current euros) of spending was postponed to after 2025 for total savings of close to €<sub>2013</sub> 10 billion (or €12 billion in current euros) from initial estimates.

The contribution of postponements to this overall revision was therefore revised slightly up compared with 2017. Although additional savings have been identified regarding the ten-year inspections and the application of feedback from Fukushima (for a total of €<sub>2013</sub> 6.2 billion or €7.2 billion in current euros), the replacement of steam generators and major components (for a total of €<sub>2013</sub> 4 billion or €4.6 billion in current euros) and other engineering projects (for a total of €<sub>2013</sub> 1.8 billion or €2.1 billion in current euros), they were offset by an increase of approximately €2 billion in current euros. Indeed from 2019 onward, usual maintenance spending, primarily due to better identification of expenses for regular inspections will be recognised as investments.

In order to complete the programme, a separate entity was created, the "*Grand Carénage*". The programme's sponsor is the Nuclear and Thermal Fleet Department (DPNT) which approves the programme's scope, currently broken down into 22 projects, and financial trajectory. The programme's supervision is taken care of by the Nuclear Generation Division, which defines the content of the activities. Project management is handled by the Programme Director assisted by the project managers over the life of the project in all areas: deadlines, quality control, financial trajectory. The Board of Directors examines the main investments for each major category of projects whose chief characteristics are presented to it, approves contracts or deals above a predefined amount, and conducts the annual review of the programme's implementation on the basis of indicators showing the extent of its physical and financial progress, what remains to be completed and the final costs.

This industrial programme is being gradually implemented in compliance with the objectives of Energy transition for green growth Law, multi-year energy programmes and the opinions and orders of the ASN as well as the procedures for authorisation for reactors to run for more than 40 years (see section 1.4.1.1.5 "Preparing for the future of the nuclear fleet in France").

Under this programme, the planned renovation or replacement of major components of power stations such as generators, transformers or steam generators will continue.

(1) The figures presented by the French Cour des Comptes in its report of 10 February 2016 cover a longer time horizon, up to 2030, and included, beyond the investment, operating and maintenance expenses. Both assessments are consistent, as stated by the Cour des Comptes in its report. Indeed, among the overall estimates calculated by the Cour des Comptes and amounting to close to €100 billion for the 2014-2030 period, the investment expenditures estimated at €74.73 billion should be distinguished from the operating expenditures estimated at €<sub>2013</sub> 25.16 billion. Within the €<sub>2013</sub> 74.73 billion of investment expenses between 2014 and 2030, €<sub>2013</sub> 55 billion are dedicated to the 2014-2025 period, which allows the two estimates established by the EDF group and the Cour des Comptes to be connected.

At end 2018:

- the alternator generators were renovated on 47 units, for a total of 49 units to be renovated;
- the programme for preventive replacement of the poles in the main transformers is ongoing. 126 main transformer poles out of 174 had been replaced, i.e. approximately 72% of the programme;
- the steam generators of 28 out of the 34 units of the 900MW series were replaced.

Industrial work will continue beyond 2025 on the occasion of the third and fourth series of ten-year inspections of 1,300MW units, the fourth series of ten-year inspections of 900MW units and the second and third series of ten-year inspections of N4 units. This programme provides the opportunity to incorporate the additional safety improvements identified following the Fukushima accident as well as modifications allowing the operation of facilities to be extended significantly beyond 40 years in line with the multi-year energy programme (see section 1.4.1.1.5 "Preparing for the future of the nuclear fleet in France" and 1.5.2 "Public service in France").

#### 1.4.1.1.3 Environment, nuclear safety, radiation protection

##### Environmental protection

EDF bases its environmental procedure on an ISO 14001-certified management system (see section 3.1.3.3.2 "Management of environmental risks" – "The environmental management system (SME)"), rolled out in 2002 at a number of sites and then extended to all nuclear generation units.

In terms of radioactive waste management, Very Low-Level Waste (VLLW) has been removed to the Morvilliers storage facility in the Aube since 2004. Concerning Low and Intermediate-Level Operating Waste (LILW), EDF continues to take steps to limit its intermediate storage on all nuclear sites and relies instead on the Centraco factory (SOCODEI, a subsidiary of the EDF group).

For a description of radioactive waste processing downstream of the fuel cycle as well as decommissioning, see sections 1.4.1.1.4 "The nuclear fuel cycle and related issues" and 1.4.1.1.6 "Decommissioning of nuclear power plants".

##### An ever present nuclear safety procedure

EDF, in its capacity as a nuclear operator, takes responsibility for nuclear safety and, in a rapidly-changing context (market competition, environmental issues, etc.), reaffirms as its absolute priority the protection of the human and environmental health, among other things, through the prevention of accidents and the limiting of their consequences as regards nuclear safety. Moreover, the Codified Law of 13 June 2006 on nuclear transparency and safety (see section 1.5 "Legislative and regulatory environment") grants public access to information regarding in particular the nuclear safety measures taken by the operator and establishes a formal basis for transparency on nuclear safety.

The implementation of the French nuclear power programme led EDF to establish a safety procedure that:

- takes into account, from the design stage, the risks that might arise during the operation of the power plants, whether relating to the actual operation of the facilities or to internal or external attacks;
- is based both on the application of strict rules of operation, and on the cautious and inquiring attitude of the technical teams by means of the establishment of a true safety culture;
- is based on the cumulative experience of a standardised fleet of 58 reactors (i.e. more than 1,970 reactor-years of operation, the arithmetic sum of years of operation of EDF's pressurised water reactor (PWR));
- incorporates a continuous improvement approach that is notably embodied by the ongoing efforts to decrease the number of automatic reactor trips;
- benefits from integrated nuclear engineering and Research & Development within the Group in order to anticipate the correction of failures, maintain the facilities in good working order, develop equipment on an ongoing basis, reassess safety margins and monitor technology advances, as well as the implementation of

more effective new technologies and the management of sites being decommissioned;

- relies strongly on the development of skills; with this objective in mind, each nuclear generation site is equipped with a simulator used for training to cope with any type of situation.

Nuclear safety is subject to numerous controls, both internal and external.

- EDF has implemented internal control procedures. For example, every three to four years, EDF performs overall safety assessments for each nuclear power plant, which take place over a three-week period and involve approximately 30 inspectors. In addition, the General Inspector for nuclear safety and radiation protection, reporting to and appointed by EDF's Chairman and CEO, performs annual audits, issues an opinion on the overall safety of the nuclear fleet and suggests improvement actions to the Company's management. Efforts by EDF, notably to improve human performance, have resulted in halving, over ten years, the annual average number of automatic reactor trips. In 2018, they totalled 18 throughout the fleet.
- The external control of the safety of nuclear facilities in France is carried out by the ASN:

- at the national level, there are two types of inspections:
  - scheduled or unannounced inspections carried out by the ASN (519 inspections in 2018 over all EDF nuclear facilities),
  - a periodic (ten-year) review process designed to improve the compliance of nuclear plants with applicable rules and update assessments of the risks facilities pose to the environment and public health, taking into account the state of the facilities, the experience gained during their operation, new developments in nuclear science, and rules applying to similar facilities. The targets are established by the ASN which monitors compliance; EDF proposes solutions to meet these targets and implements them after obtaining the approval of the ASN (see section 1.4.1.1.1 "EDF's nuclear fleet in France"). The periodic review is an important step in continuing the operation of power plants (see sections 1.4.1.1.5 "Preparing for the future of the nuclear fleet in France" and 1.5.6.2.2 "Specific regulations applicable to basic nuclear facilities");
- at the international level, regular inspections are held making it possible to share the experience gained worldwide:
  - the OSART (Operational Safety Review Team) of the IAEA (International Atomic Energy Agency) performs reviews at the request of the French government with the objective of formulating recommendations and promoting best practices. In particular, EDF's first Corporate OSART was held in 2014 and concluded that EDF is fully compliant with the standards defined by the IAEA; the Follow Up Corporate OSART took place at the end of 2016,
  - the international "peer review" inspections carried out by the WANO (World Association of Nuclear Operators) are organised at the request of EDF to assess safety performance compared to best international working practices. A Corporate Peer Review took place in 2017 aimed at assessing the mode of governance and relations between corporate HQ and the facilities. Following the Corporate Peer Review, WANO identified two best practices and issued four recommendations giving rise to an action plan.

##### Whistleblowing system

In the event of an accident, a crisis plan is in place to limit impacts on the environment and people, and to ensure the safety of the facility. This crisis system is based on two closely coordinated plans, designed for both local and national use. These are:

- the Internal Emergency Plan for each nuclear site, developed by EDF;
- the Special Intervention Plan, prepared by French prefectures in collaboration with the French government and EDF.

In order to provide greater effectiveness and thus improved protection of populations, these plans in particular take into account external risks (flooding...) and internal risks (fire...). The relevance of the system for warning, informing and protecting people is regularly assessed through accident simulation exercises. Each year, approximately 100 exercises are organised for the entire French nuclear fleet, i.e., approximately one drill every three days. Approximately ten exercises are on a national level, under the management of the ASN and involve EDF and the public authorities, in particular the prefectures. In 2018, four national-scale exercises were organised. The last national-scale exercise pertaining to the physical protection of facilities (security crisis) was conducted in 2017 (scheduled every two years).

After its initial analyses following the Fukushima accident in March 2011, EDF supplemented its crisis management organisation with a national team capable of quickly delivering material and human assistance to a site in great difficulty. This system, called the Nuclear Rapid Action Force (FARN), has had many simulation exercises from regional bases located at Civaux, Paluel, Dampierre and Bugey and can be sent to a unit at any site in difficulty. The FARN is capable of a simultaneous response at six units on a single site.

### Significant events regarding safety

The operational safety of nuclear facilities is taken into consideration from the initial design stage, and is regularly monitored, together with the implementation of an employee motivation policy and large-scale investment programmes. The Group's nuclear safety policy is incorporated into training for both EDF employees and subcontractors.

### Control and surveillance

Nuclear safety is subject to internal controls (annual reviews, internal control plans and nuclear inspection audits in France) and external controls (peer reviews between corporate members of WANO and OSART audits conducted by experts from the IAEA).

In France, the safety of nuclear facilities is controlled by the ASN. Events are classified on a scale from one to seven, with seven being the most serious, called the INES<sup>(1)</sup> scale. Incidents of no consequence for nuclear safety are called "level 0 events". Since the establishment of a scale of this kind in France in 1987, no level 3 event (serious incident – very low external emission, and exposure of the public representing a fraction of regulatory limits) or above has occurred in the French nuclear fleet.

The ASN also approved the creation of an additional crisis management system, the Nuclear Rapid Action Force (FARN) following additional safety evaluations carried out by EDF after the Fukushima accident.

### Events in 2018

As in 2017, no major safety or radiation protection events were recorded in France.

In 2018, EDF's Nuclear and Thermal Fleet Department (DPNT) in France declared 583 significant safety events (ESS) classified at INES 0, 74 ESS at INES 1 and none at INES 2.

Overall, the results for 2018 are comparable with those obtained in 2017, with the average number of unclassified events (level 0) falling slightly to 10.05 ESS per reactor compared with 10.38 in 2017 while the average number of level 1 events per reactor increased slightly to 1.27 versus 1.13 in 2017.

The number of automatic reactor trips continues to fall and reached 0.31 per reactor (0.38 in 2017, 0.48 in 2016 and 0.66 in 2015).

The 2018 detailed results on nuclear safety are published in the annual report created by the General Inspector for Nuclear Safety and are available on the Internet.

### Radiation protection

The mobilisation of ground players has allowed a continuous improvement of performance on the protection of employees against the effects of ionising radiation. Thus, the average annual collective dose of all workers, both employees of EDF and outside companies intervening in power plants, has been halved in less than ten years. In 2018 the average collective dose was 0.67man-Sievert per reactor (or a collective annual dose of 38.8 man-Sieverts). The collective dosimetry in 2018 is up compared with 2017 (35.38 man-Sieverts) due to a higher activity level. EDF is proactively implementing an ALARA (As Low as Reasonably Achievable) policy to limit the collective dose in parallel with an increasing workload involved in the industrial project on the fleet in operation. Given the levels already achieved, efforts focus primarily on power plants with the poorest dosimetric results, in particular by cleaning their circuits.

EDF is furthermore committed to continuing to lower exposure to radiation below the regulatory limit of 20mSv over 12 rolling months for the whole body. Accordingly, throughout 2018 and over 12 rolling months, only one of the participants (EDF employees and contractors) was exposed to an individual dose of higher than 14mSv (exceeded by slightly more than 50 micro Sv).

In the coming years, given the levels already achieved, efforts will have to be focused on power plants with the poorest dosimetric results, in particular by cleaning their circuits.

#### 1.4.1.1.4 The nuclear fuel cycle and related issues

The average annual normative volume for nuclear fuel used by reactors in the EDF fleet in France is approximately 1,200 tonnes (of heavy metals: natural enriched uranium, enriched reprocessed uranium, plutonium) of which approximately 1,080 tonnes corresponds to ENU fuel (Enriched Natural Uranium), 110 tonnes to MO<sub>x</sub> fuel (produced from reprocessed plutonium) and 10 tonnes to ERU fuel (enriched reprocessed uranium).

The nuclear fuel cycle encompasses all industrial operations in France and abroad which enable the supply of the fuel to generate energy in a reactor, then to unload and process it. The cycle can be broken down into three stages:

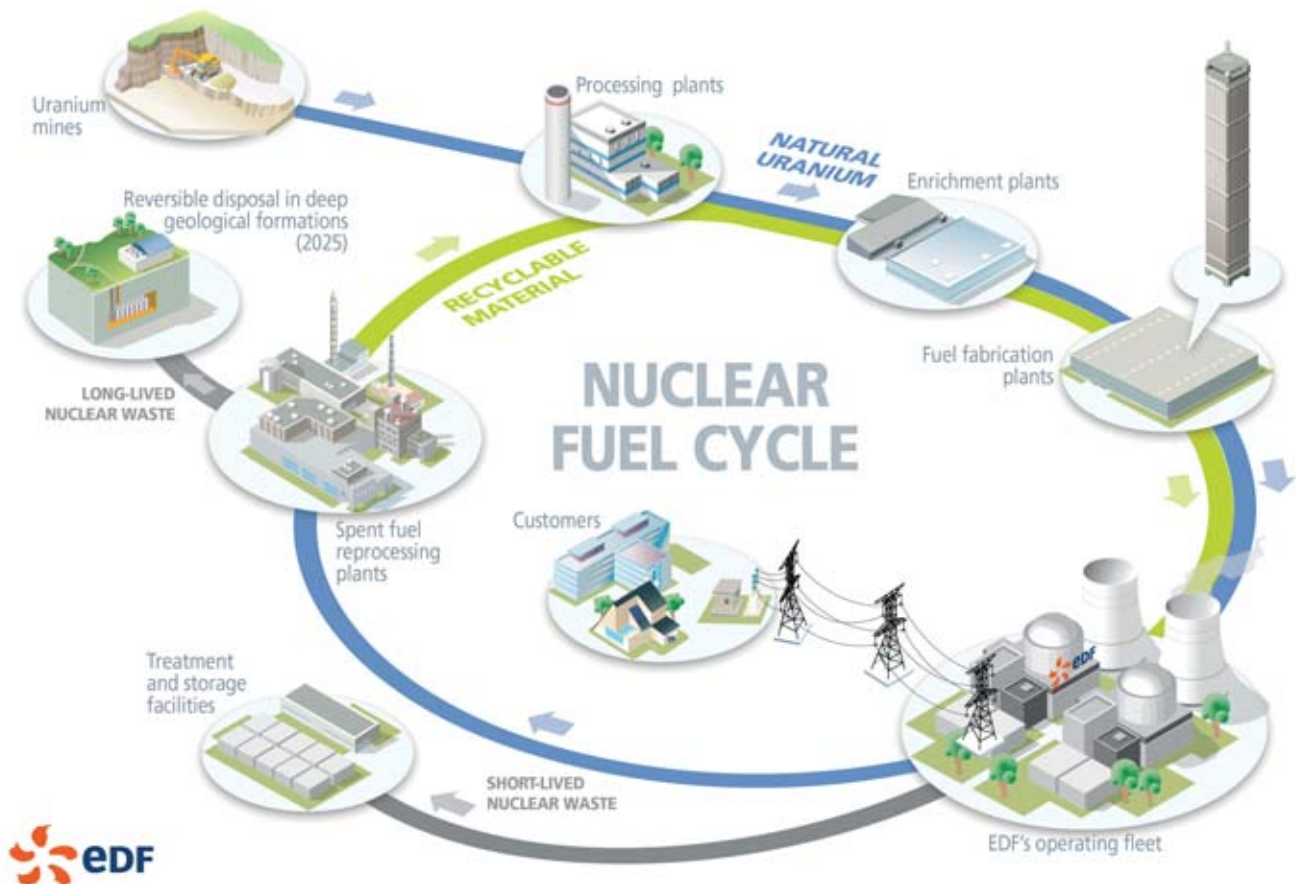
- front-end (upstream) the purchase of concentrates from uranium ore, fluorination (or conversion), enrichment and production of fuel;
- the core cycle, corresponding to the use of fuel in the reactor: receipt, loading, operation and unloading; the fuel stays four to five years in the reactor;
- back-end (downstream), for the reactor fleet in France: interim pool storage, reprocessing of spent fuel, conditioning of radioactive waste and recycling of reusable materials, the intermediate storage of treated waste prior to storage, as required by the French Law of 28 June 2006 on the sustainable management of radioactive materials and waste.

EDF coordinates all the operations in the fuel cycle. Generally speaking, upstream and downstream operations are carried out by subcontractors or suppliers, generally on the basis of multi-year contracts. EDF acquires most of the raw materials as uranium concentrates (U<sub>3</sub>O<sub>8</sub>), with transformation into more processed products carried out by industrial operators through service contracts (fluorination, enrichment and manufacture), and provides core cycle operations. EDF is the owner in most cases and is responsible for the fuel and materials it uses throughout all different stages of the cycle.

(1) International Nuclear Event Scale.



## STAGES OF THE NUCLEAR FUEL CYCLE IN FRANCE



### Upstream

To ensure the continuity and security of the supply of its reactors in France and the UK, EDF retains overall control of all operations at each stage of the cycle, through a portfolio of contacts and by stockpiling at different stages of the front-end stage of the fuel cycle (natural uranium, fluorinated enriched or unenriched uranium, and warehousing of new assemblies).

Orano is, in this respect, an important supplier (see section 2.3 "Dependency Factors").

Where necessary, the Group implements a strategy of currency hedging for its uranium supplies.

### Natural uranium supply

EDF's uranium supplies are guaranteed by long-term contracts for periods of up to 20 years with a policy of diversification in terms of sources and suppliers.

In 2018, EDF continued the securing of its long-term supplies with a number of major market suppliers.

Indexation formulas for portfolio contracts of natural uranium supply include fixed prices (base prices whether inflated or not) and variable prices (indexed according to market price indexes) and are sometimes limited by floor and ceiling prices. Consequently, the effects of fluctuations in market prices of natural uranium on supply costs are limited.

With manufacturers in the nuclear industry meeting within the World Nuclear Association (WNA), which brings together among others companies representing 90% of worldwide uranium production, EDF is making sure to implement best practices in mineral extraction so as to contribute to making overall progress in this sector. Since 2011, EDF has been periodically conducting mine audits based on a method drawn in collaboration with the WNA, which constitutes a standardised framework recognised by all stakeholders in the sector. Recommendations may be made, together with an improvement plan if necessary.

These principles defined by the WNA aim to perpetuate the best practices observed on the field and share them with all sector stakeholders; they notably reassert the principles defined by the International Council on Mining and Metals for sustainable extraction and use of uranium<sup>(1)</sup>. The clauses listing EDF's expectations in terms of enforcement of the fundamental rights and main international standards by suppliers and sub-contractors have progressively been inserted in contracts signed by EDF. In particular, they stress transparency and EDF's faculty to come and audit the supplier.

### Fluorination (or conversion)

EDF's needs are covered by the Orano group, as well as other international producers such as Cameco in Canada, Convergyn in the United States and Tenex in Russia.

<sup>(1)</sup> These ten principles concern the health of workers and local populations (safety and protection against radiation and emissions); environmental preservation (waste management and protection of drinking water resources); the need for a legal framework in accordance with current legislation and international standards (AIEA) to monitor and manage radiation, health and safety for stakeholders and the general public, waste management and environmental protection; information, transparency and dialogue with stakeholders; responsible management of hazardous waste and contaminated materials by using the best available technologies; the development of a quality management system upstream of the project (Environmental impact study) including risk analysis; accident management preparation; transport of hazardous waste in complete safety and security; regular staff training.



#### Enriching natural uranium into uranium 235

EDF meets its enrichment needs through global enrichers Orano (Georges Besse II plant on the Tricastin site in France), Urenco (UK, Germany, the Netherlands, United States) and Tenex (Russia), primarily through fixed-price contracts decreasing on a constant currency basis.

#### Enriched reprocessed uranium

Since the 1990s, reprocessing has made it possible to recycle within the reactors uranium from processing spent fuel, which represents approximately 95% of the spent fuel mass.

Reprocessing was suspended in 2013, pending the availability of a new industrial scheme.

In 2018, the Board of Directors approved the restart of a robust, competitive and efficient sector, with the first assemblies planned to be loaded in 2023, subject to technical changes made and the necessary authorisations obtained from the safety authority.

The corresponding contracts were signed with the respective suppliers in the second quarter of 2018.

Pending the effective restart of the sector, the reprocessed uranium is stored in a stable form.

#### Fuel assembly manufacturing

Contracts with the fuel assembly manufacturers Framatome and Westinghouse, covering most of EDF's needs, were renewed in 2014 to secure provisions until at least 2020.

#### Downstream

EDF is responsible for what happens to its spent fuel and how it is processed and for the related waste, without any possibility of transfer of responsibility or limitation in time. Orano is responsible for processing spent fuel and ANDRA for the management of the long-term storage of final waste, in accordance with the Codified Law of 28 June 2006 on the long-term management of radioactive materials and waste.

EDF's current strategy for the nuclear fuel cycle, in agreement with the French government, is to process spent fuel and wherever possible recycle substances such as plutonium separated in this process in the form of MO<sub>x</sub> fuel. The quantities handled are determined by the amount of recycled plutonium in reactors allowed to load MO<sub>x</sub> fuel ("equal flows" principle). The recycling capacity of nuclear units in the French fleet has allowed the processing of around 1,100 tonnes of spent fuel per year.

In addition, and in anticipation of the storage needs of the nuclear generation fleet, EDF is currently working on the design of a large spent fuel storage pool. It will make possible the long-term storage (around 100 years) of spent MO<sub>x</sub> and ERU fuel from PWRs and from fuel assemblies of the Superphénix fast-neutron reactors currently stored in the spent fuel storage pool at the Creys-Malville power station until the advent of Generation IV reactors (Gen IV).

In line with the National Plan for the Management of Radioactive Materials and Waste for 2016-2018, EDF plans to apply for permission to build the pool by 2020.

The 19-21 edition of the PNGMDR will be the subject of a public debate in 2019. The CNDP (French national public debate commission) appointed a Special Public Debate Commission, the CPDP, in May 2018, to prepare, organise and conduct this debate.

#### Processing of spent fuel from EDF's nuclear power stations

Spent fuel awaiting processing is temporarily stored underwater in cooling pools, first in pools at the plants and subsequently in those of Orano's reprocessing plant in La Hague. The storage conditions are recognised as being safe over a century-scale period of time. Approximately ten years after the spent enriched natural uranium fuel has been unloaded from the reactor, it is processed to separate the recyclable products from waste. The waste is subsequently conditioned and temporarily stored at the La Hague site in specific premises.

The relationship between EDF and Orano concerning the transport, processing and recycling of spent fuel was formalised for the 2008-2040 period by a framework agreement signed on 19 December 2008.

In February 2016, EDF and Orano signed an implementation agreement covering the 2016-2023 period as well as the associated supply contracts for the MO<sub>x</sub> assemblies.

#### The fuel supply of the two EDF reactors at Hinkley Point (United Kingdom)

In September 2016, EDF, Orano and Framatome entered into an agreement providing for the supply of uranium, conversion and enrichment services, and assembly manufacturing for the fuel supply of the Hinkley Point C reactors.

#### Storing conditioned ultimate waste

Radioactive waste, depending on its nature, level of radioactivity and the lifespan of its radionuclide components, has been classified into different categories: from High-Level Waste (HLW), to Very Low-Level Waste (VLLW) passing by Low-Level Waste (LLW) and Intermediate-Level Waste (ILW). It is called Long-Lived (LL) when it remains active for more than 30 years.

#### Long-Lived High-Level Waste (HLW-LL)

The processing of spent fuel enables the vitrification of HLW-LL, which provides very high-quality conditioning with a reduced volume. The waste is then temporarily stored at La Hague in specific facilities. For example, all of the Long-Lived High-Level Waste produced in this way, corresponding to the operation of the early Natural Uranium Gas Graphite plants (NUGG) and to 50 years of operation of the current PWR facilities, would represent a volume of approximately 9,300 cubic metres (the electricity consumption of one million people for one year generates approximately 3 cubic metres of HLW-LL).

#### Long-Lived Intermediate-Level Waste (ILW-LL)

The structures of the assemblies (shells and nozzles, clad pieces, etc.) separated during the processing of spent fuel, constitute ILW-LL. They are currently compacted and conditioned in stainless steel containers. ILW-LL waste also results from certain maintenance and dismantling operations. For example, the total volume of ILW-LL waste, including in particular the waste from the operation and decommissioning of generation fleet 1 with Uranium Natural Graphite Gas reactors and the waste from the current PWR facilities, taking into account the 50-year operating life of the power plants and the decommissioning operations, would represent about 37,000 cubic metres. Unlike HLW-LL, it does not generate heat and thus is suitable for faster storage than HLW-LL because it does not require cooling.

HLW-LL and ILW-LL from the reprocessing of spent fuel is temporarily stored in dedicated facilities in La Hague, pending the implementation of the storage in deep geological layers, as is currently envisaged as part of ANDRA's Centre industriel de stockage géologique (Cigéo) project.

Cigéo is the French deep geological storage facility project for radioactive waste. It is designed to store highly radioactive and long-lived waste produced by all current French nuclear facilities until their decommissioning, and by the processing of spent fuel used in nuclear power plants. After 15 years of research, evaluation and public debate, the principle of deep geological storage was adopted by the French Law no. 2006-739 of 28 June 2006 on the sustainable management of radioactive materials and waste as a safe long-term solution to manage this type of waste without shifting the burden onto future generations.

The centre is to be located in the east of France at the border of the Meuse and Haute-Marne departments. Cigéo will consist of surface facilities that will be used to receive and prepare waste packages as well as to excavate and build the necessary underground structures. The waste will be stored in underground facilities some 500 metres below ground in an impermeable argillaceous rock formation able to contain radioactivity over very long periods (several hundreds of thousands of years). Cigéo is designed to operate for at least 100 years and provide flexibility in order to give future generations a maximum number of possibilities to adapt it as needed.

The French Law of 11 July 2016, which specifies the details of the creation of a reversible deep storage facility, represents the fulfilment of an important prerequisite before obtaining approval of the Cigéo project for the management of long-lived high and intermediate level radioactive waste (HLW-LL, ILW-LL). ANDRA is continuing its design studies with a view to applying for permission to build the facility by 2019 (change of schedule following the updated planning of preliminary works and design optimisation works).

ANDRA is working on obtaining the building permit in 2022, launching a pilot industrial phase in 2026 and beginning to take delivery of the first waste in 2031. On 15 January 2018 the ASN gave its opinion on the DOS (list of safety options) submitted by Cigéo in which it considered the project had on the whole reached a satisfactory technological maturity at that stage. The ASN's draft opinion requires that alternatives to storing bituminous waste untreated at Cigéo be studied. In September 2018, in view of the application for authorisation to undertake the Cigéo project in 2019, a group of experts was appointed by the DGE (the French government's department for energy and climate change) to assess the management of bitumen based on three factors: knowledge of bitumen and of its behaviour, neutralisation processes, and measures relating to its storage.

#### Long-Lived Low-Level Waste (LLW-LL)

LLW-LL comes from the decommissioning of the old NUGG reactors (graphite, processing waste – see section 1.4.1.1.6 "Decommissioning of nuclear power plants"). The law of 28 June 2006 provides for a specific near-surface storage for this waste. In July 2015, ANDRA transmitted a report on the feasibility of a storage centre on a site located in the Soulaines region (Aube) in France. This report was submitted to the ASN for its opinion. Work is currently ongoing, as part of the national plan for the management of radioactive materials and radioactive waste (PNGMDR) to identify the waste that could be taken on. Furthermore, studies conducted by EDF to characterise more precisely the radiological inventory of this waste have led to significant gains. As a result the possibility of storing part of the graphite (particularly that of the Chinon A2 reactor) in existing surface facilities can be reconsidered.

#### Short-Lived Low- and Intermediate-Level Waste (LILW-SL) and Very-Low-Level Waste (VLLW)

Short-Lived Very Low-, Low- and Intermediate-Level Waste comes from the operation of nuclear facilities (gloves, filters, resins, etc.) and their decommissioning (concrete, scrap, lagging, piping, etc.). They are stored above ground in the Soulaines and Morvilliers storage facilities run by ANDRA in the Aube département.

In order to minimise volumes, some waste is treated beforehand by melting or incineration at the Centraco plant owned by SOCODEI, a subsidiary of EDF. In 2016, following the acquisition of the English and Swedish assets of Studsvik, the holding company "Cyclife" was created to bring together all the newly acquired assets and centralise the Group's internal and external activities in regard to waste treatment. In September 2017 SOCODEI was brought under Cyclife holding.

#### Consideration of future charges relating to the management of spent fuel and long-term management of radioactive waste

Each year, EDF makes provisions for the downstream side of the nuclear fuel cycle in France (see note 29 to the consolidated financial statements for the year ended 31 December 2018 in section 6.1).

#### 1.4.1.1.5 Preparing for the future of the nuclear fleet in France

EDF's industrial goal for the preparation for the future of the nuclear fleet rests primarily on the following strategic areas:

- the implementation of technical conditions allowing the extension of the operational life of nuclear power plants beyond 40 years. In the first half of 2016, all technical, economic and governance conditions required to align the accounting amortisation period of the 900MW power plants in the French nuclear fleet with the Group's industrial strategy were fulfilled; EDF's Board of Directors therefore approved on 28 July 2016 the extension of the accounting amortisation periods of the power plants of the PWR 900MW series in France (excluding Fessenheim) from 40 to 50 years from 1 January 2016, without prejudice to the approvals for continued operation, granted on a unit-by-unit basis by the ASN after each ten-year inspection;
- continued safety improvements, primarily by integrating lessons learned from the Fukushima accident in Japan;
- implementation of a preventive policy with respect to ageing or obsolete equipment.

#### Continued operation of the operating units well after 40 years

##### Additional Safety Assessments (ASA) following the Fukushima accident

On 15 September 2011 and in light of the accident at the Fukushima nuclear plant in Japan, EDF submitted 19 Additional Safety Assessment reports to the ASN, one for each of its nuclear sites, encompassing all its existing reactors and all those under construction.

These assessments consisted of re-examining the defences of existing power plants and those under construction, in light of the events in Japan, taking into account issues set out in the specifications drafted by the safety authorities. Thus, the safety margins were reassessed against the risks of earthquakes and flooding, when dealing with situations of simultaneous loss of the cooling source and power supplies and the consequences of severe accidents. These assessments also led to inquire whether certain changes to the scenarios planned beyond situations used for the sizing of the protection systems, would lead to a worsening of the consequences in terms of safety ("cliff effects") and finally to deterministically consider the extreme situations that substantially exceed those used in the design of nuclear installations and subsequent safety reviews. The safety of EDF's nuclear fleet is based on the principle of continuous improvement: existing and new facilities continuously benefit from feedback from all power plants, and lessons are learnt from incidents and accidents that may occur in the world.

Finally, the ASAs also re-examined the rules applied in outsourcing.

These analyses confirmed first and foremost the adequate level of security throughout the EDF nuclear power fleet, particularly because of the periodic safety reviews carried out in France since the end of the 1980s and codified by the Law on nuclear transparency and safety (the TSN Law) in June 2006, and codified later in the French Environmental Code. EDF also proposed additional measures to the ASN that exceed those considered for sizing safety systems, to contribute to further improving the current safety level of power plants.

In its opinion to the government published on 3 January 2012, the ASN states, on the basis of the analyses of its technical support, that "after the additional safety assessments on priority nuclear facilities, the ASN considers that the facilities examined show an adequate level of safety, and that it will not thus request the immediate shutdown of any of them". At the same time, the ASN considers that "continuing to operate these facilities requires increasing their robustness, as soon as possible, to an extent beyond existing safety margins, to handle extreme situations".

The ASN also recommended the "hard core" concept and the FARN system (see section 1.4.1.1.3 "Environment, nuclear safety, radiation protection"). The "hard core" will be made up of the plant's structures, systems and components that can withstand situations studied in connection with ASAs. On 26 June 2012, the ASN made 19 decisions requiring EDF to follow over 600 technical requirements, which set regulatory requirements according to the post-Fukushima action plan. These technical rules require that all nuclear sites must have an organisation and local crisis centres resistant to the occurrence of a large-scale event affecting several facilities. For EDF power plants, the prescribed "hard core" must in particular have "bunkerised" electrical resources in each unit. In the meantime, a temporary back-up diesel generator was installed at each of the 58 units in 2013. The complete definition of the "hard core" was covered in technical rules issued by the ASN in January 2014.

##### Operating life of EDF's PWR fleet

The provisions of the French Environmental Code do not set a limit on operating life but require a review of facilities every ten years in light of applicable rules and updates of assessments of the risks facilities pose to protected interests, taking into account the state of the facilities, the experience gained during their operation, new developments in nuclear science, and rules applying to similar facilities (safety standards).

As part of the studies related to the third ten-year inspections of the 900MW series, in early July 2009 the ASN publicly stated that it had not identified a generic problem that called into question EDF's ability to control the safety of its 900MW reactors for up to 40 years. The ASN's general opinion is supplemented by a decision on each reactor.

EDF's industrial strategy is to operate the fleet beyond 40 years in the best conditions of safety and performance, considering the significant investment linked to the third ten-year inspections and the post-Fukushima improvements on the one hand, and the energy needs of France on the other. This target is consistent with trends observed around the world for reactors using similar technologies. To this end, EDF has implemented industrial and R&D action plans. Actions have been launched to renew the major components that can be renewed (see section 1.4.1.1.2. "Operation and technical performance of the nuclear fleet"), and solutions are being studied to demonstrate the capacity of non-replaceable equipment such as the confinement containment building and reactor vessels, to ensure their operation up to 60 years.

An extension to the life of the current nuclear fleet would enable, whilst respecting the absolute priority of nuclear safety and as part of the multi-year energy programme (see section 1.4.1.1.2 "Operation and technical performance of the nuclear fleet"), better use of the industrial base it represents and the spreading of the commissioning of new plants over time.

The decision on 1 January 2016 to extend the useful lives of the 900MW PWR series of power plants (excluding Fessenheim) from 40 to 50 years, enacted in June 2016 once all the relevant technical, economic and governance conditions had been met, forms part of the Group's industrial strategy to extend the operating life of the nuclear fleet in France to beyond 40 years. It is based on the technical capacity of the PWR 900MW fleet facilities to operate for at least 50 years, supported by international benchmarks, as well as by the investments made progressively under the "Grand Carénage" programme. These investments will enable the PWR 900MW series to reach a level of safety as close as possible to that of the EPR, and one of the highest internationally, after its fourth ten-year inspection (VD4).

The extension of the operating life of the 900MW units will be aligned on the current revision of the multi-year energy programme for the periods 2018-2023 and 2024-2028.

Concerning safety improvements required to extend the operating life of certain units beyond 40 years, the ASN indicated that following the meeting of the Expert Committee in April 2015 it would issue an initial position on the major strategic decisions of the safety review relating to the fourth series of ten-year inspections of the 900MW reactors. It initially planned to issue a final position in 2018-2019 on the "generic" phase of this review, the final authorisation for use beyond 40 years being made on a reactor-by-reactor basis. On 20 April 2016, the ASN sent a letter to EDF in which it defines its expectations to allow a potential operational extension of the 900MW French nuclear reactors. After reviewing the report submitted by EDF presenting its approach and its methodology to extend the use of the 34 reactors in question beyond 40 years, the ASN considered that EDF had adequately responded to safety issues and that its programme did not call for any comments in principle. However, the ASN asked EDF to complete its programme regarding several aspects, including the scope of control programme and the goals relating to improving investigations.

In its letter dated 28 September 2018 on the NRO (Memorandum on Response to Objectives) of the 4<sup>th</sup> periodic review of the 900MW units, the ASN stated that *"the works carried out and the planned arrangements will significantly improve the safety of the facilities and contribute to the attainment of the objectives of the review."* The ASN is expected to give a generic opinion in 2020. Until then, the examination will continue and EDF is considering additional ASN requests in terms of studies, inspections and works.

In September 2018, EDF, along with the IRSN and the ANCCLI (French National Association of Local Information Committees and Commissions), also launched a public consultation over 6 months in order to involve the general public in the debate and talk with experts from EDF, ASN and IRSN in public meetings, organised by the Local Information Commissions (CLI) of the concerned sites. A digital platform will complement these public meetings.

The accounting period of the other series of France's nuclear fleet (1,300MW and 1,450MW), which are more recent, currently remains at 40 years, because the conditions for an extension have not been met. The subsequent extension of the most recently installed reactors in the French nuclear fleet is at the heart of the Group's industrial strategy.

At end-2018, 32 of the 34 units of 900MW had undergone their third ten-year inspections. Of these 12 (Fessenheim 1 & 2, Bugey 2, 4 & 5, Tricastin 1, 2 & 3, Dampierre 1 & 2 and Gravelines 1 and 3), completed the exchange of information with the ASN (its opinions and requirements were received). Inspections of the last two units, Chinon B3 and Chinon B4, are scheduled for 2019 and 2020 respectively.

### 1.4.1.1.6 Decommissioning of nuclear power plants

EDF takes full regulatory, financial and technical responsibility for the decommissioning of its plants, the challenge being to demonstrate, through the decommissioning process, its control of the entire life cycle of the means of nuclear power generation.

The reference scenario adopted by EDF since 2001 is for decommissioning without a waiting period, consistent with French regulations, which provide for decommissioning *"in as short a time as possible on acceptable economic terms and in line with the principles set out in Article L. 1333-2 of the French Public Health Code and Article L. 110-1 II of this Code"* (see Article L. 593-25 of the French Environment Code).

The regulatory process for decommissioning is governed by the French Environment Code and Decree no. 2007-1557 of 2 November 2007 (see section 1.5.6.2.2 "Specific regulations applicable to basic nuclear facilities"). It is characterised, for a given site, by:

- a shutdown declaration at least two years prior to the planned shutdown date;
- a decommissioning request resulting, following examination by the authorities and a public inquiry, in a decree allowing for decommissioning;
- key progress reviews with the ASN, included in a safety reference system relative to dismantling;
- finally, once the work has been completed, the declassification of the facility to remove it from the legal regime governing basic nuclear facilities.

### Decommissioning of shut down power plants

Concerning power plants that have been shut down (a pressurised water reactor (PWR), Chooz A; a heavy water reactor (HWR), Brennilis; a fast-neutron reactor (FNR), Creys-Malville; and six graphite-gas-moderated reactors (NUGG) in Bugey, Saint-Laurent and Chinon), EDF has chosen to fully decommission them as soon as possible in line with the principles of the French Public Health Code and the French Environment Code while ensuring that the technical risks associated with these activities are managed.

The sites remain the property of EDF, and they will remain under its responsibility and monitoring.

Given its role as responsible operator, EDF will act as the contracting authority for the decommissioning.

The decommissioning of EDF's nine first-generation units in final shutdown will produce approximately one million tonnes of primary waste materials, of which 80% is standard waste material and none is High-Level Waste. The remaining 20% comprises Very-Low to Intermediate-Level Waste including about 2% Long-Lived Waste requiring the availability of a storage facility for ILW-LL and LLW-LL.

Existing means for removal of short-lived VLLW and LILW will be supplemented by:

- the project to build a packaging and intermediate storage facility for radioactive waste (Installation de conditionnement et d'entreposage des déchets activés – ICEDA), almost completed at the Bugey site. It is scheduled to be commissioned in 2019;
- the LLW-LL storage centre provided for by the Law of 28 June 2006 concerning the long-term sustainable management of radioactive materials and waste. Following an unsuccessful initial site search by ANDRA in 2008, and the sending of a report to the government at end-2012, in 2013 ANDRA restarted the search and in July 2015 submitted a report on the feasibility of a storage facility on a site located in the Soulaines region in France (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"). Moreover, the new dismantling schedule of the NUGG plants provides for the construction of a storage facility for the LLW-LL liners of the silos at Saint-Laurent, pending the availability of a definitive disposal route (first removal of graphite in 2044).

The decommissioning of the Chooz A plants is still under way with the filling of the Chooz reactor pool and the end of the cuttings and extractions of the internal components of the reactor vessel, on schedule. Chooz A is a pressurised water reactor using a technology similar to the 58 units in operation, but of an older design. It was commissioned in 1967 and operated until 1991 (final ending date for power generation). The reactor location in a rocky cave in a hillside means that access conditions and entry and exit of materials are more difficult than those of the rest of the existing PWR fleet. After EDF chose to opt from 2001 for a strategy of decommissioning without any period of dedicated waiting time for radioactive decrease and following adoption in 2007 of the Decree for complete decommissioning, the decommissioning was launched and is expected to come to an end by 2022, that is to say 15 years after it was authorised. This duration was chosen by EDF for the decommissioning of the Pressurised Water Reactors.

Following the filling of the Crey-Malville reactor vessel in end-2017, the dismantling process continued through the construction site of the cutting workshop for caps of the reactor vessels.

Regarding Brennilis, pursuant to a 2008 agreement<sup>(1)</sup> with the CEA, EDF has become fully responsible for the decommissioning of this facility. The decommissioning work included in the scope of the original Decree is in progress with the demolition of the last section of the apron and soil excavation of the waste treatment plant.

The decision of the Administrative Court of Appeal in Lyon of 4 December 2014, by restoring the validity of the ICEDA building permit, led EDF to relaunch the study of a file on the complete dismantling of Brennilis, taking into consideration any new regulations arising since the creation of the previous file, in particular the application of the BNF regulations. The complete dismantling file was thus submitted at the end of July 2018.

The industrial strategy of the dismantling of the NUGG reactors was thoroughly reviewed at the end of 2015 with the shift from "in-water" dismantling to "in-air" dismantling, and takes into account the results of the 2013-2015 pre-project studies, which show a significant prolongation of the operations to dismantle the caisson (about 25 years instead of 10 as originally planned), and the need to make the operation less risky by completely dismantling an initial series unit before dismantling the other 5 units. The new dismantling strategy was presented to the ASN's Audit Council in March 2016 and June 2017. At the ASN's request, a group of independent experts was commissioned to assess the robustness of the proposed dismantling whose chief features were confirmed. The update of the industrial scenario for the dismantling of first generation plants, in particular in regards to the NUGG reactors, had led to an increase in the provision of €590 million on 31 December 2015 (see note 29.1 to the consolidated financial statements at 31 December 2015).

The update of their dismantling schedule has yielded the following sequencing:

- construction of an industrial demonstrator to test the tooling to be used during the "in-air" dismantling of the first caisson;
- realisation of an "in-air" dismantling of an initial series unit, followed by the realisation of a complete feedback procedure before engaging in the industrial dismantling of the other NUGG reactors;
- for the other caissons, work to develop a secure configuration after electromechanical dismantling and the dismantling of the peripheral buildings and structures (reactor buildings, pool hall, etc.) will be carried out for some in advance in regards to the previous scenario.

This new scenario forecasts an initial removal of the graphite from the first NUGG reactor by 2044 and pushes back the need for a disposal route for the other graphite waste to after 2070.

After the first hearing of the ASN's Audit Council in March 2016, the ASN in its follow-up letter of 29 July 2016 suggested an exchange of ideas around the matter. At the ASN's request, a group of independent experts was appointed in the first quarter of 2017 to examine the solutions chosen by EDF to decommission its six NUGG reactors; EDF's measures were confirmed. A new hearing of the ASN's Audit Council was held in June 2017 on the basis of these conclusions and arguments submitted by EDF in March of that year.

EDF submitted documentation on strategy and secured configuration safety options as well as a detailed schedule of operations covering the 2017-2032 period in late December 2017. In 2018, ASN issued its main questions and conclusions on the NUGG strategy documentation. The "in-air" dismantling of all the reactors, the relevance of an industrial demonstrator, and the planning of the first "initial series unit" dismantled reactor (Chinon A2) appear to be accepted. However, discussions are continuing with regard to the schedule for dismantling the other five reactors. The schedule proposed by EDF would allow substantial feedback (dismantling of a first reactor) before the start of more complex phases. Although the ASN recognises the need to take into account the feedback on the initial series unit, it has not, at this stage, expressed agreement on the overall schedule. EDF was heard on 12 February 2019 by the ASN's Audit Council in order to present all information supporting the planning proposed by EDF. The ASN's proposed decisions which will be submitted for public consultation are expected in 2019.

Considering the sources of uncertainty surrounding the complex operations to be undertaken (in particular the development of new methods and technologies), the provisions are highly sensitive to the sequencing of operations, and the overall schedule of the dismantling programme of the six reactors. If, ultimately, the Company has to change the schedule for the operations (shortening the sequencing), this is likely to lead to an increase in the level of provisions.

### Closure project of the Fessenheim plant

Article L. 311-5-5 of the French Energy Code introduced by Law 2015-992 ("energy transition law") caps the nuclear installed capacity in France at 63.2GW. The commissioning of the Flamanville EPR can therefore not take place before the closure of the two Fessenheim reactors in order to comply with that ceiling.

The early closure of the Fessenheim plant would give EDF the right to compensation, as recalled by the Constitutional Council in its decision of 13 August 2015, on the occasion of the review of the constitutionality of Law 2015-992 of 17 August 2015 ("energy transition law").

Talks between EDF and the French government led to a draft memorandum setting out compensation principles that was approved by the European Commission under State aid rules.

At its meeting of 6 April 2017, EDF's Board of Directors took note of the irreversible and unavoidable closure of Fessenheim provided that the revocation of the Fessenheim plant's operating permit takes effect only once the Flamanville 3 EPR comes into service and that the closure of the Fessenheim plant is necessary to comply with the legal cap of 63.2GW with regard to both the revocation request and the commissioning date of the Flamanville 3 EPR.

Pursuant to the law, the Board had authorised the Chairman to sign the compensation memorandum negotiated with the French government and approved by the European Commission no later than the date on which the revocation request is made.

The Board's decision, taken in accordance with Law 2015-992 of 17 August 2015 ("energy transition law"), secures EDF's corporate interests and will enable the firm to continue its business at the service of its customers in all circumstances.

On 25 January 2019, the Ministry of Ecological and Solidarity Transition published the draft multi-year energy programme for the 2019-2023 and 2024-2028 periods which specifies that "the Fessenheim nuclear power plant should be decommissioned by spring 2020".

Given this change in situation, new negotiations have started with a view to fine-tuning certain provisions of the draft agreement and in particular to dissociate the closure of Fessenheim from the commissioning of Flamanville 3, while maintaining EDF's right to compensation.

EnBW, EDF's partner in the plant, will under certain conditions be entitled to a share of lost earnings in proportion to its contractual rights to the plant's generation capacity. For its part CNP decided to end its involvement in the partnership. Once EDF took note of CNP's decision the contract between the two firms ended on 31 December 2017.

(1) With this agreement the CEA has become fully responsible for the decommissioning of Phénix.



## Decommissioning costs

### EDF nuclear power plants

Since the beginning of operations at its power plants, EDF has made provisions to cover decommissioning operations, engineering, monitoring and maintenance of facilities, and site security (see section 6.1 "Consolidated financial statements at 31 December 2017", notes 29.1.3 and 29.1.5 to the consolidated financial statements for the year ended 31 December 2017). The aim of decommissioning is to return sites and land to a state suitable for industrial use.

EDF continues to reinforce its analyses through international intercomparisons while making sure to take account of certain elements that could distort direct comparisons such as differences in the estimate scopes or national and regulatory contexts.

The cost estimate for the dismantling of second-generation power plants (Gen II – PWR plants in operation) was revised in 2016 to take into account both the recommendations of the audit mandated by the DGEC (the French government's department for energy and climate change) on the decommissioning costs of PWRs, conducted between July 2014 and August 2015 on the basis of the "DA09" model, and the feedback gathered from the decommissioning of first-generation power plants (Gen I – in particular the Chooz A plant).

Reviewing these cost estimates consisted in implementing a detailed analytical process, identifying all the engineering, work, operation and waste treatment costs linked to future decommissioning of units currently operated. It resulted in figures based on detailed plant decommissioning feedback. This implemented process allowed to deepen the assessment of the costs specific to leading models and of the series and pooling impacts, those costs and impacts being indeed inherent to the size and the design of the fleet.

The results of this detailed process led at 31 December 2016, to a decrease in the provision for decommissioning of €<sub>2016</sub>451 million and an increase in the provision for long-term management of ILW-LL waste of €<sub>2016</sub>162 million (see note 29.1 to the consolidated financial statements as at 31 December 2017). The nature of main pooling and series effects selected when calculating the estimates are presented hereafter.

There are different types of pooling effects:

- some of them are linked to the affectation of common buildings and facilities to the operation of several reactors on a same location, and therefore these buildings and facilities will not have to be dismantled twice. Thus, structurally, the dismantling of a couple of reactors on a same location costs less than the dismantling of two single reactors on two different sites. In France, unlike in the other countries, there is no isolated reactor but locations with two, four and in one case six reactors;
- some costs are not higher if you dismantle 2 or 4 reactors on a same site. It is usually the case for surveillance costs and costs incurred by keeping the site in safe operating conditions;
- waste processing in centralised facilities (for example for the cutting of major components) is cheaper than multiple processing facilities on the dismantling sites.

There are mainly two types of series effects:

- a first effect comes from the fact that on a fleet driven by a single technology, a large amount of the studies does not need to be performed again each time;
- a second effect comes from the fact that on a fleet driven by a single technology, robots and tooling can be largely reused from one site to another.

Such series effects have the same nature than those observed during the construction of the fleet, in terms of studies or of components manufacturing plants.

As an example, for the 900MW fleet, a series effect of approximately 20% is expected on an average 2 units reactor in comparison to a 2 units leading model.

Due to series and pooling series effects in particular, a simple comparison of the average dismantling cost by reactor between the French fleet and other countries' nuclear fleet is not relevant.

However, figures include only very marginally the evolution of productivity and series effect. External audit conducted by the DGEC on the dismantling cost of the operating fleet had considered that series effect taken into account in the estimate was conservative.

The estimate also includes, by caution, an assessment on risks and uncertainties.

### Third-party facilities: La Hague (Orano) and Phénix (CEA)

As the responsibility for the decommissioning of facilities is incumbent on their operator, EDF wished to free itself financially from these operations.

As such, the agreements signed with Orano in July 2010 and the CEA in late 2008 clarified the financial responsibilities of the parties. Following a cash payment, EDF was released from any obligation to finance the decommissioning of the Phénix facilities, which have been shut down, and the La Hague plant.

#### 1.4.1.1.7 Assets available to cover long-term nuclear commitments (outside the operating cycle)

Dedicated assets have been gradually established 1999 to cover long-term nuclear commitments (see section 6.1 "EDF's "Consolidated financial statements", note 45.2 "Content and evaluation of dedicated assets" to the consolidated financial statements for the fiscal year ended 31 December 2018).

Article L. 594 of the French Environment Code and its implementing regulation specified which liabilities are not associated with the operating cycle and must therefore be covered by dedicated assets (see section 6.1 "Consolidated financial statements at 31 December 2018", note 45.4 "Updated cost of long-term nuclear commitments" to the consolidated financial statements for the fiscal year ended 31 December 2018).

#### 1.4.1.2 New Nuclear projects

See also section 2.1.5 "Specific risks related to the Group's nuclear activities", the risk factor called "Description 5D: in addition to the risks related to the control of complex projects (4A risk factor), the success of EPR projects depends on specific factors of an industrial, regulatory and financial nature".

##### 1.4.1.2.1 Flamanville 3 EPR project

EDF is both the owner and manager of the Flamanville 3 EPR (European Pressurised water Reactor) project.

### Interactions with the Nuclear safety authority (ASN) and administrative authorisations

The examination of the application for commissioning, submitted in March 2015, is into its final phase with the ASN. The three expert Committees mandated by the ASN help bring together all of the technical requirements the EPR must satisfy. A permanent experts' group met at the end of the 1<sup>st</sup> half of 2018 and issued a favourable opinion on the demonstration of safety in view of authorizing the commissioning of the facility. However, this commissioning is subject to the examination of the welds of the main secondary circuit, the findings of the start-up tests and the granting of the Safety Certificate for the boiler's ESPN<sup>(1)</sup>.

The partial commissioning authorisation decision relating to the conduct of hot functional tests has been issued by the ASN. The Decree on emissions has also been updated, which will reduce the site's environmental footprint.

The request for authorisation for a partial commissioning in order to allow the reception of fuel on site, is under final examination by the ASN. The related draft decision should be submitted for public consultation in the first half of 2019.

On 9 October 2018, EDF sent the Application for authorisation to operate to the DGEC (the French government's department for energy and climate change).

(1) Nuclear pressure equipment.



## Progress of on site implementation

The site is still at a high level of activity with close to 3,600 people on site every day.

At end-2018, the percentage of assembly of electromechanical equipment was above 98%, with the remaining activity carried out as and when the system performance testing is performed.

A number of major milestones were reached in 2018:

- “cold functional” testing which consists of running several tests including testing for leaks in the primary circuit at a pressure of over 240 bars, higher than its operating pressure;
- the reactor containment building pressure tests were carried out successfully in April 2018. This is an “in-air” test to verify the proper mechanical behaviour of the concrete structure and its airtightness by increasing the pressure inside the building to six times the atmospheric pressure;
- the integration of an instrumentation and control configuration representing some 250 changes was completed in early September 2018, and hot functional testing could thus be carried out with a consistent and stable configuration of the instrumentation and control.

To date, the three main issues concerning the commissioning of Flamanville 3 are as follows:

- approval of the strategy for treating the welds of the main secondary circuit, then the success of repair operations, jointly with the main stakeholders: the ASN, partners and their sub-contractors;
- ramp up of testing in line with safety and quality standards and on schedule so as to be ready by the start date;
- industrialisation of the finishing off and gradual transfer of the facility to the operator via a new step in the organisation of the site for maximum optimisation of the short-term planning of activities.

## Quality equipment manufacturing

At the end of 2018, most of the equipment of the nuclear section, such as the conventional island, had been delivered and installed on site. The equipment quality situation for the primary cooling system manufactured by Framatome is described below:

### Reactor vessel

In the first half of 2017 the ASN examined “higher-than expected” carbon levels in the vessel head and bottom on the basis of documentation submitted by Framatome, under the supervision of EDF. Based on the opinion on 11 October 2017 of a group of experts appointed by it, the ASN considered the mechanical features of the vessel head and bottom to be up to requirements including in the event of an accident.

On 9 October 2018, the ASN authorised:

- the commissioning of the vessel bottom (contingent on appropriate checks);
- the commissioning of the vessel head, by limiting the lifespan to 2024, unless the technical feasibility of checks is proven to be similar to the vessel bottom.

EDF is currently working on a project to develop the in-service inspection of the vessel head, so as to apply to the ASN in 2019 to keep the current vessel head if this type of operation is industrially feasible. In the absence of such an authorisation, the costs incurred for the manufacture of a replacement vessel head might have to be borne, in part or in full, by EDF. They are not included in the target construction cost due to the fact that they would be incurred, if applicable, after commissioning. Furthermore, an arbitration procedure has been initiated on this matter by EDF against AREVA SA.

## Problem of break preclusion and quality deviations in the welds of the main secondary circuit

On 30 November 2017, EDF declared a significant event to the Nuclear safety authority regarding the detection of a quality deviation in the welding in the primary secondary pipes that transfer the steam from steam generators to the turbine at Flamanville 3 EPR.

The circuit that transfers the steam from the steam generators to the turbine of the Flamanville 3 EPR (main steam line) was designed and manufactured according to the “break preclusion concept”. This approach consists in strengthening requirements for design, manufacture and monitoring in service. These strengthened requirements, requested by EDF, also involve a “high quality” requirement in the building of these circuits.<sup>(1)</sup>

However, these requirements were applied during the design phase but were not correctly taken on board in the welding. Non-compliance with these requirements does not necessarily imply non-compliance with the nuclear pressure equipment regulations.

After 21 March 2018, EDF also identified quality deviations on the welding of the pipes of the main secondary system of the Flamanville EPR, during the initial comprehensive inspection. The initial comprehensive inspection, is a regulatory requirement prior to the plant commissioning, which consists, in particular, of examining the welds of the primary and secondary systems. It allows an initial reference inventory of the plant to be conducted before its entry into operation.

In accordance with industrial procedures, the welds had been inspected by the consortium of contractors in charge of manufacturing the system. Each weld had been declared compliant by the consortium just as they were being completed.

On 10 April 2018<sup>(2)</sup>, EDF notified the ASN of a significant event relating to the detection of deviations in the inspection of these welds (part of the main secondary system was already subject to a deviation with respect to the correct application of “break preclusion” requirements).

In the second quarter of 2018, EDF thus undertook a new check of all the 150 concerned welds of the main secondary system.

Of all the 150 welds checked:

- 33 welds with quality deviations have to be repaired. Activities to repair the welds with quality deviations started on site at the end of July 2018;
- EDF also decided to repair 20 welds, even if they did not show any defects, as they were not compliant with the “break preclusion” requirements defined by EDF when the EPR was designed. The remedial action records of the first welds were sent to the ASN and welding started on site in November 2018;
- For 10 other welds, EDF proposed a specific justification process to the ASN, whereby the high safety level of the facility can be confirmed throughout its operation. After the final analysis, this number was reduced to eight. Furthermore, it appeared after inspection, that one of these eight welds had a small quality defect. The specific justification process mentioned above will be the subject of an in-depth examination by the ASN in the coming months.

(1) Given that these requirements were stated, the potential for pipes rupturing did not have to be considered during the safety demonstration. This proves, with a high degree of confidence, that accidents are physically impossible or extremely unlikely and that their consequences are limited to acceptable economic conditions.

(2) See EDF press release of 10 April 2018 “EDF has detected quality deviations on certain welds of the main secondary system of the Flamanville EPR and has begun additional controls”.

### Commissioning schedule and construction cost

On 25 July 2018 <sup>(1)</sup>, the Group presented a progress report on these checks and amended the schedule and construction cost target accordingly:

- the target for fuel loading has been set for the end of the 4<sup>th</sup> quarter of 2019, with hot functional testing then scheduled to begin at end of 2018;
- the construction cost target was increased from €10.5 to €10.9 billion <sup>(2)</sup>.

On 21 January 2019 <sup>(3)</sup>, EDF announced that the hot functional testing schedule had been reviewed with a start expected in the second fortnight of February 2019. Hot functional testing began on 22 February 2019.

The schedule and the estimate of the construction cost remain tight. They include a timetable of administrative authorisations by the ASN described above, which depends, in particular, on the completion of the examination of the procedures considered by EDF for processing the welds in the main secondary system, as stated in the press release published by the Group on 31 January 2019 <sup>(4)</sup>.

The ASN Chairman announced on 29 January 2019 that the ASN would issue a statement in May 2019 concerning the validation programme on the welds in the main secondary system and that "if it turns out that the eight welds in the reactor containment building structure also need replacing then it will no longer be possible to meet the deadline." A precise update of the progress of the Flamanville EPR site, in particular on its schedule and its construction cost, will thus be issued after the ASN ruling has been published. At this stage, EDF is not able to measure the impact of the ASN's decision, which would not validate the proposed approach.

On 11 March 2019, EDF sent the Ministry of Ecological and Solidarity Transition a request to amend the construction authorisation decree to extend the deadline for commissioning the reactor until 11 April 2023 as a precaution.

#### 1.4.1.2.2 Other "New Nuclear" projects

##### UK

In the UK, EDF Energy owns 66.5% of the construction project of two nuclear plants at Hinkley Point, with the remaining 33.5% owned by China General Nuclear Power

Corporation (CGN). Nuclear New Build (NNB) is the project owner and the New Nuclear Projects and Engineering Department is responsible for the design studies.

EDF is also working, as part of its partnership with CGN, on two nuclear construction projects in the UK: Sizewell C and Bradwell B.

See section 1.4.5.1.2.5 "Nuclear New Build Division".

##### Taishan EPR

In China, EDF owns 30% of TNPJVC (Taishan Nuclear Power Joint Venture Company Limited), which was set up to build and operate two EPR nuclear reactors in Taishan, in the province of Guangdong in China. CGN holds a 51% stake and Yudean a 19% stake.

In 2018, Unit 1 reached major commissioning milestones:

- loading of fuel in the vessel;
- connection to the electricity grid;
- operation at full power;
- commercial commissioning, announced on 13 December 2018, whereby the Taishan nuclear plant became the first EPR to start commercial operations.

Unit 2 has reached a number of important milestones of the performance testing phase. EDF continued to provide technical support to the Taishan project, while simultaneously incorporating feedback from these activities for other EPR projects.

Regarding Unit 2, several major tests have been performed. Cold performance testing, including the hydraulic test of the primary system, were completed in July 2018; the containment building leak test was successfully carried out in October 2018 and hot functional testing ended in January 2019.

The Taishan EPR project will continue in 2019 for unit 2 with the preparation of fuel loading in the vessel. The issue in the 1<sup>st</sup> half of 2019 concerns the delivery by the Chinese safety authority of the authorisation to start.

(1) See EDF press release of 25 July 2018 "Welds in the main secondary system of the Flamanville EPR: EDF sets up corrective actions and adjusts schedule and target construction costs".

(2) In 2015 euros, excluding interim interest.

(3) See EDF press release of 21 January 2019 "Flamanville EPR: status update" on the scheduling of the hot tests.

(4) See EDF press release of 31 January 2019 "Flamanville EPR: status update" on the ASN's statements.

Until now, the commercial commissioning of Unit 1 was based on a provisional tariff, which is below EDF's expectations. Discussions between electricity producers and the Chinese authorities will lead to a definitive tariff which will apply to the 3<sup>rd</sup> generation nuclear plants with retroactive effect from the date of commercial commissioning.

## **EPR 2**

EDF submitted a safety options file for the "New Model EPR" (NM EPR) project at the end of 2016 to the Nuclear Safety Authority which examined it in 2017. In early 2018, the permanent experts' group for nuclear reactors submitted its conclusions on the safety options file. In particular, it found that *"most changes in the design used for the NM EPR project take into account the lessons learned from the feedback on Flamanville EPR and on the reactors currently operating as well as lessons learned from the accident at Fukushima Daiichi,"* and *"is of the opinion that the design options used for the NM EPR project, complemented or modified in the light of the discussions held during the technical examination which have led to a number of commitments, are likely to ensure a safety level at least equivalent to that of the Flamanville 3 EPR reactor and complies with the recommendations of ASN Guide 22 (on the design of Pressurised Water Reactors)."*

In parallel with the examination of the safety file by the ASN, the work undertaken by EDF and Framatome on the New Model EPR project led to the finalising in 2017 of the technical configuration of a model which could replace the nuclear fleet currently operating in France and ultimately expand the French nuclear industry's export offers. As a result, the NM EPR project was renamed "EPR2". This technical configuration integrates, in advance, most of the recommendations issued by the permanent experts' group for nuclear reactors during its examination of the safety file of the NM EPR.

Based on the conclusions of the permanent experts' group and EDF's answers to questions, the ASN should issue an opinion in early-2019 on the safety options file submitted by the EPR 2 project in 2016.

## **Preparation of a programme to build new nuclear reactors in France**

On 25 January 2019, the French government published the main guidelines of the multi-year energy programme. In accordance with these guidelines, the government stated that it would conduct in-depth work with the nuclear sector by mid-2021 so as to be able to decide on the appropriate nature of a programme of renewal of nuclear facilities in France. The sector contract signed on 28 January 2019 by the French government and the Nuclear Sector Strategic Committee (CSFN) contains a section on the preparation of the industrial capacity necessary for the performance of a programme of construction of new reactors in France.

In order to keep in line with this initiative, EDF has started to prepare economic and industrial proposals based on the EPR2 technology. EDF will provide the information to enable the French government to define an appropriate regulatory framework for the financing of such an industrial programme.

## **Projects under development**

In March 2018, EDF signed a non-binding industrial cooperation agreement with the Indian national electricity company Nuclear Power Corp of India Ltd. (NPCIL) for the construction of 6 EPR reactors in India at the Jaitapur site. This agreement defines the industrial scheme, the roles and responsibilities of the partners as well as the project's next steps, including, in particular, the supply by EDF and Framatome of all the nuclear island's studies and equipment. An initial commercial and technical offer was submitted in May 2018 on EDF's scope of activity. To support the Jaitapur project, on June 2018, EDF and General Electric signed a strategic cooperation agreement for a long-term partnership on the construction of the conventional islands of the 6 reactors. A comprehensive conditional non-binding offer was submitted to the customer at the end of 2018 by EDF and its partners.

EDF is also participating in the call for tenders initiated in Saudi Arabia by K.A.CARE (King Abdullah City for Atomic and Renewable Energy) for a construction project relating to two reactors. At the end of the first phase, EDF was notified by K.A.CARE in June 2018 that it had been selected for the next phase of the process.

# 1. PRESENTATION OF EDF GROUP

## Description of the Group's activities

In the medium power segment, EDF relies on its historic partnerships with China (CGN) and Japan (MHI). The Group intends to take advantage of market opportunities, with two medium power technologies (UK HPR1000 with CGN and ATMEA1 with MHI). For the UK HPR1000 technology, EDF and CGN are collaborating through a joint venture (GNS) for the certification of this technology by the British safety authority.

For all these new development projects outside France and the UK, the EDF group aims to position itself as a technology supplier and an industrial partner. It could in this respect be exposed to risks related to the management of the projects but without impacting on its balance sheet as an equity investor.

### 1.4.1.2.3 The digital transformation of nuclear engineering (SWITCH programme)

Launched in July 2017, this programme feeds into EDF's CAP 2030 strategy, under sections related to managing current new nuclear projects, extending the operating life of the fleet in operation, expanding abroad and embracing digital transformation. It is a multifunctional programme involving all EDF players in the nuclear sector, including Framatome.

The programme seeks to mark a turning point in engineering by:

- transforming and simplifying processes and methods to better grasp the complexity of large-scale industrial projects throughout their lifecycle by applying systems engineering standards, among other methods;
- digitise processes using a data-centric approach based on an integrated, collaborative and industrial high-performance information system within an extended enterprise model.

In this context, the call for tenders launched in 2017 led to the selection in the 2<sup>nd</sup> quarter of 2018 of Dassault Systèmes as supplier of the PLM (Product Lifecycle Management) solution and Cap Gemini as integrator covering PLM (Plant Life Management) tools.

The SWITCH programme entered into its operational phase in the 4<sup>th</sup> quarter of 2018 with the launch of transformation works covering the scopes including ESPN (nuclear pressure equipment), RTI (engineering technical baseline), EPR 2 and HPC.

### 1.4.1.3 Framatome

Framatome is a major international player in the nuclear energy market, whose activities cover the design and manufacture of the nuclear steam supply system, as well as the design, supply and installation of equipment, instrumentation and control (I&C) systems and fuel. Framatome supports its customers through to the commissioning of their power plants and offers all related services.

With over 14,000 employees worldwide, Framatome's expertise helps its customers improve the safety and performance of their nuclear plants and achieve their economic and societal goals.

Framatome has a significant industrial presence in France (17 sites), Germany (4 sites), the United States (7 sites) and China (8 sites). The company also has an industrial or sales presence in South Africa, Argentina, Brazil, Bulgaria, Canada, South Korea, Spain, Hungary, Japan, Czech Republic, United Kingdom, Russia, Slovakia, Kazakhstan, Sweden and Ukraine.

Framatome, owned by EDF (75.5%), Mitsubishi Heavy Industries (MHI - 19.5%) and Assystem (5%), has been included in the consolidated financial statements of the EDF group since 31 December 2017.

#### 1.4.1.3.1 Framatome's strategy, market and commercial opportunities

Framatome's strategy is based on its core business *i.e.* nuclear steam supply systems, and aims to offer safe and competitive solutions, industrialise them and carry out the projects as part of an industrial sector.

Framatome supports its development by leveraging five strategic axes: proven and sustainable expertise, performance in delivering, agile organisation, safe and competitive solutions and international development.

The company's customer base includes leading international energy players and it works on over 250 reactors in the world.

With Framatome's experience in reactors of all types of technologies it can meet the specific needs of its customers worldwide.

With a current global fleet of 450 reactors representing close to 392GWe in service in 32 countries<sup>(1)</sup>, and new forthcoming nuclear capacities, the nuclear market offers opportunities in the field of fuel, modernisation and services. Framatome's goal is to expand its market share through a differentiated offer and export partnerships.

#### 1.4.1.3.2 Framatome's activities

With an experience built up over 60 years in the design and construction of nuclear plants, Framatome is present at every stage of the process, across all types of reactor technologies. With its highly skilled engineers and operators, the company has completed more than 90 nuclear power plant projects around the world to date.

##### Engineering

Framatome's experts are specialised in the design of the principal items of equipment making up nuclear steam supply systems, and that includes mechanics and metallurgy, neutronics, the scientific calculation work, fluid mechanics and risk and nuclear safety analysis. Framatome's engineering services include the heart of the power plant, referred to as the "nuclear island", and the main components of the reactor's primary circuit such as steam generators, pumps, pressurisers, as well as the nuclear reactor pressure vessel itself. Its specialists and technicians are actively involved in major new nuclear power plant construction projects such as the new EPR reactors.

##### Equipment manufacturing

Framatome components equip more than 100 power plants in 11 countries. At its plants in Le Creusot, Saint Marcel and Jeumont, in France, Framatome's manufacturing plants produce the key equipment for nuclear steam supply systems for electrical utilities all over the world to equip new-build power plants or to replace items of equipment at power plants in operation. The company manufactures advanced technology heavy equipment (reactor pressure vessels, steam generators, etc.) and mobile components (reactor coolant pumps and control rod drive mechanisms). Since 1970, around 10,000 components have been produced at its manufacturing sites by Framatome's forge workers, machinists, materials technicians, mechanical test technicians, boilermakers and welders.

In 2018, the company continued to increase production at its Le Creusot plant in Burgundy, which specialises in the manufacture of heavy components for the nuclear industry, after receiving the green light at the end of January from the French nuclear safety authority (ASN) and EDF to resume the manufacture of forged components for the French nuclear fleet. The Le Creusot plant will also supply the main forged components for new construction projects abroad, in particular for the EPR reactor project of Hinkley Point C in the UK, as well as parts for replacement components intended for French reactors.

##### Instrumentation & control systems

Framatome designs, manufactures and installs safe nuclear instrumentation solutions and instrumentation & control systems for plants in operation and new builds. Its solutions range from safety instrumentation & control systems to automation systems for normal operation, from nuclear instrumentation to lifecycle solutions, from simulators and global I&C engineering expertise to human-machine interface design and human factors engineering. Framatome has installed over 300 complete instrumentation and instrumentation & control systems on reactors of all types worldwide.

In 2018, Framatome finalised the modernisation of the digital instrumentation & control system of the Borssele plant in the Netherlands, operated by EPZ (Elektricitets-Productiemaatschappij Zuid-Nederland). The project started in 2014 and included the installation of a new reactor control and limitation system to monitor the operation of the plant.

Framatome also provides for reactor 3 of the Chinese plant of Tianwan, a complete instrumentation & control (I&C) system, based on its proven TELEPERM XS platform, the corresponding instrumentation, I&C electrical supply cabinets and operational I&C system.

(1) Source: CEA - ÉlecNuc - 2018 Edition, figures at 31 December 2017 (<http://www.cea.fr/english/Documents/scientific-and-economic-publications/ElecNuc-2018.pdf>)

## Fuel

Framatome designs, develops and manufactures fuel assemblies for pressurised water reactors, boiling water reactors and research reactors. The company's know-how spans the entire process: from the design of the fuel assembly, to the production of zirconium and its alloys – zirconium being vitally important for fuel production – on to fuel fabrication and related services, right through to operations on the nuclear power plants. The company performs all relevant calculations from general fuel management up to dedicated licensing for the highest performance and safety. Over 226,000 Framatome fuel assemblies are loaded in more than 100 reactors in operation around the world.

In 2018, Framatome and the Chinese group CNNC, through their joint venture CAST, delivered the first batch of fuel cladding tubes for the Fuqing nuclear power plant unit 5 "Hualong-1". These zirconium alloy tubes will contribute to the safe and efficient operation of the reactor. After two years of continuous and stable production, 51,494 cladding tubes (198km – equivalent to 185 fuel assemblies) will be delivered by the CAST plant.

In 2018, the company also signed a contract with Talen Energy to supply its advanced fuel, ATRIUM 11, to the Susquehanna nuclear plant in the United States. In January 2021, it will deliver the first of the six fuel reloads to the site located in Berwick, Pennsylvania.

## Commissioning and licensing of nuclear power plants

Framatome has substantial international experience working with nuclear safety authorities on all types of reactors currently in service around the world. The company also offers support for operators through relationships with their respective safety authority and in the application of existing regulations. In France, Framatome has expertise in the application of the Order relating to nuclear pressure equipment (*Arrêté relatif aux Équipements Sous Pression Nucléaire* – ESPN). Technical centres and test facilities are available to the company's customers to qualify equipment and to provide assistance in the preparation of the qualification studies and associated documentation.

## Services and solutions to maintain and modernise nuclear power plants and extend their operating lifetime

Framatome offers innovative solutions and services to maintain and modernise existing nuclear power plants, and extend the lifetime of existing installations, while guaranteeing the safety, performance and availability of operations. Framatome has 60 years' international experience of all types of technologies and maintenance of more than 250 reactors worldwide. Its teams have expertise and knowledge in maintenance, component replacement, inspections and checks, refuelling operations, and optimised management of reactor shutdowns for maintenance. More specifically, its activities cover supply of fuel assemblies and related services, management of equipment and spare parts, modernisation of I&C, and chemistry and radiochemistry services.

In 2018, Framatome competed the refurbishment of 31 reactor coolant pump motors for three southeastern nuclear energy facilities in the United States. From 2002 to May 2018, the company modified and upgraded these components, which resulted in a 100% reliability and zero-failure performance since being re-installed. The motors in reactor coolant pumps help move coolant around the primary circuit of a nuclear reactor core.

This same year, Framatome, Bureau Veritas and Doosan Babcock created EQUALLE™, an alliance to provide nuclear equipment qualification services in the United Kingdom.

## Management of large projects

Framatome's participation in the construction of new-build nuclear reactor projects spans across design, through procurement and supply, and onto commissioning.

With recognised expertise in the management of complex projects, its teams are tasked with delivering to the most stringent security standards and fulfil the requirements of its customers. In the case of new-build construction projects, the company proposes solutions for the nuclear island scope. Framatome is actively involved with EDF in the construction and commissioning of 5 EPR reactors worldwide: in France (Flamanville 3), in China (Taishan 1&2), and in the United Kingdom (Hinkley Point C, 2 reactors).

In 2017, EDF and Framatome created Edvance, a joint engineering subsidiary for the construction of new nuclear power plants in France and in the world (see also section 1.1 "History and development of the Company").

### 1.4.1.3.3 Key achievements by Framatome in 2018

In January, Framatome signed a joint development agreement with its Chinese partner CNNC, with the purpose of extending their cooperation in nuclear fuel design, engineering and services relating to nuclear fuel; enhancing their collaboration on digital instrumentation and control for nuclear power plants and increasing their cooperation in maintenance, safety and operation upgrades for in-service nuclear power plants. In parallel, a major contract renewal was signed with CNEC (a subsidiary of CNNC) for ten years in the field of components for fuel assemblies.

At the same time, in the United States, Lightbridge and Framatome launched Enfusion, a 50-50 joint venture company to develop, manufacture and sell nuclear fuel assemblies based on Lightbridge-designed metallic fuel technology and other advanced nuclear fuel intellectual property.

In February, Framatome completed purchase of Schneider Electric's instrumentation and control nuclear business. With this transaction, Framatome adds to its engineering expertise and expands its Instrumentation & Control (I&C) offerings.

In April, Framatome and Vattenfall signed a contract for the delivery, between 2021 and 2024, of ten fuel assembly reloads to the Swedish nuclear power reactors Forsmark 3 and Ringhals 3 and 4. These contracts include additional options for two reloads for each reactor after 2024.

In May, Framatome signed a multimillion-dollar contract with Dominion Energy to provide steam generator maintenance services for its entire nuclear reactor fleet in the United States. The inspection and maintenance work is scheduled to take place during eight outages from 2018 to 2020.

At end-June, Unit 1 of the Chinese plant Taishan was successfully connected to the grid for the first time, with the support of Framatome. After the first criticality reached on 6 June, this was the world's first EPR reactor producing electricity.

In September 2018, Framatome also signed a contract for upgrading the Instrumentation & Control (I&C) system on EDF's 900MWe reactor fleet in France. Following on from the studies already underway since 2015, the first on-site operations will begin in 2019, coinciding with the fourth ten-yearly inspections of the 900MWe series reactors.

In November, Framatome signed a memorandum of understanding (MoU) with Bruce Power in Canada as part of the Life-Extension Programme updates of nuclear reactors, covering a range of innovations and new activities.

### 1.4.1.3.4 Nuclear facilities

#### Basic nuclear facilities (BNF)

There are two basic nuclear facilities (BNF) at the Framatome site of Romans, BNF no. 63 (fuel elements fabrication for research reactors - CERCA) and BNF no. 98 (fabrication of fuel assemblies for nuclear power reactors). In July 2018, the plant of SOMANU (*Société de Maintenance Nucléaire*), within Framatome's Installed Base Business Unit, changed from the BNF regime to that of facilities classified for environmental protection (ICPE).

### 2018 results on nuclear safety <sup>(1)</sup>

As in 2017, no major safety or radiation protection event was recorded at Framatome's Romans-sur-Isère site or the SOMANU site.

In 2018, Framatome's Romans-sur-Isère site declared 16 significant safety events (ESS) classified at INES 0, 4 ESS at INES 1 and none at INES 2. The number of events declared is stable compared with 2017.

No event declared in respect of the year 2018 had any impact on workers, the general public or the environment.

The 2018 detailed results on nuclear safety are published in the annual report drawn up by the General Inspector for Nuclear Safety and in the TSN report of the Framatome site of Romans-sur-Isère and are available on the website [www.framatome.com](http://www.framatome.com).

### Dedicated assets

Dedicated assets have been established to cover long-term nuclear commitments (see section 6.1 EDF's "Consolidated financial statements", note 45.6 "Framatome and SOCODEI dedicated assets" to the consolidated financial statements for the year ended 31 December 2018).

### 1.4.1.4 Thermal generation in mainland France

In an environment of stagnating consumption in France in 2018 (-1%), thermal generation from fossil fuels has declined, playing its role as "connection group".

EDF's electricity generation from its thermal power plants in mainland France represented approximately 2.5% of its total electricity generation in 2018. During the same period, this fleet had a total installed operating capacity of 5,525MW.

Thermal generation assets have a number of advantages: they are very responsive and flexible (quick to start up and power can be modulated), and they have relatively low investment costs and short construction times.

Thermal generation assets are one of the key components of the energy mix to ensure the balance of generation and consumption in real time by accommodating fluctuations in electricity consumption and renewable energy generation (sun and wind power in particular). Together with some hydropower facilities (lakes, pumped storage plants), they are used to meet mid-merit and peak demand electricity requirements. They also help to regulate the system and thereby contribute to maintaining suitable voltage and frequency levels across the grid.

#### 1.4.1.4.1 EDF's thermal generation in mainland France

At 31 December 2018, the thermal generation facilities operated by EDF were of different types, both in terms of fuel and power:

Fuel	Unit capacity (in MW)	Number of units in operation at 31/12/2018	Total capacity (in MW)	Year commissioned	Output (in TWh)	
					As at 31/12/2018	As at 31/12/2017
Coal	580	3	1,740	in 1983 and 1984	3.9	6.1
Fuel oil	-	-	-	-	-	0.5
	85	4	340	in 1980 and 1981		
	203	1	203	in 1992		
Fuel oil and dual-fuel combustion turbines (gas and fuel oil)	134	1	134	in 1996		
	125-129	2	254	in 1998 and 2007		
	185	2	370	in 2010		
	179-182	3	542	in 2008 and 2009	0.2	0.5
	427	1	427	in 2011		
Combined Cycle Gas Turbine	465	2	930	in 2012 and 2013		
	585	1	585	in 2016	6.9	9.0

#### 1.4.1.4.2 Issues relating to thermal generation

##### A renovated coal fleet to meet mid-merit demand and a cofiring study to reduce the share of coal

After having closed, between 2013 and 2015, ten coal-fired units, EDF retains one coal power plant, consisting of three generation plants based on recent technology and located in Le Havre (1 unit) and Cordemais (2 units). A renovation programme for these coal-fired units was completed between 2014 and 2016 in order to improve their reliability and efficiency.

They are equipped with flue gas desulphurisation and denitrification systems (90% reduction in sulphur dioxide emissions and 80% reduction in nitrogen oxide emissions) as well as dust collectors that trap virtually all dust. These treatments allow the units to meet environmental regulatory requirements in force since 2016.

A coal and green biomass cofiring project was also initiated in 2016. A coal and biomass cofiring test carried out at Cordemais in February 2016 demonstrated the

technical capacity of a boiler to grind, pulverise and burn biomass (20%) with lowering its technical performance. Studies continued in 2017 and a plant residue densification pilot was set up in 2018. Tests performed in 2018 demonstrated the feasibility of co-firing 80% biomass in EDF coal boilers and the pilot's capacity to produce biomass pellets by the steam explosion process.

This project, called "Ecocombust", is in keeping with the spirit of the Climate Plan of July 2017, the national low carbon strategy (SNBC) and the proposed multi-year energy programme (PPE), which plan to stop coal power generation by 2022 and develop biomass resources. On 24 January 2019, EDF and the Ministry of Ecological and Solidarity Transition approved a working programme prior to a decision on the Ecocombust project. In 2019, this working programme should qualify the technical tests, environment impact studies and the project's business model. Subject to satisfactory conclusions at the technical, economic and environmental levels, and following continued discussions with the French government and local authorities, EDF will start the industrialisation phase for fuel production from 2022.

(1) The objective of Framatome is to detect, report and treat in the best possible manner all deviations and anomalies occurring in connection with its activities. The purpose of this indicator is to enhance the sharing of experience, broaden analysis and the importance given to weak signals. Events declared at level 0 on the INES scale are safety deviations, considered as "weak signals". It is essential to take them into account as part of a continuous improvement process for a better management of risk prevention in the conduct of activities. In order to facilitate the reporting on "weak signals" and the sharing of experience, Framatome detects and records any deviation. The analysis of the latter, by the Filière Indépendante de Sécurité (independent safety reviewer), assesses the level of reporting to the safety authority.



More generally, the Group is working to optimise the performance of all of its thermal fleet.

### Closure of the oil fired fleet

EDF decided to permanently shut down the Aramon thermal plant on 1 April 2016 and the Porcheville and Cordemais unit 2 thermal plants in the spring of 2017 as they had been scarcely used over the past number of years.

EDF also permanently shut down the last oil-fired unit (Cordemais 3) in the spring of 2018.

### Modernising the thermal generation fleet with natural gas combined cycle turbines

EDF commissioned the first Combined Cycle Gas Turbine (CCGT) plant in France at Blénod in 2011, then two CCGT plants at Martigues in 2012 and 2013 followed by a next-generation CCGT plant at Bouchain in 2016 in partnership with General Electric. This modernisation of the thermal generation fleet reduces its atmospheric emissions of CO<sub>2</sub>, nitrogen oxides and sulphur oxides.

The CCGTs in Martigues are the result of the repowering of former oil-fired units, a part of whose facilities, such as the steam turbine, the condenser and the water treatment facilities, were reused. The repowering of a unit of this capacity is a first in Europe. The installed capacity of the Martigues site is 930MW and the return is over 50%, markedly higher than the return from coal-fired thermal units, for example.

The CCGT plant at Bouchain is equipped with General Electric's new high-capacity "9HA" turbine. The innovative 9HA CCGT delivers improved capacity (600MW achievable in under 30 minutes) and return (over 60%, versus an average return for a standard CCGT of 57-58%) and offers good environmental performance with CO<sub>2</sub> emissions of around 360g/kWh on average, one-third of those of the old neighbouring coal-fired plant shut down in 2015. Under specific operating conditions it generated a record return of 62.22%. As a prototype it underwent testing from when it was commissioned in the spring of 2016 to when ownership was transferred from General Electric to EDF in December 2017. The facility operated steadily in 2018 (5,630 hours) and generated 2.6TWh.

### Evolution of the environmental regulatory framework

Today, EDF's thermal power plants are operated within the context of regulations that apply to installations classified for environmental protection purposes (*Installations classées pour la protection de l'environnement* – ICPE), as well as regulations relating to greenhouse gas emissions and a specific regulation for air quality (see section 1.5.6.1 "General regulations that are applicable to the environment, health, hygiene and safety").

In 2018, EDF's thermal power plants in mainland France emitted 6.4 million tonnes of CO<sub>2</sub> (9.5 million tonnes in 2017) for a net electricity generation of about 11TWh (16TWh in 2017). The CO<sub>2</sub> content per kWh generated by EDF's thermal power plants in mainland France in 2018 is 579g/kWh net i.e. the lowest CO<sub>2</sub> footprint in EDF's entire thermal history (590g/kWh net in 2017). This decarbonisation of EDF's thermal kWh is the direct result of the ramp up of the share of CCGT plants in EDF's thermal generation mix, which contributed over 62% of the production of the thermal generation fleet in 2018 (compared with 56% in 2017). It is to be noted that in 2010, the CO<sub>2</sub> content per kWh generated by EDF's thermal fleet in mainland France was still more than 900g CO<sub>2</sub>/kWh net.

In 2018, EDF's thermal generation fleet in mainland France also emitted 1.8kt of SO<sub>2</sub>, 4.6kt of NO<sub>x</sub> and 0.03kt of dust. Per kWh generated, polluting emissions from EDF's thermal plants have fallen compared with 2010 by four times for NO<sub>x</sub>, by over ten times for SO<sub>2</sub> and by over twenty times for dust. These drastic reductions in emissions were made possible by the shutdown of the oldest thermal plants, the renovation and installation of smoke treatment equipment using the best techniques

available at the most recent plants, the use of low sulphur fuel and the commissioning of low pollution natural gas combined cycle turbines.

The environmental performance of the thermal fleet in mainland France is fully in keeping with the objectives set out in the new Sustainable Development policy of the EDF group signed in June 2018 and in particular:

- reduce CO<sub>2</sub> emissions of the EDF group in line with the path defined by the Group in order to reach 30 million tonnes in 2030 (i.e. - 40% between 2017 and 2030, Corporate Social Responsibility Goals no. 1 of the EDF group);
- reduce the EDF group's SO<sub>2</sub>, NO<sub>x</sub> and dust emissions in the air by 50% between 2005 and 2020.

#### 1.4.1.4.3 Generation and technical performance

Thermal generation in 2018 amounted to 11TWh with a lower level of operation than in 2017 given the stagnating consumption in France.

In 2018, coal units supplied 3.9TWh, CCGT plants 6.9TWh and oil-fired units 0.2TWh. Minimising unplanned outages is the essential aim for facilities such as thermal plants, used for mid-merit and peak generation. The priority for these means of generation required on a variable basis all year round is to ensure system security by ensuring maximum reliability and availability.

The reliability of the thermal fleet was confirmed in 2018 and meets European standards. The fleet's adaptability to a sustained level of operation was demonstrated. The response rate achieved by combustion turbines to requests from optimisation services and from RTE was very good. In a tense balance between supply and demand, the combustion turbines fully played their role in maintaining the system's safety.

#### Decommissioning of shutdown units

EDF has planned all of the decommissioning operations on its thermal fleet units which were shut down or whose shutdown is scheduled. The provisions for these operations have been made in an amount that corresponds to the cost of decommissioning all of the units being operated and the clean-up of the sites (see section 6.1 "Consolidated financial statements at 31 December 2018", note 30 to the consolidated financial statements for the year ended 31 December 2018).

In 2018, EDF continued the decommissioning work on sites that had been definitively shut down.

#### 1.4.1.5 Renewable energy generation

Renewable energy <sup>(1)</sup> (hydropower, wind, solar, biomass, geothermal, marine etc.) has seen robust growth worldwide.

The EDF group is now the renewable energies leader in Europe and specifically the leading supplier of hydropower in the European Union; hydropower generation represents the Group's most important renewable energy, with an installed capacity of 23GW and 301 <sup>(2)</sup> large dams in the world. The Group also plays a role in the rise of competitive sectors, primarily wind and solar.

Hydropower is the renewable energy leader in the world, with an aggregate installed capacity estimated at 1,271GW <sup>(3)</sup>, of which 119GW of storage capacity through pumping. It has significant prospects for development in certain regions, even though it is close to its maximum operating potential in many developed countries. According to the IEA, from 2018 to 2022, hydropower is expected to account for about 13% of new capacity.

The combined installed onshore wind capacity reached 495GW <sup>(4)</sup> worldwide (of which 161GW in China) compared with 453GW a year before (of which 147GW in China).

(1) Renewable, or "green" energies, are derived from natural resources that are replenished quickly enough to be considered non-depletable in human terms.

(2) Counting done in 2018, according to the French classification (Decree 2015-526) relating to class A and B dams (with a height exceeding 10 metres). Number of dams in gross, regardless of the equity interest of EDF group in these dams. Number of dams in net: 270.

(3) Source of hydraulic capacities worldwide: Renewable capacity statistics 2018, International Renewable Energy Agency (IRENA) – March 2018.

(4) Source of onshore wind power capacity worldwide: International Renewable Energy Agency (IRENA) – March 2018

# 1. PRESENTATION OF EDF GROUP

## Description of the Group's activities

In solar photovoltaic power, total global installed capacity stood at 386GWc<sup>(1)</sup> compared with 292GWc a year before, up 32%. Today, it is largely wind, solar and biomass that are driving growth in renewable energy.

The EDF group's commitments in terms of developing renewable energy are also described in section 3.1.2 "Committed to sustainable development".

### NET GROUP INSTALLED CAPACITY<sup>(1)</sup> IN RENEWABLE ENERGY AT END 2018

(in MW)	Hydropower	Wind	Photovoltaic	Biomass	Geothermal	Marine	Total
France	20,327	1,340	225	240	8	240	22,380
Europe excl. France	1,994	2,316	103	9	-	-	4,422
America	-	3,663	697	40	-	-	4,400
Asia	432	185	110	-	-	-	727
Africa	-	374	235	-	-	-	609
<b>TOTAL NET INSTALLED CAPACITY</b>	<b>22,753</b>	<b>7,878</b>	<b>1,370</b>	<b>289</b>	<b>8</b>	<b>240</b>	<b>32,538 [*]</b>

(1) Power generation capacity, in proportion of the share the EDF group held in each asset.

#### 1.4.1.5.1 Hydropower generation in France

The electricity generated by EDF from its fleet of hydropower plants in mainland France in 2018 (including pumped storage) totalled 46.5TWh, 10.3% of its total electricity output.

##### 1.4.1.5.1.1 EDF's hydropower generation fleet

Hydroelectricity is the second source of electricity generation after nuclear power and the first source of renewable electricity in France. This is an important sector for the electricity system for many reasons, particularly in terms of grid security and balancing.

EDF's hydropower fleet in mainland France comprised 433 plants at the end of 2018 with an average age of 74 years<sup>(2)</sup>:

- approximately 11% of these plants have a unit capacity above 100MW. They account for around 56% of total generation;
- approximately 51% of these plants have a unit capacity under 12MW. They account for around 7% of total generation.

	31/12/2018	31/12/2017
<b>Hydropower plants with capacity lower than or equal to 12MW</b>		
Maximum capacity (in MW)	988.7	989.7
Consumption by pumping operations (in GWh)	48.2	23.5
Output including pumping (in TWh)	3.1	2.1
<b>Hydropower plants with capacity greater than 12MW</b>		
Maximum capacity (in MW)	19,025.5	19,017.0
Consumption by pumping operations (in TWh)	7.3	7.0
Output including pumping (in TWh)	43.4	34.7
<b>TOTAL MAXIMUM CAPACITY (IN GW)</b>	<b>20.0</b>	<b>20.0</b>
<b>TOTAL OUTPUT INCLUDING PUMPING<sup>(1)</sup> (IN TWh)</b>	<b>46.5</b>	<b>36.8</b>

(1) Corresponds to the sum of the exact values rounded to one decimal place.

Within mainland France, hydropower plants are mainly located in mountainous areas in the Pyrenees, the Alps, the Massif Central and the Jura, as well as on the Rhine. In all, they represent an installed capacity of approximately 20GW (excluding French overseas departments and Corsica), or 22% of EDF's fleet, for an annual generation capability of around 40TWh.

The various hydropower facilities are designed to optimise the use of water resources in the valleys where they are situated, as part of multi-purpose water management (detailed in 1.4.1.5.1.4 on Hydropower generation issues). Given the size and variety of its fleet, EDF has facilities able to respond to all types of desired uses, from base to peak generation, and which also offer levers for optimisation due to their flexibility: "run-of-river" plants, like the ones on the Rhine, which have

almost no storage capacity and generate electricity depending on the available water flow; plants with pondage, thus accessing average-sized reservoirs (smaller than lakes) for occasional use during the week or during the day, to cover peaks in demand; lake plants (seasonal reservoirs) located in mountainous areas (Alps, Massif Central and Pyrenees); pumped-storage plants, which pump water from a lower reservoir to an upper reservoir during periods of low demand when electricity is also lower in cost, in order to build up reserves used to generate energy at peak times (by releasing the stored water through turbines from the upper reservoir to the lower reservoir); and a tidal power plant on the River Rance (Brittany) which, using the up and down movement of the tides, provides a very regular supply of electricity.

(1) Source of photovoltaic capacity worldwide: International Renewable Energy Agency (IRENA) – March 2018

(2) Arithmetic mean.

[\*] IIND Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4)

Facility category	Turbine capacity	Average generation capability over 50 years
Run-of-river	3.6GW	16.8TWh
Lake-supplied	8.1GW	14.2TWh
Pondage	3.1GW	8.2TWh
Pumped-storage	5.0GW	1.5TWh
Tidal	240MW	0.5TWh

#### 1.4.1.5.1.2 Hydropower safety

Hydropower safety comprises all the measures taken when designing and operating hydropower plants to reduce risks and hazards to people and property associated with water and the presence or operation of facilities. Hydropower safety is a constant concern of the highest priority for plant operators (see section 2.2.2.4.2 "The hydropower field"). It involves three main activities:

- the management of operational risks, by providing information to users (communication campaigns, information of the employees operating on waterways, hiring "hydro-guides" during the summer months) about changes to water levels or flow fluctuations in downstream waterways;
- the management of facilities during periods of exceptionally high water levels, in order to ensure safety at the facilities and for the surrounding communities;
- measures to address the major risk associated with dam or reservoir failures, through the regular monitoring and maintenance of facilities under the supervision of public authorities. Among the largest dams, 68 are subject to a specific administrative procedure ("Special Intervention Plan") implemented by the relevant prefectural authority.

EDF performs regular monitoring and maintenance of dams, in particular by means of continuous structural health monitoring.

Furthermore, for each of the 236 class A and B dams (according to the French regulations resulting from Decree 2015-526), a danger study is conducted every ten or fifteen years (for one class A dam and one class B dam respectively). These studies consolidate a satisfactory overview of the structures and associated countermeasures <sup>(1)</sup>, and include a complete assessment made using underwater equipment or by emptying the reservoir. These operations are carried out under the strict supervision of public authorities. In 2018, the hydropower safety of EDF's fleet remained satisfactory with one hydropower significant safety incident (EISH) within the scope of EDF Hydro <sup>(2)</sup> classified as "orange" (an incident that placed people in danger or significant damages within the meaning of the Decree dated 21 May 2010; in 2018, the situation classified as "orange" is a "significant damage to a dam" and not an "incident that placed people in danger"). 8 EISH classified as "yellow" (incidents reflecting non-compliance without putting anyone in danger) were recorded this year. The key indicators are still at good levels:

- the number of sites downstream of facilities with high sensitivity to risks related to variations in water flow fell from 114 in 2005 to 6 in 2017 and 3 in 2018;
- the management of hydropower facilities was properly handled during the floods that occurred this year.

Since 2006, the engineering programmes for the safety and performance components of the hydropower fleet in operation have continued with a high level of investment, ensuring the careful management of major safety-related activities and providing them with national visibility. The goal is the technical updating and improved maintenance of the facilities, in order to maintain a high level of hydropower safety and preserve the technical performance of the fleet over the long-term. At the end of 2018, 440 specific systems and measures (i.e. a temporary measure to prepare an acceptable level of security, performance and individual safety) were being carried out, down from 2017, and were being monitored in five priority facility groups, namely galleries, pipes, dams, penstocks and floodgates.

#### 1.4.1.5.1.3 Performance of the hydropower generation fleet

In 2018, EDF invested €370 million in mainland France for the development and maintenance of its hydropower generation fleet to ensure optimum and safe operation.

##### A highly-automated and remotely-managed fleet

In order to take advantage of the flexibility of its hydropower generation facilities, for some years now EDF has been initiating ambitious programmes involving automation, remote control of hydropower plants and centralised management for each valley. Currently, the largest plants in EDF's hydropower fleet, representing over 15GW (around 75% of its installed hydropower capacity) are remote-controlled from four control centres able to make adjustments to the plants' operating programmes at any time in order to respond to the needs of the electrical system and to economic opportunities arising on the electricity market.

In order to improve their reliability EDF connected the largest power plants to five regional operating centres in charge of overseeing the physical settings of machines, such as temperature and vibration, allowing any deviations to be detected as early as possible and thus avoid incidents.

##### Technical performance of the fleet and hydropower conditions in 2018

Hydropower generation may witness substantial variations from one year to the next, depending on climatic fluctuations in water resources. 2018 is marked by an excellent performance in generation following the materialisation of projects on transformation, result-based management, outage optimisation based on needs and market prices (jointly managed with DOAAT) and abundant generation due to the large surplus of hydrologic conditions in the first half of the year and a slight deficit in the second.

EDF has developed a dynamic management of its reservoirs, with its weather programming department, which led, as for example in 2018, to the gradual preventive emptying of some of its lakes when snow melts in order to maximise generation over time.

Hydropower electricity generation before the deduction of the power needed to operate pumped-storage plants was 46.5TWh in mainland France and 39.2TWh net of consumption by pumped storage.

The 2018 generation indicators show a highly satisfactory level of performance with a low rate of internal loss <sup>(3)</sup> of 4.5% (3.5% in 2017). The overall availability of the hydropower fleet, i.e. the percentage of time over the year during which the power plants are available at full capacity, was 99.20% in 2018 compared with 99.31% in 2017. The loss rate was 3.1% in 2018.

In order to attain the operational performance and competitiveness of its hydropower fleet, EDF has invested, upon completion, close to €2018,800 million in the last ten years, to develop the industrial performance of its hydropower fleet, by modernising the maintenance and operation of the hydropower fleet, specifically via the renovation of electrical facilities, instrumentation & control and computerised management, maintenance and operating tools.

This is the basis on which EDF is pursuing its work to streamline and modernise its assets.

(1) For further details, see the annual report of the Inspector of Hydropower Safety, available on EDF's website.

(2) Excluding statements made on facilities operated by the affiliate SHEMA.

(3) Internal loss is the energy from flows that do not pass through turbines which were not stored. The rate of internal loss is obtained by dividing the internal loss by the generation performed during the year, and then adding the internal loss.

### 1.4.1.5.1.4 Hydropower generation issues

The hydropower segment is currently working on implementing Law no. 2015-992 ("the energy transition law"), managing access to water and developing projects.

#### Concession renewals

In France, hydropower generation facilities are operated under concessions awarded by the French State for structures of 4.5MW or more and within the framework of prefectural authorisations for structures of less than 4.5MW (see section 1.5.6.2.4 "Regulations applicable to hydropower facilities").

Concessions have an initial term of 75 years, pursuant to the French Law of 16 October 1919 relating to hydropower use. The majority of concessions expired before 2012 were renewed for terms of 30 to 50 years. The French State has however not yet renewed 13 concessions that had expired at 31 December 2018. Since their expiry these concessions have fallen under the "rolling delay" situation defined by Article L. 521-16 par. 3 of the French Energy Code as when a concession that has expired but not been renewed is extended under its former conditions until such time as a new concession is granted so as to ensure the continuity of operations in the meantime. In this respect, these concessions under the "rolling delay" will, by virtue of Finance Law no. 2018-1317 of 28 December 2018 for 2019, be subject to a fee as from 1 January 2019. The fees will be determined by decree of the Council of State, taking into account the characteristics of the concession. The Law on the Energy Transition for Green Growth of 17 August 2015 and the Decree of 27 April 2016 concerning hydropower concessions set down a new statutory and regulatory framework in which hydropower is included.

A set of legal texts supplements this framework concerning the attribution and/or performance of hydropower concession contracts: the Order of 29 January 2016 relating to concession contracts and its implementing Decree of 1 February 2016, which define together the general framework for competitive bidding, the Decree of 27 May 2016 relating to purchase obligations and additional compensation, which may apply to certain hydropower facilities (see section 1.5 "Legislative and regulatory environment").

In this context, EDF is preparing for the renewal of concessions under the legal framework set out above, combining improved energy efficiency, attention to aquatic environments, compensation of the government and municipalities through fees and regional development, while ensuring the safety and security of operations.

The European Commission (EC) initiated proceedings against the French State regarding hydropower concessions in France, based on Article 106 section 1 of the Treaty on the Functioning of the European Union (TFEU) read in conjunction with Article 102 of the same treaty. The European Commission therefore sent a formal notice to the French State on 22 October 2015, stating that it considered the fact that most hydropower concessions in France are attributed to and reserved for EDF as a violation of the above articles, since these measures reinforce EDF's dominant position on the French retail electricity markets. The State replied to this notice, which marked the beginning of an adversarial exchange of positions between the State and the EC, without prejudice to the final outcome. As the chief interested party, EDF received a copy of the formal notice and sent its observations to the EC on 4 January 2016, firmly contesting the EC's analysis and the grounds for this analysis. EDF has since been involved in certain exchanges between the French State and the EC, particularly to provide technical details on the operation of the French market. These discussions should continue in 2019 (see section 2.1.1 "Risks associated with the regulation of energy markets").

In accordance with Article L. 521-16-3 of the French Energy Code introduced by Law 2015-992 ("energy transition law"), the French government submitted an energy transition investment package to the European Commission in exchange for the extension of certain concessions held by EDF. The European Commission is due to rule on the compatibility of such an extension with European law, in particular Article 43 of Directive 2014/23/EU of 26 February 2014 on the award of concession contracts which limits the extent to which an active concession can be modified.

On 7 March 2019, the European Commission sent the French government formal notification concerning the renewal of hydropower concessions contracts. Other member States also received similar formal notification. More specifically concerning France, the Commission had identified problems with the application of European law concerning public orders to these renewals as well as issues of non-compliance of French legislation governing these renewals with the same European Public Order law. The French government has a period of two months to reply to the arguments made by the Commission.

#### Development

EDF undertakes a number of measures to give its rightful place to a profitable hydroelectricity sector in support of energy transition.

- New projects include the one at Romanche Gavet, in Isère, where EDF has begun work to replace the six small existing plants with the construction of a new subterranean plant (capacity of 93MW for a generation capability of 55GWh more than the existing plants). This project is carried out in the context of the renewal of the Middle Romanche concession and the decrees published on 31 December 2010.
- The development of storage, by harnessing the potential of pumped-storage plants in France (STEP) as part of the Group's Electricity Storage Plan, announced on 27 March 2018. The Decree of 17 June 2013 authorised EDF to build a new 240MW turbine generator set on the STEP site at La Coche in Savoie. This Pelton set, construction of which began in 2017, will increase the capacity of the existing facility by 20% and will generate approximately an additional 100GWh every year; the water supply line (244 metres long) was commissioned in 2018 and the assembly of the new generation set has started. EDF is also working on a major project in the Truyère Valley, in particular to meet the storage needs for energy transition purposes. This project would be conducted as part of an extension of the Truyère and Upper Lot concessions. It was submitted by the French State in April 2017 to the European Commission. An authorisation in principle is awaited prior to the formal notification process.
- Capacity increase:
  - through renovation, e.g. at La Bâthie plant in Savoie with the replacement of six generation groups to increase the plant's total capacity to 600MW; works to increase the capacity of a fourth set started in 2018, with the first three sets already commissioned;
  - by increasing the capacity of existing smaller hydropower plants under the system of authorisation initiated by the Order of 29 January 2016, to contribute to the development of leading-edge means;
  - by developing reserved-flow turbines. The purpose is to equip a certain number of dams in order to recover part of the energy associated with these minimum regulatory flows, by adding in 2018 an additional total capacity of 4.5MW already commissioned since 2015, plus new projects currently under consideration with commissioning scheduled by 2020;
- The development of "small-scale" hydropower plants (with capacity under 12MW but which can sometimes reach 20 to 30MW). One of the aims is to develop small-scale hydropower by:
  - forging partnerships with a view to developing projects and looking at opportunities to develop the installed capacity of the Group's "small-scale" hydropower plants in France;
  - optimising and increasing the generation capacity of the existing fleet with the return to service in 2017-2018 of several facilities after a major programme of renovations and/or, after a long period of standstill, responding to calls for tenders to build and/or operate micro-scale and small-scale hydropower projects. Three projects proposed by SHEMA and Électricité de Strasbourg won a call for tenders issued on 26 April 2016 and two projects proposed by SHEMA were successful in 2018 (in Vichy in l'Allier and Lescherette in Savoie).

### Regional anchoring in hydropower valleys

EDF Hydro has always taken care to ensure the sustainable and shared development of the hydropower valleys and the economic regions close to its generation facilities. These regions, often rural and sometimes isolated, are always looking to adapt to the changes in their environment: economic, societal or even climatic.

Over and above its outstanding and effective compliance with standards and regulations, EDF, as part of its development of maintenance and operation of hydropower plants, ensures that it provides support to these regions to tackle the societal and economic changes that they face.

It is in this context and in order to strengthen its determination to provide local support in the vicinity of its hydropower valleys that in 2012 EDF launched a dedicated programme named "One River, One Territory".

"One River, One Territory" is a win-win local programme which, at end-2018, drew upon seven active agencies in mainland France.

These agencies, created under a shared governance with local economic operators and which employ strategic actions specific to the needs of their regions, aim to integrate through and for employment, develop sustainable economic activities in the valleys, support private or public project promoters, facilitate communication among stakeholders and create or protect employment in companies in the hydropower valleys via a dedicated financing subsidiary, which has supported some forty businesses in ten years.

The action of the "One River, One Territory" local agencies led to the referencing in the panel of suppliers to EDF of close to 1,000 local businesses in business lines specific to hydropower, in particular in the field of mechanical engineering.

### Managing access to water

Water reservoirs held by EDF's large dams in France enable the storage of 7.5 billion cubic metres of water, corresponding to 75% of national surface storage reserves.

The hydropower facilities have positive effects on both economic development and the environment, and EDF applies a proactive management policy in relation to water resources, in liaison with various water stakeholders. Agreements are entered into with local authorities, farmers, fishermen, managers of tourist sites and manufacturers (see section 1.5.6.1 "General regulations that are applicable to the environment, health, hygiene and safety").

The Law of 30 December 2006 on Water and Aquatic Environments contains provisions relating to the management of water resources (in particular, the benefits of reserved flows and <sup>(1)</sup> the flexibility of hydropower plant operations). These provisions were supplemented by the statute on the reconquest of biodiversity, nature and landscapes of 8 August 2016. The EDF group nevertheless remains vigilant concerning the local implementation procedures and forthcoming developments of this regulation, and calls for more coherent public policies on water, energy and the environment.

### 1.4.1.5.2 New renewable energies

#### 1.4.1.5.2.1 Wind power

A wind turbine uses the action of the wind to drive rotor blades connected to an electrical generator. There are various categories:

- onshore wind power, a proven and increasingly competitive sector which is now close to competing with, if not matching, traditional sectors in certain areas. It benefits from economic incentives in various countries, although an increasing number of projects are developed without a financial support mechanism (see section 1.5.3 "Electricity market legislation"). On average, the rated capacity of onshore wind turbines installed worldwide is more than 2MW, a figure which is

increasing steadily. The subsidiary responsible for developing wind power within the Group is EDF Renewables. The subsidiaries EDF Luminus and Edison also have wind farms in service;

- offshore wind power, a less mature, high-growth sector which currently requires a higher initial investment and is more expensive to connect to the grid than onshore wind power and whose operation and maintenance are more difficult. The advantages of this sector are the higher rated capacity of each wind turbine (typically over 5MW) and increased productivity due to more reliable winds. The EDF group has decided to ramp up its investment in offshore wind generation which offers interesting development prospects in some of the Group's key countries including France and the United Kingdom.

#### 1.4.1.5.2.2 Solar photovoltaic power

The operating principle of solar photovoltaic power is to convert sunlight directly into electricity. Photovoltaic solar power is used in two ways: it can either be connected to the grid, or it can generate electricity at isolated sites. Grid-connected photovoltaic systems have witnessed steady growth around the world in two markets: ground-based solar farms and rooftop installations on buildings and homes.

The cost of generating solar power has fallen considerably in recent years. However, there is still considerable room for improvement, especially in the field of innovation and enhanced industrial processes. EDF R&D also conducts research on photovoltaic technology, under the aegis of the French Institute for Photovoltaic Power Research and Development (IRDEP), established in partnership with CNRS (National Centre for Scientific Research) and ENSCP (Paris National School of Chemistry).

#### 1.4.1.5.2.3 Biomass and biogas

Technologies based on biomass mainly consists of burning certain types of waste, particularly from the timber and farming industries, or exploiting wood fuel forests, to produce heat or electricity.

Biofuels can come from a wide range of sources. There are three different energy streams: combustion plants for plant matter (wood, agricultural waste) or animal matter; biogas generation plants (gas generated from the fermentation of organic animal or plant matter); household waste incineration plants.

Lastly, through its holdings, the Group owns shares in France (notably through its subsidiary Dalkia, see section 1.4.6.1.1 "Dalkia"), and abroad in several dozen heating networks and small-scale, mainly wood-fired generating plants.

#### 1.4.1.5.2.4 Geothermal energy

The temperature of the rocks in the earth's crust increases with depth (3°C on average every 100 metres). In some regions, geothermal energy reaches the surface in the form of hot springs, water or steam. The hot water is used directly in the form of heat: central heating in homes or heating of greenhouses.

Steam extracted from the ground is also used to generate electricity: as in a classic thermal power station, it drives a turbine. It is also possible to use hot and dry rocks as a source of electricity production from steam. To develop this type of energy, EDF has joined forces with several partners (including ES and German energy companies) as part of a European consortium that develops and operates a prototype geothermal power plant in the hot, naturally fractured crystalline rock around Soultz in Alsace.

France also has high-temperature resources located in its overseas territories. The EDF group is present in this activity mainly through its minority stake in the Company Géothermie Bouillante in Guadeloupe.

(1) Minimum flow maintained downstream of dams to protect aquatic life.



#### 1.4.1.5.2.5 Other technologies

Renewable energies cover a wide range of sectors and technologies. To prepare for the future, EDF Renewables responsible within the EDF group for identifying promising sectors and, with the support of the Group's R&D teams or industrial partners, contributes to the emergence of new technologies. Along with so-called concentrated solar power (see section 1.4.1.5.2.2 "Solar photovoltaic power") and energy storage, marine energy is another area, the Group is exploring in depth.

#### 1.4.1.5.3 EDF Renewables

Apart from hydropower, the EDF group's involvement in renewable energy is largely conducted by its a wholly-owned subsidiary EDF Renewables (ex-EDF Énergies Nouvelles). The companies in the EDF Renewables group had a workforce of 3,853 employees at 31 December 2018.

EDF Renewables has the expertise required to ensure EDF's development in renewable energies, particularly in the fields of onshore and offshore wind power and solar photovoltaic power. It also contributes to the development of the Group's Electricity Storage Plan.

At 31 December 2018, EDF Renewables has a gross installed capacity of 12,890.5MW, a net installed capacity of 8,296.6MW and 2,359.9MW gross capacity under construction; the project portfolio <sup>(1)</sup> represents 27.8GW, of which 25.4GW of projects, excluding capacity under construction. Present in over 20 countries, EDF Renewables is a major player in renewable electricity

development and generation, particularly in its biggest and historical markets, namely North America (US, Canada and Mexico) and Europe. It has continued to develop since 2012, positioning itself in new countries with significant potential for renewable energy development such as South Africa, Brazil, Chile, China, India and Israel, and more recently in 2017 with its entry into the United Arab Emirates and Egypt.

EDF Renewables is an integrated operator in renewable energies and is involved in every stage of the value chain. EDF Renewables operates upstream, in project development, as well as in engineering during the construction of power plants and their operation and maintenance. Each of these activities may be conducted on its own account or on behalf of third parties.

As part of its business model, the Group is also involved in the Development and Sale of Structured Assets (an activity referred to as "DSSA"), which consists of selling projects it has built, in whole or in part, to third-party investors. With regard to DSSA, the net capacity sold in 2018 amounted to 773.6MW.

Alongside development focusing on wind and solar photovoltaic power (which represent around 98% of its net installed capacity), EDF Renewables has a strong position in fixed-foundation and floating offshore wind farms as well as presence in other sectors such as electricity storage. Lastly, EDF Renewables is present in the decentralised renewable energy sector (rooftop solar power) for individuals and corporate customers in France, and more recently in the US and China for corporate customers.

(1) Including storage related projects.



## INSTALLED CAPACITY BY SEGMENT AND COUNTRY

	At 31/12/2018		At 31/12/2017	
(in MW)	Gross <sup>(1)</sup>	Net <sup>(2)</sup>	Gross <sup>(1)</sup>	Net <sup>(2)</sup>
<b>Wind</b>				
US	3,704.5	2,605.5	3,589.5	2,667.5
France	1,536.0	1,328.1	1,449.2	1,118.2
UK <sup>(3)</sup>	591.7	184.6	731.8	262.5
Turkey	661.6	267.4	661.6	267.4
Portugal	546.5	205	534.7	199.1
Canada	724.7	588.4	724.7	588.4
Mexico	391.5	229.5	391.5	229.5
Italy	424.2	298.1	424.2	290.1
Belgium <sup>(4)</sup>	325.2	26.9	325.2	26.9
Greece	264.5	238.2	264.5	238.2
China	219.3	102.6	198.4	85.9
South Africa	110.6	55.8	107.6	54.2
Morocco	50.4	50.4	50.4	50.4
Poland	106.0	106.0	106.0	106.0
India	164.0	82.0	164.0	82.0
Brazil	182.0	182.0	66.0	66.0
Denmark	6.0	6.0	6.0	6.0
Germany	185.8	183.8	151.3	149.3
Chile	115	57.5	0.0	0.0
<b>TOTAL WIND POWER <sup>(5)</sup></b>	<b>10,309.2</b>	<b>6,797.8</b>	<b>9,946.4</b>	<b>6,487.7</b>
<b>Solar power</b>				
France	230.4	174.9	233.1	177.0
US	394.0	205.4	394.0	322.4
Decentralised energy (France)	66.3	40.1	78.3	51.8
Israel	295.1	192.5	193.5	99.2
India	207.0	99.7	207.0	81.3
Italy	76.9	74.3	76.9	74.3
Canada	61.4	42.4	23.4	23.4
Greece	12.1	12.1	12.1	12.1
Brazil	398.5	199.3	283.6	226.9
Chile	261.0	130.5	146.0	73.0
UAE	266.0	42.6	0.0	0.0
China	14.0	10.5	0.0	0.0
Mexico	119.6	119.6	0.0	0.0
<b>TOTAL SOLAR POWER <sup>(5)</sup></b>	<b>2,402.3</b>	<b>1,343.8</b>	<b>1,647.9</b>	<b>1,141.5</b>
<b>Other segments</b>				
Hydropower	0.0	0.0	62.8	60.0
Biogas	70.0	70.0	70.0	70.0
Biomass	40.0	40.0	40.0	40.0
Storage	69.0	45.0	20.0	20.0
<b>TOTAL OTHER SEGMENTS <sup>(5)</sup></b>	<b>179.0</b>	<b>155.0</b>	<b>192.8</b>	<b>190</b>
<b>TOTAL <sup>(5)</sup></b>	<b>12,890.5</b>	<b>8,296.6</b>	<b>11,787.1</b>	<b>7,819.1</b>

(1) Gross capacity: total capacity of the facilities in which EDF Renewables has a stake.

(2) Net capacity: capacity corresponding to EDF Renewables' stake.

(3) EDF Renewables owns 51% of EDF Renewables UK (the other 49% is owned by EDF Energy).

(4) MW in offshore wind exclusively.

(5) Corresponds to the sum of the exact values rounded to one decimal place.

# 1. PRESENTATION OF EDF GROUP

## Description of the Group's activities

In 2018, the electricity production of EDF Renewables' fully consolidated fleet across all segments and countries was 15.2TWh. The load factor reached at end 2018 30% in onshore wind power generation and 18% in solar power generation.

### Wind power

#### Onshore wind power

In 2018, EDF Renewables continued its growth in onshore wind power.

EDF Renewables increased its gross wind power capacity by 362.8MW, bringing its total gross onshore wind power generation to 9,874.5MW at end 2018.

Onshore wind farms with a gross capacity of 686.9MW were commissioned in 2018, onshore wind farms under construction represented a gross capacity of 895MW at 31 December 2018.

#### France

In 2018, EDF Renewables continued its growth in wind power contributing to the EDF group's CAP 2030 strategic plan by commissioning close to 100MW of additional capacity.

Several wind farms came into operation during the year, including those of Espiers (18MW), Guilleville (17.7MW), Clanlieu (13.2MW) and in Futuren, those of Courant-Nachamps (21MW) and Demange (19.8MW).

In addition to these new capacities, several wind farms are under construction for a total of about 129.1MW, including those of Taillades (27.2MW), Pays d'Anglure (21.6MW) and the farm des Coteaux (38MW) owned by Futuren.

Futuren's wind power capacity brought EDF Renewables' gross installed wind power capacity in France to 1,536MW at 31 December 2018 with another 129.1MW of onshore wind power under construction.

#### UK

In 2018, EDF Renewables UK (51% owned by EDF Renewables and 49% by EDF Energy) sold 49% of its subsidiary EDF Energy Renewables Holdings, which owned 311MW of wind capacity in service and the Dorenell wind farm in Scotland (177MW) commissioned in 2018.

EDF Renewables UK operated a total gross wind power capacity of 488.2MW at end 2018 (net capacity of 127MW).

#### Germany

With Futuren and its installed capacity, the Group reached a gross installed wind power capacity of 185.8MW in Germany at 31 December 2018.

EDF Renewables has also returned the Eckölstadt wind farm into service. The wind farm went through a repowering or renewal, i.e. the overhauling of a facility which has reached its end. From an initial capacity of 14.5MW, the Eckölstadt wind farm now has an installed capacity of 34.5MW, with 10 new generation wind facilities.

#### Italy

The Group reached 424.2MW gross installed wind capacity in Italy at 31 December 2018.

#### Portugal

The extension of phase 2 of the Arada wind farm (11.8MW) has been commissioned. The Group currently operates 546.5MW of wind power capacity in this country.

#### Turkey

In 2018, EDF Renewables owns 661.6MW of gross wind power capacity in the country.

#### South Africa

In South Africa EDF Renewables runs three wind farms following its successful bid in the government's call for tenders representing a total gross installed capacity of 110.6MW.

#### US

At the end of 2018, EDF Renewables North America reached an installed capacity of 3,704.5MW gross (or 2,605.5MW net) in onshore wind.

During 2018, it started the construction of the Glacier Edge wind farm (202.7MW), in the State of Iowa, which is supported by a contract with Google, and the Coyote wind farm (242.2MW) while continuing with the construction of the Stoneray wind farm. The Copenhagen wind farm (80MW) has been commissioned.

Furthermore, 50% of the Red Pine (100MW net) and Rock Falls (77MW net) projects were sold during the year.

#### Canada

At end-2018, the Group's total gross installed wind power capacity in Canada was 724.7MW (or 588.4MW net).

The Romney project (60MW), 50% owned by EDF Renewables Canada, is under construction. EDF Renewables Canada has also signed a RESA (Renewable Electricity Support Agreement), a support agreement with AESO (Alberta Electricity System Operator), manager of the Alberta electricity grid. This 20-year contract relates to the Cypress project, of a capacity of 201.6MW. This project is supported by a power purchase agreement (PPA), awarded during the second phase of the calls for tender of the REP (Renewable Electricity Program), managed by AESO on behalf of the government of the Province of Alberta; it is part of the partnership between EDF Renewables, Canada and the *Gens-du-Sang* (Blood Tribe), First Nations.

#### Mexico

At end-2018, the Group's total gross installed wind power capacity in Mexico was 391.5MW (or 229.5MW net).

#### China

In 2018, the subsidiary of EDF Renewables China commissioned the Feicheng I wind farm in its entirety (45.3MW in total) and continued the construction of the Kangping II and III wind farm (96MW).

At end-2018, the Group's total gross installed wind power capacity in China was 219.3MW (or 102.6MW net).

#### India

At end-2018, the Group's total gross installed wind power capacity in India had reached 164MW (or 82MW net). A portfolio of 300MW of wind projects was awarded following a government call for tenders in September 2018.

#### Brazil

In 2018, EDF Renewables Brazil commissioned phase 2 (116MW) of the Ventos de Bahia wind plant of a total capacity of 182MW in the State of Bahia. EDF Renewables Brazil has also won long-term electricity supply contracts (PPA) over 20 years under different federal auctions for new energy launched by the Brazilian regulator, for several wind projects: the Folha Larga project of a capacity of 147MW in the State of Bahia, and a 129MW wind project which is an extension of the Ventos de Bahia wind plant. EDF Renewables Brazil has also signed a twenty-year corporate PPA with Braskem, one of the world leaders in the manufacture of thermoplastic resins. The electricity under the contract will be generated from part of the Folha Larga project up to 33MW.

#### Chile

EDF Renewables Chile's first wind farm, Cabo Leones 1, has been commissioned for a gross capacity of 115MW.

#### Morocco

The Group's total gross installed wind power capacity in Morocco reaches 50.4MW via its subsidiary Futuren.

### Offshore wind power

Offshore wind power represents a strong area in EDF Renewables' development. The company is already present on the offshore wind power market through several projects with a total capacity of 2.8GW under development, in service or under management and maintenance across Europe (Germany, Belgium, France, UK) and aims to contribute significantly to the development of the offshore wind power sector in the US.

In France it won three projects in 2012 under the call for tenders issued by the French government, namely the offshore wind farms in Fécamp, Saint-Nazaire and Courseulles-sur-Mer. Together they make up a total capacity of 1,428MW and cost around €6 billion. All relevant permits for the three wind farms were granted. However, appeals were filed on each of the three wind farms, pushing back the initially planned dates for the investment decision. In 2016 a partnership with the Canadian producer Enbridge (replacing DONG Energy) was signed to develop, build and operate the three jointly-owned (50/50) wind farms. In 2018, the French government confirmed, following a period of negotiations, these three offshore wind power projects. The final investment decision for the start of works can be taken once the permits obtained are cleared of any claims.

In 2018, EDF Renewables UK acquired the offshore wind power farm project "Neart na Gaoithe" from Mainstream Renewable Power, an international player in wind and solar power. This 450MW project, which has obtained all administrative permits, is located on the Forth Estuary on the east coast of Scotland and covers an area of 105km<sup>2</sup>. This project enjoys one of the best wind systems in Europe. The total investment required for the project is close to £1.8 billion.

Lastly, EDF Renewables US set up at the end of 2018 with Shell New Energies US, LLC (Shell) a joint-venture equally owned, called Atlantic Shores Offshore Wind, LLC for the development of offshore wind projects at the site known as OCS-0499, in the New Jersey Wind Energy Area (WEA), as part of a lease issued by US Federal authorities. The area covered by the lease has a potential for wind power generation of about 2,500MW. This operation is subject to obtaining the regulatory permits. Construction is subject to the final investment decision. The leased site covers an area of 74,200 hectares. It is approximately 13 kilometres off the coast of Atlantic City, on a US outer continental shelf (OCS). This area has substantial and regular wind resources in relatively shallow waters near large cities with high electricity consumption.

### Photovoltaic solar power

EDF Renewables pursued growth in solar photovoltaics, its second area of growth. At end 2018, gross installed solar capacity was 2,402.3MWp (1,343.8MWp net), up by 202.3 MWp net *i.e.* 18%, compared to end 2017. EDF Renewables also has a portfolio of solar projects under construction comprising 1,111.4MWp gross.

#### France

EDF Renewables reached 230.4MW gross installed solar capacity in France at 31 December 2018.

EDF Renewables has taken steps to contribute to the EDF Solar Plan launched by the Group in December 2017, which aims to develop and construct over the period 2020-2035, 30GWc of solar photovoltaic projects in France, in addition to its other activities for the development of renewable energies in France and internationally, contained in the EDF group's CAP 2030 strategic plan. In order to step up its growth in solar power, EDF is implementing a strategy covering all market segments, based on an integrated development model for projects up to their operation, the quest for industrial excellence and continued investment in innovation. This strategy leverages EDF's research and development and the territorial networking of EDF's teams dedicated to local authorities and businesses. The lands targeted as a priority are sites referred to as "damaged", *i.e.* industrial wastelands, polluted, abandoned or former quarry sites, which can be rehabilitated with the development of photovoltaic projects.

Furthermore, the Aramon solar project (5MWp), in the Aramon commune in the Gard and carried out by EDF Renewables following the CRE 4 call for tenders relating to land-based solar farms, went through a crowdfunding campaign in 2018 on WiSEED, the leading digital investment platform. This campaign was conducted with the inhabitants of the 7 departments neighbouring the Department of Gard to contribute to the financing of the construction of the photovoltaic plant on the site of a thermal plant under decommissioning in Aramon.

EDF Renewables has also launched a crowdfunding campaign for the photovoltaic project of Saint-Pargoire on the digital investment platform WiSEED. This campaign aims to raise €200,000 from inhabitants of Hérault and its four neighbouring departments to contribute to the financing of the construction of a photovoltaic plant.

Lazer, the first floating solar plant of the EDF group on the Buëch, in the Hautes Alpes, was selected for the ground-based solar call for tenders launched by the Ministry of Ecological and Solidarity Transition. The solar panels of this project of a maximum power of 20MWp will be installed on 24 hectares on the hydroelectric reservoir *i.e.* three-quarters of the water body's total area.

#### North America (USA and Canada)

In 2018, EDF Renewables North America launched the construction of the solar plants of Valentine Solar (134MWp) and of Maverick 2 & 3 (210MWp).

It has also signed two twenty-year power purchase agreements relating to the Big Beau Solar+Storage project, in California, in Kern country. With a capacity of 128MWac, the facility is connected to 40MW (160MWh) of battery storage. 55% of the electricity generated by the facility will be sold to Silicon Valley Clean Energy (SVCE) and 45% to Monterey Bay Community Power (MBCP), two local electricity suppliers. EDF Renewables North America and Shell Energy North America (US), L.P. (SENA) have also signed a fifteen-year power purchase agreement (PPA) relating to energy generation of a unit of 132MWp (100MWac) of the photovoltaic project of Palen (500MWac), called Maverick 4, in the Riverside

county of the State of California, in the heart of the Mojave Desert. The construction of this project has been launched.

In 2018, in Canada, EDF Renewables Canada also started the construction of the Barlow (18.2MWp) and Pendleton (19.8MWp) solar plants.

In North America the Group has a total gross installed photovoltaic solar power capacity of 455.4MWp.

#### Mexico

The Group entered the Mexican solar power market in 2016 by winning the Bluemex project following a national call for tenders. Located in the state of Sonora, the plant (119.6MW) was commissioned at the end of 2018.

#### India

In 2018, the Group owns a gross total solar capacity of 207MWp in service in India, *via* EDEN, the common subsidiary created in 2016 by EDF Renewables and EREN Renewable Energy to run the solar photovoltaic power activities of the two partners in India.

#### Brazil

In 2018, EDF Renewables Brazil commissioned the Pirapora II project (114.9MWp). With the Pirapora I (191MWp) and Pirapora III (92.6MWp) projects, commissioned in 2017, Pirapora II is the last phase of the Pirapora photovoltaic complex located in the South-East of Brazil, with a total capacity of approximately 400MWp. The Pirapora complex is equally owned by EDF Renewables and Omega, a local energy player, following the acquisition in end-2018 by Omega of Canadian Solar's stake and of 30% of the shares of EDF Renewables.

#### Chile

In 2018, EDF Renewables Chile commissioned the Santiago solar photovoltaic plant (115MWp) located to the north of the Chilean capital. The Group now has 261MW of gross installed solar capacity in Chile.

#### Israel

In Israel, EDF Renewables commissioned five solar photovoltaic power plants totalling 101MWp of installed capacity: the solar plants of Mashabai Sadeh (60MWp), Mefasim 2 (13.4MWp), Peduyim (14.1MWp), Kfar Maimon (6.7MWp), and Bitcha (7.4MWp), in the Negev desert. The Group now runs 17 solar plants in Israel, totalling a gross installed solar capacity of 295.1MWp. The Group has also launched the construction of the Timna (60MW) and Shoshon (27MW) solar plants.

#### United Arab Emirates (Dubai)

EDF Renewables joined the consortium led by Masdar to develop the "DEWA III" project which is the third phase (1,062MW) of one of the most powerful solar farm projects in the world, the Mohammed bin Rashid Al Maktoum solar farm, which is being developed in partnership with Dubai Electricity and Water Authority (DEWA) near Dubai.

The plant will be commissioned in three phases. In 2018, a first unit of 266MW (phase A) was commissioned and the construction of a second unit of 394MW (phase B) was launched.

#### Egypt

EDF Renewables entered the Egyptian market by joining forces with Elsewedy Electric to develop, build and operate two photovoltaic plants with a total installed capacity of 130MWac. Located in the south of the country the two plants form part of the Benban solar complex (1.8GWac) and come with a 25-year power purchase agreement (PPA) with the Egyptian Electricity Transmission Company (EETC).

### Operating & Maintenance

As an integrated operator, EDF Renewables operates and maintains most of its own wind and solar facilities. Dedicated first and foremost to EDF group wind and solar assets, this activity is also carried out on behalf of third parties. Worldwide, EDF Renewables operates 15.1GW at end-December 2018 with over 1,300 experts, engineers and technicians across eleven countries. EDF Renewables has long been active in the operation-maintenance field in North America where it manages close to 10.8GW. The business has grown in Europe and the rest of the world with a total capacity of over 4.4GW at end 2018.

# 1. PRESENTATION OF EDF GROUP

## Description of the Group's activities

This activity is driven by commissioning new plants and choosing which facilities to operate on a case-by-case basis according to technology and region. The aim is to achieve maximum efficiency in every facility in conjunction with manufacturers throughout the expected or extended useful life of equipment.

Accordingly, EDF Renewables recently set up a predictive maintenance oversight centre (e-Diagnostic Center) drawing on specific in-house expertise centralised and coordinated with the EDF group's R&D Department. It complements the facility remote monitoring and control system made up of three real-time oversight centres in Colombiers (France), Emden (Germany) and San Diego (California).

Since 2017, EDF Renewables owns via its subsidiary REETEC GmbH a subsidiary specialising in the operation and maintenance of offshore wind farms, the German firm Offshore Wind Solutions GmbH (OWS). OWS operates and maintains the BARD Offshore 1 wind farm (400MW) located 95km off the German coast in the North Sea.

EDF Renewables owns several European maintenance centres: in Italy, Poland, Belgium, Germany and France. These operation-maintenance units are designed to place technical teams as close to wind or solar farms as possible to ensure faster response times and thus operational performance.

### Decentralised Energy

#### France

The Group operates as an integrated player in decentralised solar photovoltaic power generation, involved in the design, construction, operation and maintenance of rooftop installations. EDF ENR, a wholly-owned subsidiary of the Group, markets and installs solar photovoltaic power solutions in France for residential and business customers and local authorities. After embracing self-consumption with the "*Mon Soleil et Moi*" ("My sun and me") service aimed at residential households, the Company also launched the "*Notre Soleil et Nous*" ("Our sun and us") service aimed at co-owners, social housing providers and all operators of apartment buildings wanting to generate and consume their own electricity.

In addition, EDF Renewables Technologies, a wholly-owned subsidiary of EDF Renewables, is present in the upstream segment. It owns 100% of EDF ENR PWT (Photowatt brand) which designs and manufactures photovoltaic modules using crystalline silicon technology with various applications ranging from residential equipment to land-based solar farms. In early 2018 Photowatt announced a development project based on a new industrial model on the one hand and its applied R&D on the other hand. The new industrial model would specialise in the low-carbon production of high-tech silicon ingots and wafers. The generation capacity would gradually reach over 500MWp a year versus the current capacity of 50MWp of Photowatt's existing facility at Bourgoin-Jallieu (38) in the Auvergne-Rhône-Alpes region in France. Alongside this joint project, Photowatt would concentrate on its R&D activities, renamed Photowatt Lab, in conjunction with the EDF group's R&D Department and solar energy research centres such as INES or the Photovoltaic Institute of Ile-de-France region with a view to fostering the emergence of new technology in the field of photovoltaic cells and modules and testing it in pre-industrial conditions.

#### United States

Following the acquisition in 2016 of Global Ressources Options, Inc. (groSolar), which specialises in the installation and sale of photovoltaic plants for local authorities, service companies and industrial players, in 2018, EDF Renewables North America entered into a strategic partnership with EnterSolar, a leading supplier of solutions for the decentralised generation of solar energy for commercial and industrial (C&I) customers. This partnership concerns the EDF Renewables equity investment in EnterSolar to the tune of 50%. It will allow both companies to offer C&I customers the most comprehensive range of solutions for "behind the counter" decentralised electricity generation and to capitalise on the sharp growth in demand for decentralised generation solutions from the C&I sector.

#### China

In 2018, EDF Renewables together with Asia Clean Capital (ACC), one of the main developers in China of rooftop photovoltaic installations for local businesses and multinationals, launched a joint venture aimed at building and operating a portfolio of decentralised solar energy projects on rooftops in China. The joint venture will leverage the local reputation of ACC as a key decentralised solar

player in the country and the international expertise of EDF Renewables in decentralised solar power and in self-consumption solutions for industrial players.

### Storage sector

In 2018, the Group launched an Electricity Storage Plan which provides for the installation of 10GW new storage facilities for electricity systems by 2035, to which EDF Renewables contributes.

EDF Renewables, via its subsidiary EDF Renewables Technologies, is the controlling shareholder of EDF Store & Forecast, a wholly-owned Group subsidiary. EDF Store & Forecast, founded in March 2014, markets software solutions to forecast, plan and optimise automatic control of renewable energy generation and storage.

In a context marked by the strong growth of renewable energy generation and by the closure of large-scale electrical facilities, battery storage technology, combined with a smart control system, helps smooth out the generation of electricity of the national grid. The storage system can be activated on the grid in order to respond quickly to fluctuations. In this context, through its subsidiaries, EDF Renewables develops innovative storage systems in the US, the United Kingdom and France.

In 2015, EDF Renewables had announced the commissioning, by its EDF Renewables North American subsidiary, of an innovative storage system that combines an energy storage battery and a computerised monitoring software. The McHenry facility provides nearly 20MW of capacity (40MW of dynamic capacity) and helps monitor an energy reserve to stabilise the frequency of the electricity grid at a local level.

In 2018, EDF Renewables commissioned the battery storage system with a capacity of 49MW located in the West Burton B plant in Nottinghamshire in the UK for which it had won a call for tenders in 2016. This facility is the most important project of the new frequency control system to be rolled out across the entire UK. The objective is to improve electricity grid stability and quickly respond to grid frequency fluctuations.

In 2018, EDF Renewables also signed two twenty-year power purchase agreements in the US relating to the construction of the Big Beau Solar+Storage solar project, in California (see. section Solar photovoltaic power North America), and connected to the battery storage system of 40MW (160MWh).

Lastly, in addition to the Toucan photovoltaic plant with battery storage (5MWp) in French Guiana in operation since 2015, the proposed Toucan 2 photovoltaic plant (5MWp) was chosen in 2017 under the CRE II call for tenders to build and operate photovoltaic facilities with a capacity of more than 100kWp with battery storage systems located in zones that are not interconnected (ZNI). With more than one hundred thousand photovoltaic modules, the future Toucan 2 plant will feature an electrical equipment remote control system developed by EDF Store & Forecast and EDF Renewables.

## 1.4.2 SALES AND SUPPLY ACTIVITIES IN FRANCE

### 1.4.2.1 Presentation of the market in France

#### 1.4.2.1.1 Demand

Domestic electricity consumption in France (including Corsica) for the 2018 financial year stood at 478TWh <sup>(1)</sup>, down by 0.8% in comparison with 2017, due in particular to milder temperatures.

#### 1.4.2.1.2 Competition

Since 1 July 2007, the French market for electricity and gas has fully opened-up each customer able to choose their energy supplier.

Over the last three years, the number of active electricity suppliers in France excluding historical suppliers has practically doubled from 24 at end-2015 to 43 at 30 September 2018 according to the Energy Regulation Commission (CRE). As of 30 September 2018, according to the CRE, the electricity market shares in terms of sites of alternative suppliers, were 18.2% in the residential market, and 42.4% in the non-residential market, and a gas market share, in terms of the number of sites, of 28.5% and 43.2% respectively.

(1) Gross consumption; source: 2018 Electricity report published by RTE.



In the electricity and gas markets many suppliers have been proposing offers to businesses and local authorities since the early 2000's. For residential customers, competition has intensified significantly since 2017 with the entry into the market of gas and electricity suppliers well established in other activities or geographical areas.

To supply their customers in 2018, EDF's alternative suppliers had access to their own generation capacities as well as to the wholesale electricity market and the ARENH for around 82TWh. During the November 2018 application process, the demand from alternative providers reached 132.98TWh for an ARENH distribution volume of 100TWh. See also section 1.4.3.3 "Regulated access to historic nuclear power (*Accès Régulé à l'Énergie Nucléaire Historique*, or ARENH)".

#### **1.4.2.1.3 Regulated electricity sales tariff contracts**

##### **Access to regulated electricity tariffs**

Since the NOME Law entered into force in 2010, the situation for electricity, by category of customer, is as follows:

- domestic and non-domestic final consumers who have subscribed power for their site(s) not exceeding 36kVA: these customers benefit from regulated sales tariffs. They can freely switch back and forth between regulated tariffs and market offers;
- domestic and non-domestic final consumers who have subscribed power for their site(s) exceeding 36kVA: since 1 January 2016 these sites can no longer subscribe to regulated sales tariff products which were cancelled on 31 December 2015;
- domestic and non-domestic final consumers for their site(s) located in areas not connected to the continental metropolitan network: these customers have the right to regulated sales tariffs;
- on 1 January 2018 the basic necessity tariff offered since 1 January 2005 was replaced with the energy cheque which came into effect after trials in 2016 and 2017 in the Ardèche, Aveyron, Côtes d'Armor and Pas-de-Calais départements.

##### **"Tarifs bleus" (blue tariffs applicable mainly to households and small companies) decisions of the Council of State of 18 May 2018 and 3 October 2018**

Appeals were lodged by Anode and Engie before the Council of State against the tariff decisions of 2016 and 2017 on the grounds that the regulated electricity sales tariffs known as "*Tarifs bleus*" for households and small companies do not comply with European law.

Ruling on these appeals and by decisions of 18 May and 3 October 2018, the Council of State accepts the principle of regulated electricity tariffs, recognising in particular that they pursue the objective of general economic interest of guaranteeing that consumers pay for electricity at a price which is more stable than market prices. The Council of State confirmed that this objective can only be met by a less restrictive state intervention than a general electricity unit price regulation and that the regulation on "Regulated electricity tariffs" (TRV in French) guarantees equal access to consumers by electricity companies and is not discriminatory.

However, the Council of State considered that the regulation was disproportionate as to its permanent duration and its scope of application, which now includes the sites of large companies with a subscribed power of less than 36kVA. These elements justify the partial cancellation of the tariff decisions of 28 July 2016 and 27 July 2017. The onus is now on the French government to implement these decisions. It is now working on the necessary legislative measures through the future Pacte law.

##### **"Tarifs bleus" - tariff changes**

Since 8 December 2015, in accordance with Articles L. 337-4 and L. 337-13 of the French Energy Code ("*NOME law*"), the CRE has been responsible for notifying the ministries in charge of the economy and energy of its justified proposals for regulated electricity sales tariffs (TRV). If there is no opposition to the latter before a deadline of three months, such proposals are deemed to have been approved.

Regarding 2018 tariff changes, the CRE, in accordance with the NOME law, proposed to the Government by a deliberation dated 11 January 2018 an increase of +0.7%, excluding tax in residential "*Tarifs bleus*" and +1.6% excluding tax in

non-residential "*Tarifs bleus*". This proposal, confirmed by a tariff decision dated 31 January 2018, published in the "*Journal Officiel*" on 1 February 2018 was implemented on 1 February 2018.

Thereafter, the tariff level of summer 2018 was also changed in accordance with this process: given the change in TURPE on 1 August 2018 and pursuant to the French Energy Code, the CRE proposed in a deliberation dated 12 July 2018 a reduction of -0.5% excluding tax in residential blue tariffs and an increase of +1.1% excluding tax in non-residential "*Tarifs bleus*". Furthermore, referring to the decision of the Council of State of 18 May 2018 as set out above, it also included in its deliberation of 12 July 2018 the abolition of non-residential "*Tarifs bleus*" for all sites of large companies, by suggesting a definition to be used to determine the scope of large companies, based on "Decree 2008-1354 of 18 December 2008 relating to criteria enabling the membership category of a company to be determined for the purposes of statistical and economic analysis." The CRE's proposal, in its entirety, was confirmed by a tariff decision dated 27 July 2018, published in the *Journal Officiel* on 31 July 2018 and implemented on 1 August 2018.

With respect to 2019 tariff changes, the CRE proposed to the government, via the decision of 7 February 2019 published on 12 February 2019, that residential and non-residential "*Tarifs bleus*" be increased by 7.7%, excluding tax. The proposal was reached by taking into account the rise in costs resulting from several components of electricity regulated sales tariffs (TRV), primarily wholesale energy costs and the price of capacity guarantees, as well as the effects of the ARENH's capping mechanism. The date this will be brought into effect is not known. The Government has a three-month period in which to refuse.

#### **1.4.2.1.4 Electricity supply contracts**

In France, customers are free to leave the regulated sales tariffs at any time and without prior notice for a market offer proposed by any other supplier, including EDF.

With the exception of customers directly connected to the transmission network, who must sign separate supply and delivery contracts, all other customers may enter into a single contract with the supplier of their choice for their electricity supply and transit. In this respect, a commissioning is paid by the distributor to any supplier offering a single contract to its customers since, by doing so, it fulfils obligations on behalf of the distributor.

The quality of supply, which is the distributor's responsibility, is monitored on a regular basis under contracts with the distributors. EDF monitors the impact of outages and the quality of supply to its customers and their satisfaction with the aim of working with the distributor on a continuous improvement basis (see section 1.4.4.2.2 "Distribution activities").

#### **1.4.2.2 The Customer Division**

EDF's sales and supply activities in France (excluding overseas departments and Corsica) are managed by the Customer Division.

##### **1.4.2.2.1 Presentation and supply strategy**

In France, EDF markets energy and services to nearly 30 million customer sites (excluding overseas departments and Corsica).

On the electricity market, EDF's sales in 2018 were close to 280TWh, excluding LDCs, which represents a market share of almost 65%.

EDF provides gas supply to all types of customers. In 2018, EDF marketed 31TWh of gas (compared with 30.1TWh in 2017), which represented a market share of 6.6%, to more than 1.5 million customers.

Besides gas and electricity supply, EDF accompanies its customers through energy efficiency offers and new decentralised energy solutions. Furthermore, in order to meet the expectations of its customers and assist them with the digital revolution in progress, EDF is continuing to digitise its products and customer relationship management. These efforts are being channelled through EDF Pulse Studio, the Group's innovation accelerator, which supports initiatives by means of an internal ecosystem and a network of external partners. EDF also has its Smart Lab dedicated to innovative applications, for example in artificial intelligence. The Group continues to lead the way in energy innovation and customer service. It also intends, in relation to its residential customers, to combine "sustainable well-being at home" with an economic and societal promise.



For example, residential customers can download the mobile application "EDF & MOI" and view the "e.quilibre" solution and receive assistance with reducing their energy consumption.

Implemented in 2006, the energy savings certificates (CEEs) scheme was amended on 1 January 2018: the national obligation for the fourth period (2018-2020) was fixed at 1,600TWh, of which 400TWh for households in a situation of energy poverty. This is more than a two-fold increase compared with the previous period (2015-2017), which was fixed at 700TWh, then increased to 850TWh with the introduction of CEEs for "energy poverty households" on 1 January 2016. EDF fulfilled its obligations for the third period 2015-2017 and increased its supplies in 2018 for the 4<sup>th</sup> period to cover its obligations for the year.

The EDF group wants to be the reference partner for territories in the energy transition, to meet their needs for their energy efficiency projects for the production of local renewable energies as well as the eco-district development projects. It is a leading player in the development of electric mobility via its subsidiary IZIVIA.

Lastly, customer satisfaction is a priority objective for EDF and it achieves good results in all segments: residential customers, companies and local authorities. This performance is the result of a culture of satisfaction which is translated into targets for each sales manager up to the highest level in addition to possibility for customers to seek support from the EDF mediator ([mediateur.edf.fr](http://mediateur.edf.fr)) with regard to their complaints.

#### 1.4.2.2.2 Activity by customer category

##### 1.4.2.2.2.1 Residential customers

At the end of December 2018, EDF had 24.5 million residential electricity sites and more than 1.4 million gas customers in France. For fiscal year 2018, the volume of its sales totalled 120.3TWh of electricity and 13.4TWh of natural gas.

EDF innovates on a daily basis and the satisfaction of residential customers is a priority: after contacting EDF, about nine out of ten customers are satisfied with the manner in which they were dealt with, whatever the channel or reason why they contacted the Company. The annual report of the French national energy mediator published in May 2018, shows that EDF has the lowest rate of disputes, far behind its competitors<sup>(1)</sup>. The customer experience offered is both digital (customer space, chat, web call back, mobile application, digital solutions, social media, etc.) and human. 5,000 advisers, all based in France, are attentive to the needs of customers and offer them personalised advice. At end-October 2018, over 42,000 training hours were given to EDF advisers on commercial relation and sales.

##### Energy supply

EDF supplies electricity at the regulated sales tariff (TRV) and with a comprehensive range of market offers in electricity, complementary to the TRV. In 2018, EDF extended its range of market offers in electricity to offer even more choices to residential customers. The Vert Electrique Auto (Green electric car) tariff was thus launched in January. This offer of renewable electricity supply focuses in particular on for customers who recharge their electric or hybrid car at home. This tariff also facilitates recharging away from home, for hassle-free trips, with the "itinérance" (touring) solution offered by IZIVIA, a subsidiary of EDF. In October, EDF also launched "Digiwatt", its first online electricity offer at -5% per kWh exclusive of tax compared to the regulated sales tariff. This innovative offer is designed for customers who wish to manage their relation with EDF independently, comfortably and at an attractive price.

EDF also supplies 1.4 million customers with natural gas as part of market offerings. EDF's range of market offers in gas includes three offerings. The "Avantage Gaz" offer is based on a fixed price per kWh (exclusive of tax) for four years. "Avantage Gaz Durable" not only comes with all the benefits of "Avantage Gaz" but also offsets the carbon emissions of gas consumed and provides support to a biogas research programme in France. Lastly, "Avantage Gaz Connecté" gives customers the possibility of managing their heating remotely and enhancing their comfort with the purchase of a connected thermostat.

##### Functionality and services

EDF, in partnership with AXA, offers a comprehensive range of support services, called "Solution Dépannage Confiance" with three rapid repair options applying to external electricity and gas installations (electricity & gas option), electricity, gas & water installations and plumbing/locksmith problems (home option) and equipment (equipment option). Also in partnership with AXA, EDF offers Assurénergie which allows customers to benefit from a flat rate reimbursement to

enable them to pay their energy bills in the event of difficulties (loss of employment, inability to work, hospitalisation, invalidity or death).

EDF offers a wide range of solutions to help its customers achieve energy savings. e.quilibre, the digital solution accessible to all of EDF's residential customers, allows customers to better understand and manage their energy consumption and in particular monitor their estimated energy consumption on a monthly basis, compare it with that of the previous year and with that of similar households or identify the electrical appliances that consume the most energy. Personalised advice to achieve energy savings on a day to day basis is also available on e.quilibre. Moreover, more than 10 million EDF customers with a Linky smart meter can, if they have given their consent, get news regarding their real consumption in TWh and in euros, by day or by 30 minutes. If they wish, they can also set a consumption target in euros and thus be alerted if it is exceeded. They can also access "Fil d'Actu" on the "EDF & MOI" app using this timeline they can access information to understand their consumption and save energy (weather impact, similar households, proportion of heating, adopted actions, etc).

Electriscare, an online platform, helps Internet users, whether they are EDF residential customers or not, choose household appliances that minimise electricity consumption.

In addition to these digital tools, EDF offers energy saving tips on its website ([edf.fr](http://edf.fr)) and runs a network of "EDF Home Solutions Partners" to help residential customers renovate their home energy use project. Residential customers also have access to loan solutions from Domofinance, EDF's finance partner, to renovate their home energy use.

Lastly, EDF is investing in open innovation with EDF Pulse & You, a digital collaborative platform for co-construction with internet users and startups. Since its launch in March 2016, 6,000 Internet users have taken part in the development of innovative projects by testing new products and have made more than 90,000 contributions.

##### Earning of energy savings certificates (CEE)

Where Residential customers are concerned, the production of the CEE results from the energy renovation of the home, essentially based on a network of "EDF Home Solutions Partners" (see also section 1.5.6.1 "General regulations that are applicable to the environment, health, hygiene and safety"). All residential customers who made energy efficiency alterations to their home qualify for a direct cash bonus from EDF by visiting [www.prime-energie.edf.fr](http://www.prime-energie.edf.fr) and providing the information and documents required.

##### Solidarity policy

Solidarity is a core value of EDF, which has been pursuing a policy dedicated to economically disadvantaged customers for close on 30 years (see section 3.2.3.2 "Implementation of operational solutions").

##### 1.4.2.2.2.2 Business customers

Together EDF Entreprises and EDF Collectivités have 1.5 million customers. Electricity sales in 2018 came to 163TWh at regulated sales tariffs or market prices and natural gas sales came to 17.7TWh.

##### EDF and business customers

EDF Entreprises supports businesses and professionals so as to contribute to their energy performance, in particular by helping them reduce their energy bills and participate in the energy transition. This action is at the core of the EDF group's strategy, which favours in particular the development of energy services.

##### EDF Entreprises' products

EDF Entreprises provides businesses and professionals with competitive tailor-made electricity and gas supply offers. Offers are varied depending on customer expectations and consumption patterns.

The electricity offers provided by EDF Entreprises enable small businesses, very small businesses and professionals to optimise their energy supply through simple contractual arrangements. They allow customers that consume more to choose the length of their commitment at the offered prices, depending on their needs in terms of budget visibility. Lastly, EDF Entreprises is able to tailor solutions for the heaviest users depending on the structure of their consumption. EDF Entreprises also offers its business customers guaranteed prices over three-year periods to enable them to plan ahead.

EDF Entreprises structures its products to encourage its customers to optimise consumption according to generation costs by offering different prices at peak and

(1) Source: 2017 annual report of the French national energy mediator.

off-peak hours and even summer and winter prices for heavier users during these times of year.

EDF Entreprises offers all its customers across all its products the option to choose electricity from renewable sources to cover their consumption. For small and medium sized enterprises and professionals, it involves a specific offer, the renewable energy contract, which guarantees that 100% of their consumption will come from electricity generated from renewable energy sources and facilitates their communication with their own customers regarding their commitment. For larger customers, it involves an option that allows them to decide themselves what proportion of their consumption will come from guaranteed sources, between 20% and 100%.

EDF Entreprises has a diversified range of products intended for all its electricity and gas customers, whether small companies or large industrial customers: online consumption monitoring, electronic invoices, assistance and troubleshooting, advice (optimisation of subscribed power, efficiency and reduction of energy expenses, etc.), in particular for customers who want to use an energy management system.

EDF has put into place offers dedicated to large customers, not only with tailor-made electricity and gas supply offers and offers that reward customers that can shed load, but also support controlling their energy consumption and their CO<sub>2</sub> emissions as well as CO<sub>2</sub> trading for businesses subject to the national quota allocation plan (see section 1.5.6.1 "General regulations that are applicable to the environment, health, hygiene and safety").

Lastly, in order to assist its customers with the energy transition, EDF Entreprises gets involved into the promotion of eco-gestures by means of awareness-raising campaigns. In addition, EDF Entreprises carries out energy audits for its customers in order to help them better identify the possible energy savings. The EDF Entreprises's certified teams assist their customers with the implementation of energy management systems (ISO 50001).

EDF supports its Business and Local Authority customers achieve their objective to engage directly in energy transition through photovoltaic self-consumption solutions optimised based on their electricity needs, with a range of related services, such as financing, maintenance, supervision and performance monitoring. EDF also has new offers for its self-consuming customers to complement their electricity supply tailored to their profile, whereby they can maximise their savings from self-generation and, where necessary, manage their consumption. EDF is also innovating by experimenting with services and technical systems aimed to facilitate the organisation and management of collective self-consumption operations; EDF is engaged in several pioneering operations in France.

### Customer satisfaction

EDF Entreprises prioritises the satisfaction of its customers to whom it listens and whom it surveys every time they contact it both in terms of how offers match needs, the monitoring of requests and the information and advice offered. After a sharp increase of almost 10 points in 2017, average overall satisfaction across all segments of customers of EDF Entreprises is stable in 2018 at 89% of customers satisfied or very satisfied.

### EDF and regional authorities, social housing landlords, local distribution companies ELDs and public service providers

Against the background of regional reform and the energy transition, EDF offers customised solutions for local authorities and public institutions with decentralised decision-making powers (hospitals, universities and major graduate schools, chambers of commerce and industry, CROUS student service centres, ports and airports).

As an operator in a competitive sector, the EDF group is active for these customers in three areas:

- the supply of electricity and gas at market price, responding to their energy problems (proposal of offers and solutions adapted to the needs described in calls for tender);
- the development of offers and services in terms of energy transition: local climate plans, eco-districts, local generation, street lighting, electric mobility, energy efficiency of buildings, etc.;
- in addition, with respect to its public service missions, EDF is in charge of:
  - the conclusion of concessions agreements to supply electricity at the regulated sales tariff,
  - the supply of electricity at the regulated sales tariff,
  - the fight against energy poverty.

In 2018, overall satisfaction of EDF Collectivités customers is stable with 9 customers out of 10 satisfied or very satisfied.

### Managing energy consumption with local authorities

Agreements have been signed with local governments, covering the implementation of the energy transition in their regions. In addition, local authorities with the power to make decisions in the area of energy arrange specific actions in their region in matters concerning control of energy demand and renewable energies. A "Load Amount" device for social-housing lessors aims to improve the energy efficiency of social housing, and makes it possible for EDF to issue energy savings certificates. In 2018, more than 127,700 of which were for renovation work. EDF also offers CEE programmes for local authorities (e.g. TEPCV or "Watty à l'école").

#### 1.4.2.2.3 For sustainable cities and regions

Cities and regions have to reconcile local appeal with responsible development. EDF supports those engaged in local development (local authorities, town and country planners, industrial promoters, etc.) to identify the different possible energy solutions and services taking into account the technical and economic characteristics of projects.

EDF has developed a range of advisory services (Optim Range) to design a low-carbon neighbourhood, draw up a strategy for renovating a building stock based on an asset management strategy or to create an electrification plan for vehicle fleets or a plan for installing stations or renewable energies. Actions are also being implemented to control energy demand, some of which are part of the energy savings certificates (CEE) programmes.

45 Development Managers are present across all regions so that EDF can better meet the needs of large cities, urban communities, medium sized cities, rural areas."

#### 1.4.2.2.4 Customer data protection

The protection of data belonging to EDF customers is a major component of the Customer Department's action plan to secure assets/goods and information systems.

Measures taken under the plan are presented every year to suppliers' governance bodies.

Special attention is paid in particular to compliance with data processing regulations (General Data Protection Regulation - GDPR). In 2018, work was carried out to update the description of customer data processing, identify their Operational Data Controllers (ODC) and create a Committee to meet twice a year - the Data Protection Committee - bringing together the Data Controller and the ODCs.

All Customer advisers of the Residential Customers market and the Corporate Customers market have been trained to deal with requests from customers regarding the exercise of their rights.

Every year, an internal audit on the capacity of the information systems to securely host customer data is conducted. It ensures that only employees in charge of customer relations have access to customer data.

Access to customer data is subject to certification and signing an acceptable use policy.

Special attention is also paid to the implementation of actions on a proactive basis. A Customer Preference Centre allows Residential customers to enjoy a central view of consents and preferences and manage these consents from their customer space.

#### 1.4.2.2.5 Public electricity distribution concessions at regulated tariffs

Concessions hereby referred to cover two distinct public service missions:

- the development and operation of public distribution networks, which are the responsibility of Enedis<sup>(1)</sup> in mainland France, excluding Local Distribution Companies (ELD) (see section 1.4.4.2 "Distribution – Enedis") and of EDF in the non-interconnected areas (ZNI);
- the supply of electricity to customers benefiting from regulated sales tariffs connected to the public distribution networks, under the responsibility of EDF for mainland France (excluding ELDs) and ZNIs. This mission is carried out in compliance with the commitments of the concession specifications and general terms and conditions of sale (subscription terms, payment and delivery terms, contractualisation, etc.).

Each concession contract in continental metropolitan France is co-signed by EDF, Enedis and the licensing authority, and concerns a municipality or a grouping of municipalities. These public service missions are executed within the framework of 475 concession agreements of which 50 are at Department level.

2018 was the first year of the process concerning the implementation of the new national concession agreement model which was the subject matter of an agreement signed on 21 December 2017 between EDF, Enedis, the FNCCR (national federation of licensing authorities) and France Urbaine. Some sixty agreements aligned on this new model were entered into at 31 December 2018, with departmental energy consortia, urban communities and communes.

2019 will be marked by the continued application of the new agreement model. An organisation and tools are maintained, particularly in order to renew concession contracts, mobilise both national and regional competences, develop the expertise of EDF's contacts in the contracting authorities, draw up each year the concession activity reports (CRAC) and respond to inspection requests from the granting authorities.

### 1.4.3 OPTIMISATION ACTIVITIES FOR EDF IN FRANCE

#### 1.4.3.1 Role and activities of the Upstream/Downstream Optimisation & Trading Division (DOAAT)

The DOAAT is responsible for managing the balance of EDF's upstream/downstream electricity portfolio, optimising and securing the electricity gross margin created by this portfolio, as well as managing the associated physical and financial risks.

Management of electricity supply/demand can be broken down to real-time, within the framework set by the policies of extreme risk (volume risks) and of price risks, developed pursuant to the Directives of the Group Risk Control Department, and validated by its Executive Committee (see section 2.1.2 "Risks related to the competitive and general context"). Climate variations affect this management. Hence, a fall in temperature of 1°C in winter leads to a rise in electricity consumption in France of the order of 2,400MW<sup>(2)</sup> and EDF's portfolio bears a large part of this thermosensitivity. In addition, depending on the run-off, the amplitude of hydraulic generation in the EDF scope, between one extreme year and another, can amount to around 20TW hours. The DOAAT ensures that it has, in all timeframes, sufficient power margins in order to enable it to meet its commitments. To do this, it manages a set of leveraged actions: scheduling of maintenance operations of generation means (in particular nuclear), management of inventory (fossil fuels, hydro-electric reserves and customer load shedding), purchases and sales in wholesale markets via EDF Trading, which is in charge of market access on behalf of DOAAT (see section 1.4.6.3 "Optimisation and trading: EDF Trading"). DOAAT also manages the exposure of EDF's upstream/downstream

portfolio to price variations in the energy and fuel wholesale markets (gas, coal, petroleum products) and in the CO<sub>2</sub> emissions licensing market, with the assistance of EDF Trading.

With respect to RTE, DOAAT plays the role of "balance responsible entity" on EDF's perimeter in mainland France. In this regard, EDF is committed to financially compensate RTE in the case of a deviation onto its balance group. The optimisation consists of offering RTE an offer schedule that is balanced with the demand, which makes it possible to minimise the supply cost of EDF's contractual commitments.

#### 1.4.3.2 Long-term electricity purchase and sales contracts

EDF maintains commercial relations through energy purchase or sales contracts with European operators.

These contracts are of many types, and confer:

- rights to the energy generated by facilities, primarily nuclear, in which the counterparties hold a participating interest over the duration of the exploitation of the facility (see section 1.4.1.1.1 "EDF's nuclear fleet in France");
- drawing rights for totally or partially guaranteed electrical power, for a duration generally comprised between 15 and 25 years.

#### 1.4.3.3 Regulated Access to Historic Nuclear Power (Accès Régulé à l'Énergie Nucléaire Historique, or ARENH)

Operational since 1 July 2011, the ARENH mechanism entitles alternative suppliers to buy electricity from EDF to supply their customers, once they have signed a framework agreement, at a regulated price and at volumes determined by the Energy Regulation Commission (CRE). This mechanism can also be accessed by network operators for their losses. The CRE is responsible for managing the mechanism and for calculating entitlements of which it notifies the co-contracting parties. Thus, suppliers wishing to exercise their right to access the ARENH can do so by submitting a request to the CRE. The detailed forecasts, along with the entitlements calculated for each supplier, are only known to the CRE and the supplier. The payments are managed by the Caisse des Dépôts.

The price of the ARENH, determined by the Minister of Energy and the Minister for the Economy, upon proposal by the Energy Regulation Commission (CRE), has been maintained at €42/MWh since 17 May 2011. It includes the supply of electricity and the issue of the related capacity certificates.

The maximum ARENH volume that can be sold to suppliers, which make a request to cover the needs of the ultimate customers, is set at 100TWh per year. The conditions of application of this ceiling are defined by the CRE.

The order of 14 November 2016 is amending the ARENH framework agreement, particularly in order to incorporate provisions related to the implementation of the capacity mechanism and to frame the conditions for early termination by suppliers. The revised framework agreement restricts the use of such unilateral termination faculty by making it applicable only in cases when the price of the ARENH is modified by more than 2%, when the framework-agreement is substantially modified or when changes in the regulations relating to the ARENH substantially and unfavourably affect the balance of the procurement terms for the Buyer.

In addition, Decree No. 2017-369 of 21 March 2017 relating to regulated access to historic nuclear power amended some of the provisions of the regulatory section of the French Energy Code on ARENH, in order to define the terms and conditions for implementing the "monotony clause". It thus addresses cases not provided for in the earlier wording of the French Energy Code, namely situations where there is no framework agreement or request for ARENH in the period before the current period. The lack of subscription or agreement is now considered as a zero volume subscription.

In 2018, EDF supplied 87.1TWh to cover the needs of the ultimate customers of its competitors as part of ARENH.

By way of deliberation 2018-222 of 25 October 2018, the Energy Regulation Commission set out, pursuant to the provisions of the French Energy Code, the method of allocation of the ARENH volumes if demand is higher than the statutory ceiling. This decision provides that if the ARENH ceiling is crossed from

(1) Network operator, independently managed.

(2) Source: RTE.

November 2018, firstly, the capping will only apply to new requests for ARENH made during this application process and, secondly, subsidiaries controlled by EDF will be fully capped for volumes leading to this ceiling being crossed. Lastly, it provides that the said subsidiaries may enter into agreements with the parent company, replicating the ARENH mechanism and conditions of supply, in particular the capping rate of alternative suppliers. When implemented, this capping mechanism leads to an increase in the weight of market reference prices in the determination of regulated sales tariffs (TRV) and, all other things remaining equal, to an increase in the energy component.

Since the request from suppliers during the application process of 21 November 2018, which stood at 132.98TWh excluding EDF subsidiaries, crossed the ceiling, EDF will deliver 100TWh of ARENH in 2019 to cover the needs of the ultimate customers of its competitors.

#### 1.4.3.4 Balance perimeter dedicated to Purchase Obligations and selling on the wholesale market

EDF is a mandatory purchaser of the electricity generated by the generation facilities the government wishes to support and develop (renewable energy sources and energy efficient cogeneration). By law (Article L. 121-7 of the French Energy Code), the additional costs stemming from this obligation are offset for EDF on the basis of an electricity market benchmark price (concept of "avoided cost"). From 1 January 2017, the costs of managing these contracts have also been offset.

At its meeting of 9 October 2012 concerning the costs for 2011, the CRE indicated that: "In theory, the avoided cost should be reduced by the imbalance costs borne by EDF due to the unpredictable nature of a portion of the generation covered by the purchase obligation. Such imbalances, which were negligible in past years compared with consumption-related imbalances, are becoming more significant."

With the development of renewable energies, the cost generated by the difference between anticipated generation and actual generation has become significant. As a result, at its meeting of 16 December 2014, the CRE changed the formula for calculating EDF's avoided costs to include such imbalance costs. In order to make objective and independently identify such imbalances, the CRE asked EDF to establish a dedicated balance group.

A balance perimeter dedicated to the facilities subject to a Purchase Obligation contract was put in place on 1 July 2015. The DOAAT now organises the sale of the energy produced by the installations under Purchase Obligation contracts directly on the energy markets, which makes the management of this perimeter completely independent of that of the EDF portfolio. Thus, since 4 November 2015, electricity volumes under Purchase Obligations that can be forecast over the short-term (one day for the next, known as the "random component of the Purchase Obligations") are sold on EPEX Spot. As for the volumes which are foreseeable over the long term (share of the Purchase Obligations referred to as "quasi certain"), since January 2016 they have been sold via transparent and non-discriminatory requests for bids.

#### 1.4.3.5 Capacity mechanism

Articles L. 335-1 *et seq* of the French Energy Code, originating from the NOME Law, institute the obligation for each electricity supplier to contribute in mainland France to the security of electricity supply, in compliance with a default criterion set by the government. For this purpose, each supplier must acquire capacity guarantees corresponding to its obligation, calculated by reference to the power and energy consumption of its customers during a peak period defined by RTE.

To comply with this obligation, each supplier must therefore get capacity guarantees from producers, which must certify all their means of generation, or from demand response managers.

Once up and running, a number of auctions to exchange capacity will be held beginning four years before the delivery year and ending three years thereafter.

Over-the-counter transactions remain possible. Similarly, for integrated players such as EDF, which possess capacities as producers and have an obligation as vendors, internal capacity transfers are authorised in order to cover their obligations. They will be made at the market price.

The DOAAT, in charge of the management of this new system, proceeded with the certification of all the EDF means of production in France for the next few years

and the contractual demand response capacities with the customers. If necessary, these certifications will be the subject to regular rebalancing, either upwards or downwards. Similarly, the DOAAT will proceed with the certification and the necessary rebalancing of the means of generation subject to purchase obligations (OA) and sale obligations on the market for associated capacity guarantees.

As on the Energy market, the sales/purchases of capacity organised by EPEX Spot managed by the DOAAT on behalf of EDF, are carried out via EDF Trading.

### 1.4.4 TRANSMISSION AND DISTRIBUTION ACTIVITIES IN FRANCE

The transmission and distribution of electricity in mainland France are regulated activities. They are carried out by RTE and by Enedis, grid operators which are managed totally independently, within the meaning of the provisions of the French Energy Code.

#### 1.4.4.1 Transmission – Réseau de Transport d'Électricité (RTE)

Created on 1 July 2000 and a subsidiary since 1 September 2005, the Electricity Transmission Network (RTE) is the owner and operator of the French electricity transmission network, which it operates, maintains and develops. With over 100,000 kilometres of high and extra high voltage circuits and 50 cross-border lines, this is Europe's largest network. Its geographical location places it at the core of the European electricity market. RTE guarantees the correct operation and safety of the electricity system, and provides free and fair access to all the network users. The company also pays special attention to supporting the development of renewable sources of energy in France and their integration into the electricity system, which requires the development of the transmission network and interconnections.

RTE is indirectly owned (50.1%) by EDF (via CTE) at 31 December 2018. Due to its specific conditions of governance, RTE is not fully consolidated by the Group, but rather accounted for using the equity method.

##### 1.4.4.1.1 Governance of CTE and RTE

###### CTE

CTE is a public limited company (*société anonyme*) with a Board of Directors, owned by EDF (50.1%), Caisse des Dépôts et Consignations (29.9%) and CNP Assurances (20%). CTE holds 100% of the share capital of RTE.

In accordance with its articles of association, the sole purpose of CTE is the acquisition and holding of RTE shares, and more generally, all commercial, financial, intangible and tangible property transactions relating directly or indirectly to its corporate purpose or which might facilitate its achievement or stimulate business growth.

The eight members of CTE's Board of Directors include four EDF representatives, two Caisse des Dépôts et Consignations representatives and two CNP Assurances representatives. They are appointed for six years. RTE's compliance auditor also attends meetings of CTE's Board of Directors.

###### RTE

RTE is a public limited company (*société anonyme*) with both an Executive Board and a Supervisory Board. RTE's Supervisory Board is comprised of twelve members appointed for five years:

- eight members appointed by the Shareholders' Meeting:
  - two State representatives, including the State as a legal entity, represented by an individual,
  - six representatives of the shareholder (three representatives of EDF, two representatives of the Caisse des Dépôts et Consignations and one representative of CNP Assurances);
- four members elected by the staff.

A Government Commissioner was also appointed and attends Supervisory Board meetings in a consultative capacity.



Pursuant to Decree 2018-580 of 4 July 2018, RTE is now subject to the economic and financial supervision of the French State and an Auditor General, appointed by Decree, now attends meetings of the Supervisory Board.

RTE's Executive Board is made up of five members, who perform their work under the supervision of the Supervisory Board, within the limits fixed by the French Energy Code and RTE's articles of association. After the consent of the Energy Minister, the Supervisory Board appoints the Chairman of the Executive Board and upon the latter's proposal, it appoints the other members of the Executive Board.

#### 1.4.4.1.2 RTE's activities

In France, RTE manages the public transmission network and carries out its missions under the conditions set out in model specifications approved by applicable decree until 2051. In accordance with the French Energy Code, transmission network operators must be certified according to a process associating the CRE and the European Commission, which aims to ensure that the entity concerned fulfils the conditions of independence set out by this Code. RTE obtained certification from the CRE in 2012 as an ITO (Independent Transmission Operator). Following the change in its share ownership, RTE applied to the CRE in 2017 to reexamine its certification and thereby maintained its certified status following a CRE decision dated 11 January 2018.

Thus RTE manages the transmission infrastructure, guarantees access to the transmission network and manages energy flows.

RTE has had to face a variety of challenges in its mission as an electricity transmission network operator: integration of the European market, extensive restructuring of the generation fleet, societal changes reinforcing the constraints of integrating new infrastructure of general interest and maintenance of its industrial facilities to meet the requirements of customers and the community at large.

#### 1.4.4.1.2.1 Energy report

##### 2018 Summary

In 2018, gross consumption stood at close to 478TWh, i.e. -0.8% compared with the previous year. This decline is due to generally milder temperatures, particularly at the beginning and end of the year, lower economic growth than in 2017 and labour movements in rail transport in spring. Electricity consumption reached a peak of 96.6GW on 28 February 2018 at 7pm when the late cold spell hit France. This represents the third highest consumption peak ever recorded in France.

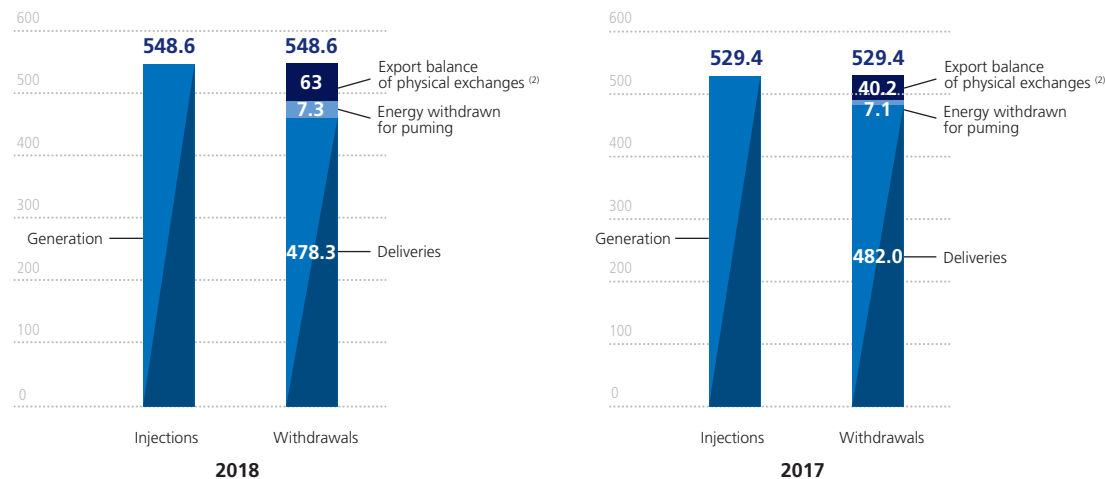
Excluding the energy sector, consumption adjusted for climatic variations and calendar effects reached 474TWh in 2018, stable compared with 2017 (-0.3%). The main structural factors behind this stabilisation are lower economic growth than in 2017 and the effects of consumption management.

Consumption of major industrial customers directly connected to the public transmission network amounts to 66.2TWh. This represented a fall in volume of 1.8% compared with 2017, mainly due to major labour movements in the rail transport sector and the incident which occurred at the site of an industrial customer in the metal sector.

Equivalent outage time is an indicator used to measure the quality of supply of electricity by RTE. RTE's indicators on supply continuity in 2018 are still provisional. Based on information available to date, the equivalent outage time is 2 min 59 sec <sup>(1)</sup> for the equivalent outage time (the target set by the CRE is 2 min 48 s) and 0.42 for outage frequency (the target set by the CRE is 0.46).

#### → Simplified energy flows on the RTE network <sup>(1)</sup>

In TWh



<sup>(1)</sup> 2018 provisional data (the final data on the electricity generation for 2018 will be available on RTE's website in July 2019: [www.rte-france.com](http://www.rte-france.com)).

<sup>(2)</sup> Including water right and exchanges via distribution network.

#### Renewable energies continue to grow in order to foster the energy transition

At 31 December 2018, the installed wind turbine capacity amounted to 15,108MW. This is an increase of 11.2% compared with 2017. Wind power generation stood at 27.8TWh in 2018, up 15.3% compared with 2017. This increase is due not only to the increase in installed net capacity but also to particularly favourable weather conditions in 2018.

With 873MW of new solar capacity connected in mainland France, installed solar capacity reached 8,527MW at 31 December 2018. This represented an increase of 11.4% compared with 2017. Solar power generation, which stood at 10.2TWh in 2018, is up 11.3% compared with 2017, boosted by both the increase in installed capacity and favourable weather conditions.

#### France is again the largest exporter in Europe

The French balance of trade amounted to 60.2TWh in 2018, an increase compared with the previous two years. The import volume is 26.1TWh, and export volume 86.3TWh. France is again the largest exporter in Europe.

The position of cross-border contractual exchanges in 2018 is as follows:

- Spain: the trade balance with Spain remains in large surplus with 12TWh. However, it fell slightly compared with the previous year, due in particular to better hydropower output in the Iberian Peninsula;
- Central and Western Europe (Germany and Belgium): although the balance showed a deficit the last two years, the trend is reversed in 2018 with a surplus balance of 6.1TWh. This was due in particular to better availability of the French

<sup>(1)</sup> The value of the equivalent outage time for 2018 can change after the publication of this document following the classification of certain incidents at the end of the year as exceptional events.



nuclear fleet, abundant French hydropower output as well as several outages of Belgian nuclear plants at the end of the year;

- Italy: the trade balance with Italy is significantly in surplus. It is up with 18.5TWh. Interconnection is primarily requested in the direction of export with only 330 import hourly periods (i.e. less than 4% of the time) compared with 452 in 2017;
- Switzerland: the balance of trade with Switzerland is increasing and stands at 10.6TWh. July is the only deficit month, with trade usually more balanced in summer (when Swiss hydropower output is higher);
- United Kingdom: the balance of trade with the United Kingdom is a surplus at 13TWh, up compared with 2017, in spite of trading capacity limited at 1,500MW between 9 March and 5 May due to a partial outage of the IFA Interconnector following a cable incident.

#### 1.4.4.1.2.2 Maintenance of the transmission infrastructure

RTE manages the assets of the transmission network through maintenance, refurbishment and replacement of structures and emergency repairs.

Implementation of a mechanical safety programme in response to extreme weather events to make the electricity grid more robust and more resilient was completed at the end of 2017, in accordance with the commitments made with the relevant Ministry following the storms of 1999. This programme cost close to €2.8 billion. The low impact of these latest storms proves the programme's effectiveness, especially regarding the role played by anti-cascading safety towers. At the end of 2017, 100% of target connections were automatically secured. Since 2018, RTE has ensured the continued existence of this secure network.

#### 1.4.4.1.2.3 Development and completion of new capital investments

In a context where energy transition is changing the fundamentals of the French electricity system, RTE is upgrading its activities to prepare for and support these major transformations: consumption growth is no longer the sole driver of RTE's investments which are more open to renewable energies while interconnections are increasing. RTE is also developing new solutions to make network management more flexible using digital technologies, storage and new practices.

RTE draws up an annual investment programme that is submitted to the CRE. In 2018, RTE's total investments within the scope regulated by the CRE stood at €1,447 million. The principal investments concerned: construction work of the direct current line between France and Italy passing through the Fréjus safety tunnel; the continuation of construction work on "IFA 2", the new direct current line between France and the UK; the commissioning of the "Cergy-Persan" project which consists of improving safety of North-West Paris and the mobility projects of Greater Paris by replacing the current grid of 225,000 volts by a 400,000 volts technology; and the launch of connection works at the offshore wind farm of Saint-Nazaire.

Out of a concern to best optimise the existing assets and to limit the impact of its construction works in the regions as much as possible, RTE dedicates approximately two thirds of its capital investments to the adaptation of existing structures.

RTE's 2019 investment programme approved by the regulator amounts to €1,642 million. The 2019 investment programme concerns the continuation of significant investment in developing and renewing the network, as well as developing and renewing IT systems, in particular in light of the changing environment associated with energy transition and European market integration. For example, it is to be noted that following the renegotiation of the contracts of tenders for offshore wind farms between the winners and the State in summer 2018, expenses for connecting these projects to the electricity grid are now borne by RTE.

In 2018, the Regulated Assets Base (RAB) increased by €194 million, up from €14,119 million as at January 1<sup>st</sup> 2018 to €14,313 million as at January 1<sup>st</sup> 2019 <sup>(1)</sup>. As a reminder, RAB is remunerated by the tariff at the weighted average cost of capital of 6.125% before tax on the TURPE 5. It represents RTE's industrial assets, net of investment subsidies, and is calculated excluding property, plant and equipment in progress (which until the end of 2012 were remunerated at 4.8% by the TURPE 3 tariff, then at 4.6% for the period from 2013 to 2016 in accordance with the CRE's pricing decision of April 2013, and which has been remunerated at 3.7% since 2017 in accordance with the TURPE 5 decision of 17 November 2016).

#### 1.4.4.1.2.4 Operation of the electricity system

##### Management of the electricity system

RTE manages the flows on the transmission network in real time, and makes use of the resources available to it through the adjustment mechanism to ensure the balance between supply and demand in real time. The cost corresponding to the adjustments made by RTE and due to the negative differences between the projected flows and those already realised is passed on to the "Balance responsible entities" (producers, traders, suppliers, etc.) in proportion to their difference. In the case of a positive difference, RTE compensates the balance responsible entities financially.

##### Management of the interconnections

RTE manages access to international interconnections in collaboration with the neighbouring European transmission network operators. These interconnections ensure the transmission of energy from one country to another, the operating safety of the electricity transmission networks and the development of the European electricity market. They ensure that an electricity supplier can sell its energy to a customer in another European Union country, by taking advantage of the differences in the timing of peak load on either side of the border, and can better pool the means of generation at the European level.

##### Network coordination in Europe

In December 2008, RTE and Elia <sup>(2)</sup> created a common company named Coreso, which aims to coordinate the operation of electricity networks comprising France and Belgium. The creation of Coreso fulfils the need of reinforcing the operational coordination between transmission network operators (TNO) expressed both by the European Commission and by the players of the electricity market. Coreso must allow better integration at the regional level of generation from renewable sources and guarantee secure management of rising cross-border flows.

RTE and Elia were then gradually joined by grid operators in Western Europe: National Grid (UK), Terna (Italy), 50 Hertz (North-East Germany), REN (Portugal), REE (Spain) and recently Eirgrid and SONI (Ireland).

#### 1.4.4.2 Distribution – Enedis

Enedis' main objective is to operate and develop the public electricity distribution network, guaranteeing its security and safety, and overseeing the balance of electricity flows at all times. Enedis has been operational since 1 January 2008. Initially called ERDF, it changed its name to Enedis on 1 June 2016. Enedis services around 95% of the population in mainland France. The remaining 5% are provided by Local Distribution Companies (LDCs).

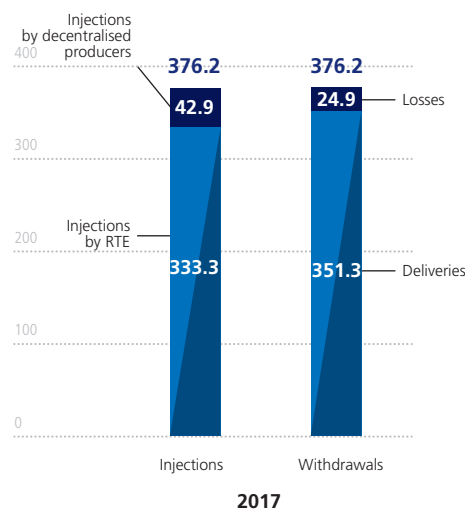
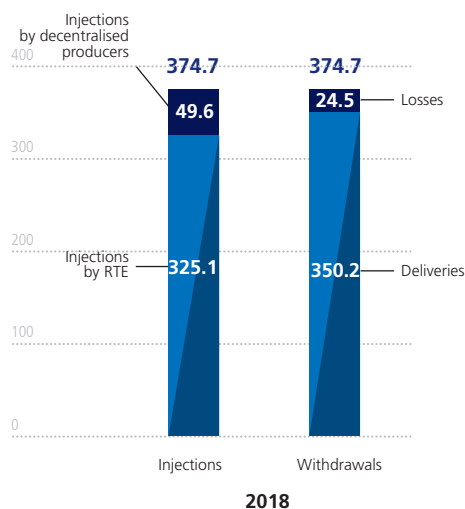
In 2018, Enedis distributed electricity to more than 36.5 million customers (points of delivery) and provided for the injection from 410,000 production sites in mainland France, thanks to a network of around 1.4 million kilometres.

At 31 December 2018, Enedis employed 38,691 people.

(1) Amounts still to be confirmed by the CRE, calculated on the basis of what has been realised.

(2) Elia is the Belgian electricity transmission network operator for high voltage (from 30,000 to 380,000 Volts).

### → Electricity volumes on the Enedis network In TWh



Electrical losses are inherent to the functioning of the distribution network and mainly result from physical effects which are directly dependent on the amount of electricity delivered. Enedis must compensate these losses to complete the amount of energy delivered to the final customers. The volume of losses in 2018 stood at 24.5TWh (see Electricity report above), i.e. a rate of 6.3% <sup>(1)</sup>. Losses recognised in the accounts, including restatements of prior financial years amount to €1,100 million. To compensate these losses, Enedis buys the corresponding electricity from the wholesale market, either through organised market platforms, or through calls for tender open to around 20 qualified suppliers.

Technical specifications: the distribution network for which Enedis is the concession holder (see section 1.4.4.2.2 "Distribution activities") is, at 31 December 2018, made up of around:

- 644,901 kilometres of A-type high-voltage (HVA) lines of 20,000 volts;
- 721,000 kilometres of low-voltage (LV) lines of 400 volts;
- 2,242 HVB/HVA source substations;
- 787,492 HVA/LV transformer stations.

#### 1.4.4.2.1 Organisation of Enedis

Distribution activities on French soil are, pursuant to the legal framework, almost exclusively conducted by Enedis, a French public limited company (*société anonyme*) with an Executive Board and a Supervisory Board responsible for the management of the public electricity distribution network.

Pursuant to Directive no. 2003/54/EC, the principles of which are applied in Directive no. 2009/72/EC of 13 July 2009, when the public distribution network operator is part of a vertically integrated company, its organisation and decision-making must be legally independent from other activities not related to distribution. Within this framework, the principle adopted by EDF and Gaz de

France, now Engie, led them to spin out their distribution network. Enedis and GRDF share a "common service" pursuant to the legal framework (see section 1.4.4.2.3 "Service shared by Enedis and GRDF").

Pursuant to the Law of 9 August 2004, the business of public electricity distribution network operator was turned into a subsidiary in 2007.

The Supervisory Board of Enedis comprises fifteen members, of which eight are appointed by the Ordinary Shareholders' Meeting, five are representatives of the employees elected in accordance with the conditions set out in Law no. 83-675 dated 26 July 1983 relating to the democratisation of the public sector, one member is appointed by the French State by virtue of Articles 4 or 6 of Ordinance no. 2014-948 dated 20 August 2014, and one, representing the organising authorities for the public electricity distribution network, is appointed by decree in application of Article 153 of Law no. 2015-992 relating to energy transition for green growth. In 2017, the Enedis Executive Board was made up of five members who performed their work under the supervision of the Supervisory Board. With effect from 11 January 2018, a new Enedis Executive Board was set up and is composed of two members.

In application of the possibility offered by Ordinance no. 2014-948 dated 20 August 2014 (Article 15) and in compliance with Decree no. 2015-38 dated 19 January 2015, the French State appointed by a Decree dated 4 February 2015 a Government Commissioner for the purposes of attending the meetings of the Supervisory Board of Enedis. A new Government Commissioner was appointed by Decree on 25 October 2018.

On 1 June 2016, the business name of the public distribution network operator was changed to Enedis, as a replacement for ERDF. This new name reflects the company's strong commitment to the energy transition in the wake of COP 21. It will also raise the profile of the network operator and clarify its purpose, as the CRE recommended.

(1) This rate is now calculated as a ratio of losses for the year to gross inflows before deducting backflows to the transmission network.

## Enedis' missions in France

Enedis, pursuant to the conditions set by law and the concession contracts signed with each of the public electricity distribution contracting authorities (see section 1.4.4.2.2 "Distribution activities"), performs its missions as the public distribution network operator in mainland France.

These missions are:

- define and implement operational, investment and development policies in relation to the electricity distribution network;
- provide connection and access for users to these networks under objective, transparent and non-discriminatory conditions, as well as inter-connection with other networks;
- provide users with the information needed to access the network efficiently (information protected by regulations or law excepted);
- oversee relations with the energy regulation authorities (Ministry of Energy, the Energy Regulation Commission (CRE), public distribution contracting authorities) in line with its activities;
- oversee relations with local authorities;
- negotiate, conclude and manage concession contracts;
- operate, maintain and repair the electricity distribution networks;
- design and build infrastructure, as well as manage work on the networks;
- carry out metering activities for users connected to the networks, particularly as regards supply, installation, meter inspection, maintenance and renewal of metering devices, as well as managing data activities and any other missions relating to its work as a whole;

- implement energy efficiency actions and promote the insertion of renewable energies onto the network;
- ensure the monitoring of the load sharing perimeters;
- be the guarantor for the distribution and accounting for the energy flows between the network user players, and the fair compensation of losses on these networks;
- provide services for the LDCs, distributors and organising authorities mentioned respectively in sections III and IV of Article L. 2 224-31 of the French Local Authorities Code.

### 1.4.4.2.2 Distribution activities

Enedis' business is based on a number of activities: manage, in its capacity as the concession holder, the assets under concession; run and maintain the network in such a way as to ensure the continuity of supply; carry out work on the network (in particular, network connection, reinforcement and renewal work); provide access to the network to all users in the framework of contractual provisions in force; and manage the meter fleet, as well as obtaining, processing and transmitting data on network user consumption.

### Change in investments

In 2018, Enedis invested €3,998 million, of which €1,464 million were mainly devoted to connections for new customers and producers, as well as to the reinforcement of the network. In addition, the contracting authorities invested €705 million in 2018. In all, almost €4.7 billion were invested on the distribution networks in 2018 in mainland France.

## GROSS INVESTMENTS MADE BY ENEDIS

(in millions of euros)

	2018	2017
Connections and reinforcement	1,464	1,411
Regulatory, safety and transmission channel obligations	415	402
Work instruments and operational resources	347	363
Network modernisation <sup>(1)</sup>	1,772	1,591
<b>TOTAL INVESTMENTS OF ENEDIS</b>	<b>3,998</b>	<b>3,767</b>
<b>WORK ALLOWANCES BY THIRD PARTIES AND LOCAL AUTHORITIES <sup>(2)</sup></b>	<b>705</b>	<b>721</b>
<b>TOTAL NETWORK INVESTMENTS</b>	<b>4,703</b>	<b>4,488</b>

(1) Of which Linky: €792 million in 2018 and €612 million in 2017 (generalisation costs and those related to post experimentation).

(2) After deducting PCT<sup>(a)</sup> and Article 8<sup>(b)</sup>

(a) PCT (portion covered by the tariff): portion paid to project manager contractors from the contributions to the delivery tariff for financing a connection.

(b) Article 8 of Annex 1 of the concession specifications relating to the integration of works into the environment (for example, the work to bury lines).

The additional resources thereby committed are dedicated to the quality of the service, to securing the networks, to the security and preservation of the environment, areas where the identified expectations of customers, local authorities and concession authorities are particularly strong.

This level of investment allows Enedis to carry out asset renewal programmes.

To complement these investments, Enedis continues its efforts in the preventative maintenance of networks, including work relating to tree topping. This came to €325 million in 2018 (compared to €327 million in 2017).

## Quality of service

Quality of service is one of Enedis' main objectives. In 2018, the average outage time, excluding transmission incidents and exceptional incidents, was 64 minutes, which is a good result for a year marked by frequent and sharp climate variations. The quality of service provided is also reflected by maintaining steady voltage levels, kept as close as possible to the level set by regulations, and by minimising the number of outages.

To respond to large-scale incidents, Enedis relies on an Electricity Rapid Intervention Force (FIRE), which allows it to mobilise, at any time, in an affected region, the teams and resources from other regions in order to restore customers' electricity as rapidly as possible. In 2018, FIRE was deployed on five occasions: Eleanor storm of

4 January which hit the North of France, floods in mid-January and early February which affected Ile-de-France, thunder of 4 July which impacted the South-West of France and heatwaves between end-July and mid-August in Ile-de-France and part of the South of France, and sticking snow on 29 and 30 October. As regards insurance cover for the protection of the overhead distribution network against the effects of large scale storms, see section 2.5.5.3 "Storm cover".

## Development of renewable energies

Across the Enedis scope, the number of solar panel generation installations connected to the network grew again: in 2018, an upswing in photovoltaic connections was observed with 825MW of new photovoltaic facilities connected (compared with 755MW at the end of 2017). The increase in wind power generation connected to the public distribution network also continued, with 1,360MW connected in 2018 (compared to 1,300MW in 2017).

At the end of 2018, a total of around 20.4GW in photovoltaic and wind power generation was connected to the Enedis grid, made up of 7.4GW from photovoltaic plants and 13GW from wind power generation. To the power thus generated are added other sources of power generation, in particular "historical" hydropower plants (1.5GW), cogeneration (2.5GW), biogas, biomass and dispatchable fossil-fuel thermal. In all, at the end of 2018, the generation fleet connected to Enedis was around 26.3GW.

In 2018, more than 19,200 photovoltaic self-consumption facilities were also connected, representing close to 80% of the year's connections for small producers.

In addition, Enedis has continued its efforts to develop capacities for accepting renewable energies, by implementing construction work on sources as part of the regulatory framework in the regional plans for the grid connection of renewable energies.

### Electricity market

The French electricity sales market has been open to competition for all customers since 1 July 2007.

65 electricity suppliers, operating on the French market, have a contract with Enedis. This contract establishes the terms and conditions for the supplier and the distributor in the event that a customer subscribes to a single contract covering the supply and delivery of electricity.

The supply market is facing sharply increased levels of competition, for subscribed power supply greater than 36kVA, since the elimination of regulated sales tariffs at the end of 2016, as well as for subscribed power supply below 36kVA. Over a hundred new third-party players likely to use data on customer consumption with the latter's authorisation contribute to the market's dynamism.

### Concessions

At 31 December 2018, Enedis and EDF were co-concession holders of 475 concessions contracts, covering around 95% of the population. The concession contracts are generally concluded for a period of 20 to 30 years.

In France, public electricity distribution is operated under a concession plan that derogates from common law on local public service concessions. Enedis is thus designated by the law (Article L. 121-4 of the French Energy Code) to carry out the development and operation of the public distribution networks (rational service of French territory by public distribution networks, connection and access in accordance with non-discriminatory conditions to the public distribution networks). The company carries out this role over the majority of French territory, with the exception of the zones which are not interconnected to mainland France, in which this same role is the responsibility of EDF, and of the exclusive service zone of the LDCs (Local Distribution Companies).

On 21 December 2017, FNCCR, France Urbaine, EDF and Enedis signed a framework agreement based on a new concession agreement model. Twenty-five years after the 1992 agreement with FNCCR, this new framework agreement includes France Urbaine which represents municipalities, large urban inter-municipalities and cities of which the majority of the members have contracting authority status for the public distribution of electricity. The new standard agreement endorsed by this agreement restates the principles of the French concession model: public service, regional solidarity and national optimisation, while at the same time taking into account issues involving energy transition. The official introduction of this new model opens the way to a modernised and lasting relationship between Enedis and the concession contracting authorities. Since 2018, concession contract renewals have been finalised and new negotiations engaged with a view to renewing all current contracts before the end of 2021. At 31 December 2018, close to 60 concession contracts had thus been renewed on the basis of the new model. Moreover, some sixty concession contracting authorities have already undertaken to renew their contract on this basis by 2021 at the latest.

Pursuant to Article L. 334-3 of the French Energy Code, concession contracts entered into or amended since the creation of Enedis (under its previous name ERDF), are jointly signed by the contracting authority (local authority or public cooperation institution), by EDF (or territorially competent LDC) for the "regulated tariff supply" portion, and by Enedis (or territorially competent LDC) for the "distribution network" portion. The other current concession contracts are deemed to have been signed in accordance with the same principles.

Within the limits fixed by the law and by the jurisprudence, the contracting authorities are the owners of the distribution networks which constitute returnable assets.<sup>(1)</sup>

See also sections 1.4.2.2.5 "Public electricity distribution concessions at regulated tariffs" and 1.5.6.2.7 "Regulations applicable to public procurements".

### 1.4.4.2.3 Service shared by Enedis and GRDF

The service shared by Enedis and GRDF, defined by Article L. 111-71 of the French Energy Code, sets out, in the electricity and gas distribution sector, to build installations, manage works projects, operate and provide maintenance for the networks, and conduct metering operations. It does not have the status of a legal entity.

Enedis and GRDF are related through an agreement that sets out their relations in the framework of this common service, the scope of said service and the sharing of costs resulting from it. Concluded for an open-ended period, it can be revoked at any time, provided a prior notice of 18 months is given, during which the parties commit to renegotiating. It is updated regularly.

In July 2014, Enedis and GRDF signed a joint communiqué taking note of the scheduled phasing out of the joint activities of meter reading and interventions on meter panels. To date, Enedis has favoured an organisation through the regional directorates integrating all its operational missions at the local level. A more detailed fabric is reserved for local activities.

In March 2018, Enedis and GRDF decided on the creation of two mixed entities: UONRH-MS which encompasses employment contracts, studies and medical and social matters; and OIT, the IT and Telecoms Operator which encompasses all telephony and office automation activities. The creation of these two mixed entities takes effect on 1 January 2019.

For Enedis, the other support activities (Vehicles & Machines, Disputes and Insurance, Training and Recruitment, and Purchase of services) are grouped under a Support Services Department.

### 1.4.4.2.4 Future challenges

#### Smart grids and smart meters (Linky)

Enedis, guarantor of the electricity distribution public service, invests at all times to develop, modernise and secure the electrical network. The adaptation of the electricity grid to the new needs of society is a major strategic challenge. To achieve this, Enedis has started the industrial deployment of the Linky system, based on a new generation of meters, called "smart meters" that can receive orders and send data without the physical involvement of a technician. This system represents the first stage of smart grid implementation or "Smart networks". It involves equipping the distribution network with connected objects, including the Linky meters, in order to integrate renewable energy electricity generation, which has undergone a significant expansion, further ensuring the balance between generation and consumption at all points of the electricity grid, and enabling suppliers to offer new energy solutions to their customers. In 2018, the latter put in place new contractual offers made possible with the introduction of Linky on a large scale (differentiated and lower tariffs, for example for the use of "green" electricity generated through photovoltaic panels). With Linky, electricity consumption curves per day, per week or per month are available to customers. This facilitates the management of energy consumption and is a concrete lever that meets the expectations of the public authorities responsible for energy transition.

Following a successful experiment, approved by the French government, on 1 December 2015, Enedis launched the first phase of the generalised deployment of the Linky meters, which represents a total investment of €4,045 million<sup>(2)</sup> over the period 2014-2021.

(1) Returnable assets are those that must imperatively be returned to the granting authority at the end of the concession. Such property is deemed to belong to this local authority from the outset. They are defined by the concession contract or even by the law. By default, generally qualified as such are the assets that are indispensable to the performance of the concession service.

(2) The programme completion costs were reviewed downward, from €4,455 to 4,045 million for the period 2014-2021, after taking into account prices of the latest contracts signed for equipment (meters and concentrators) and for installation services.

At the end of 2018, the cumulative investment (2014-2018) already carried out amounted to €1,911 million, for 15.6 million Linky meters installed (including those used in the experiment), of which over 13.7 million open to all services.

See also section 1.5.3.2 "French legislation: the Energy Code".

### **Foster energy transition**

Concurrently, Enedis is conducting large scale testing of a number of solutions to provide a greatly modernised network to consumers and companies. This work covers the operation of low- and medium-voltage networks, the integration of renewable energies and electric vehicles, storage management, voltage stability, etc. The challenge for the distributor is to support energy transition while developing the networks at the lowest cost for society. Thanks to new technologies, a more detailed and responsive oversight is possible, based on a better understanding of consumption, generation and the state of the network. This "intelligence" makes it possible to avoid over-investment by adjusting it to consumption peaks, while guaranteeing the reliability of the network, pursuant to Enedis' double public service objective of performance and security.

The projects already completed have yielded results in areas such as innovation for the network, flexibility and the integration of renewable energies. In 2017, Enedis also proposed technical solutions for individual and collective self-consumption tested under real conditions in multi-family housing and commercial buildings, storage, data management and economic models.

### **Industrialising technical solutions**

Enedis has continued the industrialisation of cutting-edge solutions in smart grids for the implementation of a "foundation network" by 2018. This concerns all the components of the network with digital technologies in the source control stations (PCCNs, or Digital Command and Control Stations, which provide central management of the network's transmission automation and FARs, or Functions for Automation of the Network, which facilitate management of the insertion of electricity from renewable sources), the distribution stations (HVA/LV Smart stations), the sensors on the network and all the information system tools (forecast, management, planning management, Linky network, etc.).

In 2019, Enedis will continue with the modernisation of the network, in order to facilitate the insertion of renewable energies and to assist all players in the electricity system.

### **Carry out the digital switch-over and the management of the data**

The digital programme undertaken by Enedis since 2014 has come to an end. Based on four vectors: infrastructure management (remote management, predictive management, etc.), dialogue with outside parties, management of data from electricity meters and sensors, and social and cultural transformation of the company, which is providing its employees with new tools connected to the Information Systems in order to deliver better services to customers. Enedis has organised itself to process, exploit and accumulate the collected data and provide it to the various players in the electricity system (suppliers, transmission network operators, local authorities, new entrants) in compliance with the confidentiality and security regulations.

### **Acting for the "cities of the future" or "smart cities", all local communities and citizens.**

Self-consumption, self-supply, electric mobility, smart meters, data management and the optimisation in real time of networks - these are the new challenges facing

electricity distributors in relation to regions as a whole, and especially cities. This has now become a reality.

Enedis is promoting the emergence of DSOs (distribution system operators), facilitators of energy transition for all uses at every level, including local (cities, neighbourhoods, etc), not only in terms of the networks but also the associated data, necessary for regional players and cities aiming to become smart cities.

The Open Innovation policy developed by Enedis has become particularly popular in local communities which have organised many energy, technological and environmental initiatives, and rely on a number of startups. Enedis "enriches" these projects and developments with its own research and innovation, especially in the fields of smart grids and data. In 2018, Enedis also included in its strategic development plan the goal of becoming a key industrial partner for all electric mobility players in order to jointly develop solutions to support its development on a large scale.

All charging stations will be directly or indirectly connected to the distribution network developed and operated by Enedis. All players are counting on Enedis' contribution to the collective challenge of electric mobility, in particular regional authorities and industrial operators which are Enedis' partners on a daily basis.

### **Focus on international expansion**

In the field of smart grids, Enedis has gone from a simple concept to demonstrators, then to industrialisation with a high level of maturity in just a few short years. In addition to the smart meters being deployed, the objective is a large-scale deployment of smart grid solutions on the networks in major geographic regions. Belgium, Egypt, Indonesia and India have selected solutions proposed by Enedis and its expertise.

Enedis has structured the French industrial sector for smart electricity grids with other French players in this sector through the "Thinksmartgrids" association which now numbers around one hundred members (major industrial players, start-ups, universities, research institutes, etc.).

The goal of the French smart grids team is to maintain its leadership in Europe and to expand in the rest of the world.

#### **1.4.4.3 Island Energy Systems**

Island Energy Systems (IES) brings together the electricity systems operated by EDF which are not interconnected, or only slightly connected, to the mainland: Corsica, the overseas departments (except Mayotte) and the overseas territories of Saint-Barthélemy, Saint-Martin and Saint-Pierre-et-Miquelon, as well as several Ponant islands (Sein, Ouessant, Molène).

EDF's organisation in these regions is based on two structures:

- the Island Energy Systems Department, ensuring the supply and demand balance on a daily basis, overseeing all networks and providing a sales and marketing activity without competition, guided by an active energy efficiency policy
- the subsidiary EDF Production Electrique Insulaire, which is responsible for building and operating new means of generation.

The additional generation costs in these territories compared with equivalent costs on the mainland, which the legislator considers as a public service expense, are offset by the state budget (see section 1.5.2 "Public service in France").

Tariffs for Using the Public Transmission and Distribution Networks (TURPE) apply to users connected to the distribution networks (See also section 1.5.3.2 "French legislation: the Energy Code").



### IES KEY ELEMENTS IN 2018

	Data at end-2018	
	Total	of which Corsica
Headcount <sup>(1)</sup>	3,457	762
Number of customers	1,166,994	259,914
Network length (in km)	37,348	11,951
Net installed capacity of the EDF fleet (in MW)	2,058	574
of which hydropower fleet and other renewable energy sources	437	204
of which thermal fleet <sup>(1)</sup>	1,621	369
Output <sup>(1)</sup> (in GWh)	5,928	1,388
of which hydropower output	1,682	569
Purchases of energy from third parties (in GWh)	3,762	894
of which renewable energies, including bagasse	1,377	278
of which other energies	2,385	615
<b>TOTAL ENERGY GENERATED BY EDF AND PURCHASED FROM THIRD PARTIES</b>	<b>9,690</b>	<b>2,281</b>

(1) Data including EDF Production Électrique Insulaire (PEI), a wholly-owned subsidiary of the EDF group, which is in charge of renewing the thermal power plants in Corsica and overseas departments. Thermal installed capacity remained stable between 2017 and 2018.

In view of the difference within these systems between the megawatt-hour generation costs and the sale price at the equalised tariff, EDF is applying demand-side management (DSM) strategies in these territories together with institutional players such as government departments, municipalities, the French Agency for Environment and Energy Management (ADEME), and local institutions.

### Changes and outlook

#### Investments to modernise and reinforce the electricity generation fleet with guaranteed capacity

In accordance with the territorial PPEs, the EDF group has undertaken to replace the main power plants which are at the end of their useful lives. The new power plants will be constructed and operated by the EDF subsidiary PEI (*Production Électrique Insulaire*).

The construction sites for four diesel power plants were completed successfully between 2012 and 2015, for a total net capacity of close to 746MW: Port-Est in La Réunion, Bellefontaine B in Martinique, Pointe-Jarry in Guadeloupe and Luciana B in Haute-Corse. These new generation resources, equipped with innovative technologies, allow the Group to deliver better industrial and environmental results and contribute to satisfying a part of the emerging electricity demands in these regions. Two more plants are in the works in Corsica and French Guyana.

The extension of the Saint-Barthélemy power plant (two new generators of 16MW) and the renewal of the power plant on Saint-Pierre-et-Miquelon (21MW) have respectively been operational since 2014 and 2015.

The Saint-Martin power plant was delivered in end June 2016 for an installed capacity of 40MW.

In total, EDF invested €92 million in IES electricity generation in 2018.

#### Investments in electricity networks

The continued growth in consumption in these regions despite the energy efficiency actions undertaken, as well as the development of renewable energies and the growing number of generation facilities coming online, have led the EDF group to continue the reinforcement of the electricity networks.

EDF thus invested €201 million in networks in 2018.

#### A commitment to projects devoted to a better integration of renewable energies in the electricity generation mix and to optimising the management of electrical systems

The energy transition Law stipulates that France's overseas territories must be energy self-sufficient by 2030 (for Corsica, the deadline is 2050).

The EDF group supports the emergence and development of electricity generation methods based on renewable energies adapted to IES. The methods favoured are those that provide abundant and guaranteed energy at competitive generation costs, but also sustainable in the long term, in such a way as to position them as credible alternatives to thermal generation: biomass, marine and river energies, waste recovery, biogas.

EDF also contributes to making advances in technical capacities relating to the insertion of intermittent renewable energies into IES by suggesting improvements to their technical specifications, making the grid more resistant to power disruptions, and developing smart metering systems. EDF is also spearheading three 5MW battery projects, intended as a means of offsetting supply/demand fluctuations, out of a series of power storage projects selected by the CRE in 2018.

Work is also ongoing to create micro-networks 100% powered by renewable energies in certain isolated zones. In 2017, an innovative system combining photovoltaic, digital monitoring and storage was installed on the island of Sein off the coast of NW France, allowing for a 100% renewable electrical supply several hours each day, while part of Mafate on the island of Réunion receives solar power and is equipped with a battery and a hydrogen fuel cell. Several other projects are planned, especially for remote communes in the interior of Guiana (Maripasoula, Papaïchthon, Saint Georges de l'Oyapock).

Energy efficiency is a crucial energy transition lever in the island systems. EDF contributes to the elaboration and implementation of the demand side management (DSM) territorial strategy, one of the main tools of which are public grants for equipment (€600 million validated by the CRE for 2019-2023). EDF actively promotes DSM operations financed by these grants for all types of customers, particularly through the Agir Plus label.

EDF has committed to deploy 1.2 million digital meters in the overseas departments (excluding Mayotte) and Corsica by end-2023. This represents an investment of €268 million. These digital meters will introduce much more modern customer relations and amplify the energy transition levers. At end-2018, over 115,000 meters were installed.

#### Reconstruction phase after the extreme weather events of 2017

Hurricane Irma struck the islands of Saint-Martin and Saint-Barthélemy on 6 September 2017. The means of generation were relatively spared. Reconstruction of the electricity grids began in 2018. This work should improve the resilience of the grids and structures to extreme weather events.

In addition, the deployment of digital meters on both islands will maximise efforts to manage the demand for energy and insert renewable energies onto the network.

#### 1.4.4.4 Électricité de Strasbourg

Électricité de Strasbourg (ÉS) is an Alsatian energy producer which is committed to the long-term energy and economic performance of its territory via its four activities: the distribution of electricity, supply of energies, energy services and the production of renewable energies. This portfolio of activities makes it possible for the ÉS group to better provide support to its customers in the energy transition.

ÉS also provides services to Local Distribution Companies (*Entreprises Locales de Distribution*, or LDCs) in eastern France.

The ÉS group is 88.64% owned by EDF, and the remaining shares are owned by the public and its employees. Its shares are traded on Euronext Paris.

#### 1.4.4.4.1 Distribution

Strasbourg Electricité Réseaux is responsible for public electricity distribution network management. Strasbourg Electricité Réseaux operates, maintains, develops and renews an electricity network of over 14,000 kilometres in the 400 Alsatian municipalities that chose ESR to operate their electricity distribution grids under concession agreement. These concession agreements were renewed between 1993 and 2001 for a term of 40 years. The territory serviced covers three quarters of the Bas-Rhin department and includes more than 520,000 points of delivery for low and high-voltage (A and B) power, as well as connections with the Enedis network and two other downstream network operators.

In order to comply with recent developments in the French Energy Code, ÉS engaged in a process to create subsidiaries for its distribution activities at May 1st 2017.

#### 1.4.4.4.2 Sales and marketing

ÉS Énergies Strasbourg is the sales and marketing subsidiary of the ÉS group.

At end-2018, ÉS Énergies Strasbourg supplied power to more than 545,000 electricity customers (including renewable), and 113,000 gas customers, to both residential and business customers (services and industrial sectors) or to local authorities.

In addition to supplying electricity and gas, ÉS Énergies Strasbourg offers related services such as electricity, gas and plumbing corrective maintenance and digital services designed to help customers better understand their electricity bill and better manage their consumption. Separately, for its residential customers, ÉS Énergies Strasbourg has continued the implementation of support services in renovation and construction of the home, via a portal enabling customers to be in direct contact with a network of local partners.

Following the end of the regulated sales tariffs for over 36 kVA in electricity and over 30MWh in gas, ÉS sells 50% of its electricity volumes and 75% of its gas volumes based on the market offering. Competitive offers and its strong local base have enabled ÉS to retain a significant market share.

#### 1.4.4.4.3 Energy services

ÉS Services Énergétiques was born out of the association between Écotral, the energy services subsidiary of ÉS, and Dalkia Bas-Rhin, on 1 January 2016.

The entity produces and operates energy services installations intended for local governments, homes, healthcare, the tertiary sector and industry.

For example, ÉS Services Énergétiques operates and maintains the Strasbourg biomass electricity power plant in Port du Rhin, produces, operates and maintains thermal plants in the new Saint Urbain development zone, and is entrusted with the lighting of the church of Saint Thomas, a historical building in Strasbourg listed as a World Heritage site by UNESCO.

In 2018, the Strasbourg city centre heating network was renovated and extended in order to improve safety and supply new areas.

#### 1.4.4.4.4 Renewable energy generation

##### Deep geothermal energy

The ÉS group is one of the leading players in deep geothermal energy in France. It holds a 40% equity stake in the ECOGI (Exploitation of geothermal heat for industry) project, which built, in partnership with the Roquette company and the Caisse des Dépôts, the first deep geothermal energy power plant for industrial use at Rittershoffen, with the support of the ADEME, the Grand-Est Region and SAF-Environnement. This power plant has been producing 24MW of thermal renewable superheated water using a geothermal resource located at a depth of more than 2,500 metres since September 2016.

ÉS has also transformed, with its partner EnBW, the deep geothermal energy research site at Soultz-sous-Forêts into an industrial installation for the production of electricity. This geothermal power plant has been producing 1.7MW of electricity since July 2016.

In 2017, ÉS launched the Illkirch Graffenstaden geothermal project, designed to supply power to the future heating network which will supply the innovation park and surrounding areas. This project is being carried out by the wholly-owned subsidiary, ÉS Illkirch Géothermie. The investment amounts to €37 million. This power plant with a thermal input of 26MW is a cogeneration plant (heat and electricity generation). The first borehole was drilled in December 2018. The second is planned for early 2019 with the plant scheduled to come into service in 2020.

Between June and August 2018, ÉS mapped out a 3D model of the subsoil in northern Alsace over an area of 200km<sup>2</sup>, the largest such mapping in France. The model will help identify the best places to build future plants.

#### Biomass

In the area of biomass, the ÉS group commissioned at the end of 2016, through its majority ownership in the ÉS Biomasse company, a biomass cogeneration plant. This power plant produces 70GWh of electricity from renewable sources and 112GWh of heat from renewable sources per year, which feed two of the three principal heat networks for the city of Strasbourg.

### 1.4.5 INTERNATIONAL ACTIVITIES

#### 1.4.5.1 United Kingdom

EDF group activity in the United Kingdom (UK) is led by EDF Energy and EDF Trading (see 1.4.6.3 "Optimisation and Trading: EDF Trading").

The Group is also active in oil and gas exploration and production in the North Sea via Edison (see sections 1.4.5.2.3.2 "Hydrocarbon business" and 1.4.6.2.2.3 "Exploration and Production") and in waste recovery through Dalkia Wastenergy (see 1.4.6.1.1 "Dalkia").

EDF Energy is principally active in the generation of electricity in the UK, the supply of electricity to domestic and business customers, the supply of gas to domestic customers, in the construction of new nuclear generation and a minority stake in development and operation of renewable energy project in joint-venture with EDF Renewables.

EDF Energy is one of the UK's largest energy companies and the largest producer of low-carbon electricity, producing around one-fifth of the nation's electricity from its nuclear power stations, coal and gas power stations and combined heat and power plants.

The company supplies gas and electricity to 5.27 million business and residential customer accounts and is the biggest supplier of electricity by volume in Great Britain.

EDF Energy is leading the UK's nuclear renaissance. In partnership with China General Nuclear Corporation (CGN) EDF Energy has a stake in Hinkley Point C power plant construction site in Somerset (EDF holds 66.5% and CGN 33.5%) and is developing further New Nuclear projects at Sizewell (EDF owns 80% and CGN 20% at development stage), in Suffolk, and Bradwell (EDF owns 33.5% and CGN 66.5%), in Essex.

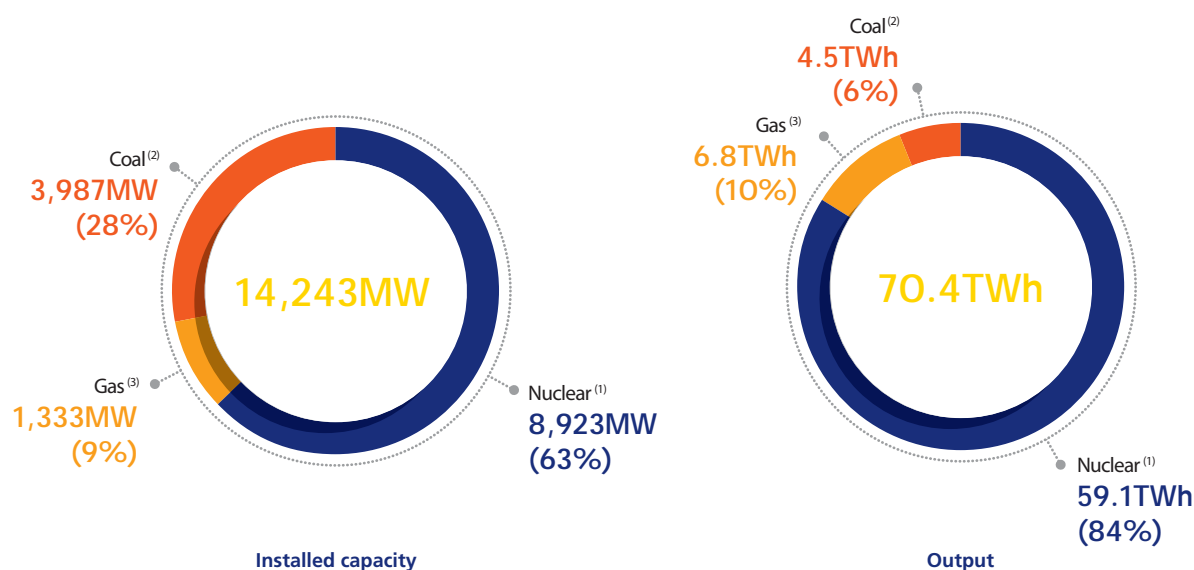
The company employs around 12,300 people at sites throughout the country.

Total electricity generated overall in the UK in 2018 was c.289TWh and total electricity supplied was c.259TWh (the difference principally reflecting losses on the transmission and distribution networks). Total gas supplied to UK domestic customers in 2018 was 311TWh.

# 1. PRESENTATION OF EDF GROUP

## Description of the Group's activities

### → 2018 Installed capacity and output for EDF Energy



(1) The figures shown represent 100% of Nuclear capacity and generation output, shared 80%/20% by EDF and Centrica.  
 (2) Coal capacity represents transmission entry capacity. Not power including biomass.  
 (3) Including 1.35MW of Barkantine CHP.

EDF Energy	31/12/2018	31/12/2017
Electricity supplied <sup>(1)</sup> (GWh)	43,939	43,769
Gas supplied (GWh)	28,944	27,879
Number of residential customer accounts (thousands) <sup>(2)</sup>	4,945	5,160
Number of employees <sup>(3)</sup>	12,292	12,797
Total Recordable Incident Rate <sup>(4)</sup>	1.12	0.59

(1) Power supplied to final consumer including previous year metering cut-offs.  
 (2) Year end Figure  
 (3) Headcount at the end of the period, including staff on maternity leave  
 (4) Total Recordable Incident Rate - Annual total combined number of Lost Time Incidents, fatalities, Restricted Work Injuries and Medical Treatment Injuries (excluding First Aid)/number of hours worked x1,000,000. This covers all employees, agency and contractor staff. Excludes EDF Energy Renewables and Hinkley Point C project.

#### 1.4.5.1.1 Strategy

##### Overview

EDF Energy's strategy targets a sustainable long-term business, meeting its customers' needs for energy and associated services in an efficient and responsible way while focused on supporting the transition to a lower-carbon economy through generation of safe, reliable and affordable low-carbon electricity. EDF Energy is entirely consistent with EDF group's CAP 2030 and is underpinned by a focus on maintaining industry leading safety performance and improving cost efficiency across the business.

In its energy supply business, EDF Energy aims to make energy easy for its customers by doing things better, faster and cheaper whilst providing excellent service and convenience. This also involves installing smart meters to our customers' homes and small business premises, as part of the national programme. In response to the temporary price cap introduced by the UK government for residential standard variable tariff customers, EDF Energy is maintaining its efficiency efforts and exploring alternative options to develop the business. It is also developing new services and revenue streams in response to market opportunities in flexibility and the electrification of the economy. Through its energy services joint venture with Dalkia, including the company Imtech, and new capabilities such as the flexibility platform Powershift, EDF Energy also aims to help businesses explore and develop solutions that deliver energy, carbon and cost savings.

In generation, EDF Energy seeks to create value from both existing and new activities.

EDF Energy aims to secure value from its existing nuclear, coal and gas assets through continued operational excellence and safe, reliable generation. Since 2009, EDF Energy has extended the lifetime of all of its nuclear Advanced Gas Reactors (AGRs) by an average of 8 years. However, due to large non-replaceable components, there is a technical limit to the AGR lifetimes, and as the stations approach this limit, it will be aiming to optimise the end of life value of the stations and to develop new activities in nuclear decommissioning, building on its expertise in operating the UK's existing nuclear stations.

Other important strategic actions concerning the company's generation fleet include optimising the operations of the West Burton B Combined Cycle Gas Turbine power station and optimising the remaining lifetime value of coal generation capacity within the UK capacity market.

In partnership with China General Nuclear Corporation (CGN), EDF is building two new nuclear units (3.2GW capacity in total) at Hinkley Point in Somerset, based on the EPR technology. EDF Energy is also working with CGN to progress a similar 3.2GW EPR project at Sizewell in Suffolk. A further new nuclear power station proposal is being developed at Bradwell in Essex based on CGN's "UK HPR1000" Chinese technology.

In partnership with EDF Energy Renewables in the UK (a joint venture with EDF Renewables), EDF Energy continues to develop new renewable generation projects, including the 450MW Nearth Gaoithe offshore project, located off the coast of East Scotland, acquired in 2018. The new 49MW battery storage project at West Burton B is now operational, providing frequency response services to the National Grid, and further flexibility projects are being explored. In June 2018, EDF Renewables entered into a new partnership with Dalmore Capital Limited and

Pensions Infrastructure Platform, transferring a 49% minority stake in 24 of its wind farms (around 550 MW). EDF Energy will continue to buy all of the energy produced, as well as the Renewable Obligation Certificates for energy generated by wind farms under standard market conditions.

## Regulation

### Brexit and Euratom Treaty

The UK voted to leave the membership of the European Union on 23 June 2016. This led to a devaluation of sterling impacting the GBP/EUR exchange rate. Further depreciation in the value of sterling is expected if there is a "no deal". Also see Section 2.1.2 "Risks related to the competitive and general context", and the risk factor entitled: "Description 2H: The United Kingdom's exit from the European Union is likely to have an adverse effect on overall economic conditions, the financial markets and EDF's activities".

The European Council of 25 November 2018 approved the withdrawal agreement and the Political declaration setting out the framework for the future relationship between the European Union and the United Kingdom after the United Kingdom's exit from the European Union and Euratom. Energy and civil nuclear are referenced in the Declaration, ensuring both will be on priority list in the future relationship negotiations. The civil nuclear section of the Political Declaration includes a commitment to a wide-ranging Nuclear Cooperation Agreement between Euratom and the UK.

Before any Brexit decisions are implemented, the agreement must be approved by the House of Commons.

The Group has been reviewing the impact of the UK's exit from the Euratom Treaty ("European Atomic Energy Community") together with broader Brexit issues. A comprehensive company-wide impact assessment exercise has led to the development and implementation of a number of mitigations required to address the key risks, particularly focusing on a 'no-deal' scenario.

The UK Government has also made good progress in addressing a number of important key issues for the civil nuclear sector that require to be addressed at a national level, including:

- all Euratom Withdrawal issues were agreed between UK and EU;
- the creation of nuclear safeguards specific to the United Kingdom;
- nuclear cooperation agreements with the US, Canada and Australia and a new nuclear cooperation agreement with Japan by end March 2019.

Taking the UK Government and the EDF mitigation actions together, these should address the most serious potential impacts arising from Euratom and the broader Brexit. Potential impact from Brexit include tariffs and non-tariff barriers and the risk of delays at ports/airports creating disruption to supply chains (and potentially impacting plant performance and the Hinkley Point C construction schedule) and also the ability to access skilled labour, including for the construction of Hinkley Point C. With respect to labour mobility, the UK Government has recently published a white paper on its proposals for the post-Brexit immigration system. Furthermore, on 29 January 2019 the British government announced that given the amount of time required to implement the new British immigration system (which is not set to take effect until at least 2021), transition measures would be applied from 30 March 2019. This means in practice that there will only be limited changes to UK mobility and incoming labour between now and the beginning of 2021.

In any case, the UK will continue to be a member of the International Atomic Energy Agency (IAEA) and work with international parties to ensure it continues to meet relevant international standards. The UK has signed a replacement, bilateral voluntary offer safeguards agreement with the IAEA that is on track for ratification by 29 March 2019.

### Capacity Market

On 15 November 2018 the General Court of the Court of Justice of the European Union found in favour of Tempus Energy against the European Commission, annulling the European Commission's decision not to object to the UK Capacity Market on state aid grounds. As a consequence, the UK Government has suspended capacity payment to generators. The Government has said that it will be working closely with the Commission so that the Capacity Market can be reinstated as soon as possible. In the meantime the Government has asked National Grid and the Electricity Settlement Company to continue to operate the Capacity Market as normal (so far as is possible) and confirmed its intention to hold a "T-1" replacement additional auction in mid-2019 (for delivery late 2019/early 2020) that will give successful bidders "conditional capacities". The government would like capacity providers to be eligible for deferred payments after the standstill period. However, deferred payments, whether related to agreements on existing capacities or future auctions, remain subject to State aid clearance from the European Commission; on 21 February 2019, the European Commission announced that it was opening an in-depth investigation into the British capacity market scheme.

## 1.4.5.1.2 Activities of EDF Energy

### 1.4.5.1.2.1 Nuclear generation

EDF Energy owns and operates eight nuclear power stations in the UK (15 reactors) with a total capacity of 8.9GW.

Since 2009, Centrica plc. ("Centrica") has held a 20% shareholding in Lake Acquisitions Limited, the company in which the nuclear generation assets sit (except Nuclear New Build).

### Nuclear generation fleet technology

Seven of the eight nuclear power stations are Advanced Gas-Cooled Reactor (AGR) power stations (Dungeness B, Hartlepool, Heysham 1, Heysham 2, Hinkley Point B, Hunterston B and Torness) and the eighth, Sizewell B, is a Pressurised Water Reactor (PWR) power station.

### Safety and radiological protection

Nuclear safety is EDF Energy's overriding priority. As in 2017, no major safety event was recorded for the EDF Energy fleet in 2018.

In 2018, EDF Energy declared 1 significant safety event (SSE) classified as INES <sup>(1)</sup> 2 on an AGR site (no INES 2 SSE in 2017).

EDF Energy operates to strict procedures to minimise and control the radiation doses received by employees and contractors at all of EDF Energy's existing nuclear power stations. In 2018, the average individual dose received by all workers on EDF Energy's existing nuclear sites was 0.058mSv, the legal dose limit being 20mSv per year. The highest individual dose received in 2018 was 7.2mSv.

### The operating lifetime of the nuclear power plants

The actual lifetime of each power station will be determined primarily by the technical and economic practicability of supporting its safety case. This is assessed at each statutory outage for the following operating period through inspection, maintenance, testing and assessment of plant performance. Following the outage, consent is required from the Office for Nuclear Regulation (ONR) before restarting the reactor. The operating period between statutory outages is normally three years for the AGR power stations and eighteen months for Sizewell B.

(1) International Nuclear Event Scale.

# 1. PRESENTATION OF EDF GROUP

## Description of the Group's activities

In addition, every ten years, the stations are subject to a more detailed and wide ranging Periodic Safety Review (PSR) of design, operational and organisational safety which must also be accepted by the ONR in order to secure continued operation. In January 2017, the ONR accepted the Hinkley Point B and Hunterston B PSRs, and in January 2018 the ONR accepted for the Dungeness B PSR. ONR are currently assessing the Hartlepool and Heysham 1 PSR with acceptance due early 2019. Heysham 2 and Torness PSRs have been submitted for ONR assessment in 2019 with an ONR acceptance due in January 2020.

The AGRs were designed with a nominal 25 year lifetime, and Sizewell B with a 40 year lifetime. However, with the aggregation of technical information, and operational and safety experience, it has been possible to revise the expected AGR

lifetimes. Seeking further lifetime extensions may require additional investment in each plant, and requires technical, safety, and economic justifications to be made; and since it may result in increasing the nuclear liabilities, the consent of the Nuclear Decommissioning Authority (NDA) is required.

Since British Energy was acquired by EDF, the AGRs have been further extended by an average of eight years. The last extensions were declared in February 2016. Hartlepool and Heysham 1 were extended by a further five years, and Heysham 2 and Torness were extended by seven years.

Although the work has not yet been carried out to support the extension of Sizewell B, EDF Energy expects that it should be possible to extend it by c.20 years.

## CURRENT OPERATING LIVES <sup>(1)</sup> AND CLOSURE DATES

Power Plant	Type of reactor	Start of Generation	Power Station Lifetime (Formally Declared)	Life Extensions (Already Formally Declared)	Associated Scheduled Closure Date	Scheduled Periodic Safety Reviews
Hinkley Point B	AGR	Feb. 1976	47 years	22 years	2023	2017
Hunterston B	AGR	Feb. 1976	47 years	22 years	2023	2017
Dungeness B	AGR	Apr. 1983	45 years	20 years	2028	2018
Heysham 1	AGR	Jul. 1983	41 years	15 years	2024	2019
Hartlepool	AGR	Aug. 1983	41 years	15 years	2024	2019
Torness	AGR	May 1988	42 years	17 years	2030	2020
Heysham 2	AGR	Jul. 1988	42 years	17 years	2030	2020
Sizewell B	PWR	Feb. 1995	40 years	–	2035	2025

(1) As formally recorded by EDF Energy and approved by the NDA.

## CAPACITY AND OUTPUT BY POWER PLANT

		Output <sup>(2)</sup> (TWh)	
Power plant	Power <sup>(1)</sup> (MW)	2018	2017
AGR Power Plants			
Dungeness B	1,090	5.7	5.7
Hartlepool	1,185	8.1	9.3
Heysham 1	1,060	7.4	6.3
Heysham 2	1,240	8.9	10.3
Hinkley Point B	965	7.2	7.3
Hunterston B	985	3.8	7.3
Torness	1,200	8.6	8.9
PWR Power Plant			
Sizewell B	1,198	9.4	8.8
TOTAL	8,923	59.1	63.9
LOAD FACTOR <sup>(3)</sup>		76%	82%

(1) Capacities are stated net of all power consumed for the power stations' own use, including power imported from the Grid.

(2) Output in each year reflects any refuelling, planned and unplanned outages.

(3) Load factors are obtained by dividing the actual output by the output that would have been achieved by each power plant operated at its stated capacity appropriate for the period.

## Operational review of the existing nuclear generation fleet

The nuclear generation fleet produced 59.1TWh during 2018, 4.8TWh less than 2017 (63.9TWh). The reduction in output is largely due to the extended outages at Hunterston B for graphite inspections and safety case work, the extended outages at Dungeness B to address the discovery of steam pipework cracking and corrosion on cooling water pipework and two additional statutory outages in 2018.

Planned statutory outages were completed on Hartlepool Reactor 1, Heysham 1 Reactor 2, Heysham 2 Reactor 7, Hinkley Point B Reactor 4 and Torness Reactor 2. A planned statutory outage that was started at Sizewell B in 2017 was extended into 2018 to make repairs to the steam generators and was completed on 31 January 2018.

A statutory outage was started on Dungeness B Reactor 22 in August 2018 with an associated outage on Reactor 21 starting in September for work on common systems. These outages have been extended to address the discovery of steam pipework cracking and corrosion on cooling water pipework. The units are expected to return to service in Q2 2019.

Hunterston B Reactor 3 was shut down for a scheduled graphite core inspection in March 2018. Following the discovery of new keyway root cracks in the reactor core at a slightly higher rate than modelled in the current safety case, EDF Energy took the decision to keep the reactor offline for further inspections and safety case work. A graphite core inspection on Hunterston B Reactor 4 planned for 2019 was also brought forward to October 2018. The units are expected to return to service in Q2 2019.



## Radioactive Waste Management

In the UK, radioactive waste is classified into four categories:

- low Level Waste (LLW), for which a near surface disposal route exists – including the LLW Repository at Drigg West Cumbria;
- intermediate Level Waste (ILW), for which no disposal route is currently available in the UK;
- high Level Waste (HLW) is defined as radioactive waste in which the temperature may rise significantly as a result of the radioactivity, so this factor has to be taken into account in the design of storage and disposal facilities;
- higher Activity Waste (HAW) – this is effectively HLW, ILW and any LLW that are unsuitable for near-surface disposal.

EDF Energy nuclear generation's strategy for LLW and HAW reflects that the UK and Scottish governments are focused on application of the waste hierarchy (reduce, reuse, recycle, recover). The use of a range of waste recycling and disposal routes will help to make the best use of the UK's Low Level Waste Repository (LLWR) in Cumbria. Only a disposal route for LLW currently exists in the UK.

HAW is stored for the medium-term in safe, purpose built facilities at EDF Energy's stations while longer term national solutions are being established within England and Scotland.

Under historic contractual arrangements, spent fuel from the AGRs is transported to Sellafield nuclear reprocessing site (owned by NDA) for reprocessing or long term storage. Heat generating HAW from the reprocessing of spent AGR fuel are converted into glass blocks for safe, long term storage.

Regarding Sizewell B, the spent fuel is stored on site and EDF Energy has built a further spent fuel dry storage facility on the Sizewell B site to allow the station to continue to safely store all of the spent fuel that will be generated over Sizewell B's life. Following long-term surface storage, the Sizewell B PWR spent fuel will be disposed to a future UK geological disposal facility.

The nature of EDF Energy nuclear generation's business and its historic government link means that the strategy for spent fuel and the management of radioactive waste from EDF Energy nuclear generation's power stations is approved by the NDA. However, EDF Energy has policies to continually improve and minimise the spent fuel

and waste arising through the company's wider safety, sustainability and environmental policies.

## Costs relating to radioactive waste management and decommissioning Restructuring Agreements

Restructuring Agreements were originally entered into in 2005 as part of the restructuring of the former British Energy Group of companies (hereafter referred to as "the EDF Energy Nuclear Generation Group") and were carried out from 2002 under the aegis of the UK government in order to stabilise the financial situation of the EDF Energy Nuclear Generation Group (EENG).

By virtue of these restructuring agreements:

- the Nuclear Liabilities Fund (NLF), an independent trust set up by the UK government as part of the restructuring, agreed (at the direction of the Secretary of State) to fund, to the extent of its assets: (i) qualifying uncontracted nuclear liabilities, including liabilities in connection with the management of spent fuel at the Sizewell B power station and (ii) qualifying costs of decommissioning in relation to the existing nuclear power stations owned and operated by EENG;
- the Secretary of State agreed to fund: (i) qualifying uncontracted nuclear liabilities (including liabilities in connection with the management of spent fuel at the Sizewell B power station) and qualifying costs of decommissioning, in each case in relation to the existing nuclear power stations owned and operated by EENG, to the extent that they exceed the assets of NLF and (ii) subject to a cap of £2,185 million (in December 2002 monetary values, adjusted accordingly), qualifying contracted liabilities for the EENG's spent fuel (including in particular liabilities for management of AGR waste from spent fuel loaded prior to 15 January 2005); and
- EDF Energy Nuclear Generation Limited is responsible for funding certain excluded or disqualified liabilities (mainly liabilities incurred in connection with the event of an unsafe or careless operation of the power stations) and the potential associated obligations of its subsidiaries to the NLF and the Secretary of State are guaranteed by the principal members of the EENG.

Certain companies in the EENG, including EDF Energy Nuclear Generation Limited, entered into a separate contract, now with the NDA for management of AGR spent fuel loaded from 15 January 2005 (termed "new fuel") and have no responsibility/liability for this fuel after it is received at Sellafield.

### 1.4.5.1.2.2 Thermal generation and gas storage

Power plant	Location	Year commissioned	Number of units	Type of station	Capacity (MW)	Output (TWh)	
						2018	2017
Cottam	Nottinghamshire	1970	4	Coal-fired	2,000	2.7	3.1
West Burton A	Nottinghamshire	1970	4	Coal-fired and OCGT <sup>(1)</sup>	1,987	1.8	1.7
West Burton B	Nottinghamshire	2013	3	Combined Cycle Gas Turbine	1,332	6.8	6.6
<b>TOTAL</b>	<b>UK</b>		<b>11</b>		<b>5,319</b>	<b>11.3</b>	<b>11.4</b>

(1) Open Cycle Gas Turbine.

In 2018, Cottam and West Burton A coal-fired power plants generated 4.5TWh of electricity. This is 0.3TWh less than last year, and represented a good performance in a year of particularly low dark spreads, in addition to outages at six of the eight coal-fired units.

On 7 February 2019, EDF Energy decided to end production on 30 September 2019 at the Cottam coal-fired power plant after 50 years of being in service. This decision reflects market changes and a drive to actively remove carbon from the power generation process.

West Burton B CCGT generated 6.8TWh of electricity in 2018, an increase of 0.2TWh from 2017. This represented a good performance considering the market volatilities, plant challenges and three interim outages during the year.

EDF Energy operates also two mid cycle gas storage facilities in Cheshire. Hill Top Farm became commercially operational in mid-January 2015 with three cavities. A fourth cavity became commercially operational in 2018 with the remaining cavity scheduled to come on-line in 2019. During 2018 the decision was made not to return the Hole House Facility to commercial operation for the foreseeable future due to challenging market conditions coupled with imminent requirements for some significant investment to the plant.

### 1.4.5.1.2.3 Customer business

	31/12/2018	31/12/2017
Customer electricity supplied (GWh)	43,939	43,769
Customer gas supplied (GWh)	28,944	27,879
Number of domestic customer accounts at the end of the period(thousands)	4,945	5,160

The Customers business is responsible for the supply of gas and electricity to residential and business customers across the United Kingdom and the wholesale market optimisation of EDF Energy's generation and customer assets.

EDF Energy sells energy to two major customer segments: domestic and business customers. The size of business customers ranges from large industrial businesses to small privately-owned businesses. EDF Energy adopts different risk management strategies for domestic and non-domestic customers.

#### Domestic

During 2018, EDF Energy supplied 11.65TWh of electricity and 28.78TWh of gas for the domestic segment. As of 31 December 2018, EDF Energy had 3.003 million electricity accounts and 1.942 million gas accounts within this segment.

#### Competition

The latest market share data from Cornwall (at the end of October 2018) showed that the combined market share of small and medium suppliers is now around 27%, compared to 20.6% at the end of October 2017. There were 62 small and medium suppliers at the end of October (excluding white labels and licence lites).

EDF Energy had 4.945 million product accounts at end of December 2018, a decrease of 0.2 million since the beginning of the year. Market share declined slightly over the last 12 months and is currently 9.6% at 31 October 2018. Although EDF Energy's market share base on total accounts declined 0.46%, this compares favourably to an average market share loss of 0.92% for the other large suppliers, with only E.ON experiencing a lower decline (0.3%).

EDF Energy won MoneySavingExpert's collective switch in January 2018, gaining 10,000 customers to a two-year fixed tariff and continued its collective switch and exclusive tariff orientated acquisition strategy.

#### Regulatory Change Default Tariff Cap

On 6 November 2018, Ofgem published their decision on the Default Tariff Cap with the following Key Features:

- introduced on 1 January 2019;
- will apply to 11 million customers on Default Tariffs in UK;
- will be updated every 6 months, to align with the existing pre-payment meter (PPM) Cap;
- will apply until at least 2020 after which Government may extend for a further 12 months at a time until 2023 at the latest.

The level of the cap for direct debit (DD) Customers is £1,137 and for cash and cheque (CC) customers is £1,221 at typical consumption.

#### Renewable Obligation equalisation

Ofgem on 21 November 2018 confirmed a shortfall of £59 million in the buy-out fund of the Governments Renewables Obligation scheme. Separately, there is also a shortfall of £4 million in supplier payments into the periodic levelisation fund of Feed-in Tariffs. These shortfalls will trigger mutualisation which means that suppliers who have complied with their obligations will be required to make up the shortfall.

#### Smart Metering

EDF Energy remains committed to delivering smart meters to all domestic and small business customers who want to benefit from this new technology by 2020. In 2018, EDF Energy has continued to ramp up its field force even further and installed a further c.515,000 smart meters, exceeding its 2018 annual target. By the end of 2018, c.24% of EDF Energy customers in scope for the rollout have smart meters. In 2018, following the national IT and communications infrastructure (the DCC) finally

becoming available, suppliers were also able to start to install second generation smart meters, with EDF Energy having installed c.36,000 of them. EDF Energy plans to complete the transition to second generation smart meters in Q1 2019, in line with the end date set by the Government.

#### Domestic Customer Services

In the Q3 2018 Citizens Advice Energy Supplier Rating league table EDF Energy finished in 3rd place of all major suppliers behind British Gas and SSE. EDF Energy dropped from 2nd place in Q4 2017 but produced an improved score from 3.7 (out of 5) in Q4 2017 to 3.95 in Q3 2018. In the overall supplier table EDF Energy improved from 9th position in Q4 2017 to 8th in Q3 2018, out of the 34 suppliers included.

Throughout 2018 customers have remained very positive about the service they have received across all channels with a year end (average Oct- Dec 18) Advisor Recommendation Score of +53 for our contact channels and a Digital Net Ease score of 4.2 out of 5. EDF Energy continues to work on reducing unnecessary customer contact with 68% of transactions completed by customers using inbound self-serve channels.

#### Non-domestic customers

In 2018, the non-domestic segment supplied a total of 32.3TWh of electricity, 1.9TWh to 203,434 small business customers ("SME") and 30.4TWh to medium and large business customers ("I&C") accounts. The business customer electricity market in the UK is c.184.1TWh in total, making EDF Energy the largest supplier to business customers.

Medium business continues its strong performance, with high volume and gross margin wins. Volume in this segment continues to grow month on month. The October 2018 round performed well and £/MWh margins increased compared to the start of the year.

Large Business has managed to grow its live on supply volume over 2018 by acquiring and on boarding two strategic prospects, Hanson and Manchester Airport Group. This is reflected in positive financial performance, with gross margin higher in 2018 than 2017. Further key acquisitions contracted in 2018, including another strategic public sector framework (NEPO), as well as a number of key renewals will support Large Businesses' volume position moving into 2019.

#### Wholesale Markets Optimisation

##### General principles

The policies surrounding EDF Energy's energy purchasing and risk management activities are carried out in accordance with EDF group's policies and ensure that EDF Energy's activities are optimised and its services delivered at a competitive price while limiting its gross margin volatility.

The Wholesale Markets Optimisation (WMO) Division's purpose is to manage the wholesale market risk of EDF Energy in one place within pre-defined risk limits and control framework. It provides a unique interface with the wholesale markets via EDF Trading. WMO also provides modelling services to the whole of EDF Energy, as well as negotiating and managing asset backed commercial structures with third parties e.g. NDA and Centrica.

#### Electricity sales and procurement

The power generated by the generation fleet is sold via the WMO Division within EDF Energy's customers business. Since April 2010, 20% of the output from nuclear generation is separately sold to Centrica, the minority shareholder of the current nuclear fleet, under the agreements made at the time of the British Energy acquisition. The remaining 80% is sold to EDF Energy's WMO under the same transfer price as used for the transaction with Centrica, based on published market prices, smoothed over forward electricity prices where liquidity allows.

Over and above its own generation, EDF Energy also sources electricity through export power supplied from power purchase agreements which are mainly with renewable and CHP generators. In 2018, EDF Energy acquired approximately 4.5TWh through this channel.

For delivery in 2018, EDF Energy's net position on the wholesale market was a sale of approximately 17.4TWh (including structured trades). In 2018, EDF Energy sold approximately 49.3TWh and bought 32.0TWh.

#### Gas, coal and carbon rights procurement

Coal and gas contracts (physical and financial) and CO<sub>2</sub> emissions rights are entered by EDF Energy to hedge the requirements of its power plants and gas consumers.

Purchases are based on coal and gas asset generation forecasts and target coal stock levels. In 2018 29% of EDF Energy's coal deliveries were from domestic suppliers and 71% from international suppliers.

#### 1.4.5.1.2.4 Nuclear New Build business

##### New Nuclear activity

Following the final investment decision (FID) made by EDF's Board of Directors on 28 July 2016, EDF and China General Nuclear Power Corporation (CGN) signed final contracts for the construction of two EPR reactors on Hinkley Point site in Somerset ("Hinkley Point C" or "HPC" project). The agreement also included a partnership for the development in the UK of two nuclear power plants at Sizewell in Suffolk ("Sizewell C" project) and Bradwell in Essex ("Bradwell B" project).

The EPR technology is already being deployed at the power stations at Flamanville in France (currently under construction and fully owned by EDF - see section 1.4.1.2.1 "Flamanville 3 EPR project") and at Taishan in China (see section 1.4.1.2.2 "Other "New Nuclear" projects - Taishan EPR"). Using the same technology, although adapted for UK regulatory requirements and Hinkley Point C site specifics, will enable to benefit from a series effect on standardisation of design, on construction and on operation.

##### Hinkley Point C (HPC)

##### Financing

EDF's share in HPC is 66.5% and CGN's share is 33.5%.

EDF intends to remain the majority shareholder, and has agreed with the British Government not to sell down its control of HPC during the construction period without the previous approval of the British Government.

##### Project Costs and Timeline

Following the final investment decision in September 2016, EDF has undertaken in 2017 a review of the costs and timeline of HPC project, concluded as follows <sup>(1)</sup>:

- confirmation of the "J0" milestone, corresponding to completion of pouring of the first safety concrete for the Common Raft on Unit 1 and scheduled for mid-2019;
- estimation of project completion costs at £19.6 billion real terms in 2015 sterling, with an increase of £1.5 billion in 2015 sterling <sup>(2)</sup> compared to previous evaluations. This estimate assumes successful operational action plans, in particular those in partnership with suppliers. The estimated additional costs <sup>(3)</sup> result mainly from a better understanding of the design adapted to the requirements of the British regulators, the volume and sequencing of work on site and the gradual implementation of supplier contracts. EDF's projected rate of return (IRR) is estimated at approximately 8.5% <sup>(4)</sup>, compared to about 9% <sup>(2)</sup> initially;

- estimation of the risk of deferral of delivery (COD) at 15 months for Unit 1 and 9 months for Unit 2. The materialisation of this risk would entail an additional potential cost of around £0.7 billion in 2015 sterling. Under this assumption, the IRR for EDF would be around 8.2% <sup>(2)</sup>.

Regarding the overall schedule, the project teams are fully mobilised and are implementing action plans to ensure that the objective set to deliver Unit 1 by the end of 2025 is fulfilled.

The agreements between EDF and CGN include a capped compensation mechanism in case of cost overruns or delays; these agreements are subject to a confidentiality clause.

##### Progress of the project

At the end of 2018, the project confirmed the "J0" target set for mid-2019 and has achieved the four goals set for 2018:

- 1<sup>st</sup> project goal: Unit 1 pre-stressing gallery construction has been completed; work on Unit 2 is underway;
- 2<sup>nd</sup> project goal: Unit 1 "deep dig" has been built; it will contain the 54m tall water pumping station;
- 3<sup>rd</sup> project goal: the design package for Unit 1 Nuclear Island Common Raft has been handed over, which enables to start work on site;
- 4<sup>th</sup> project goal: pour of the first safety concrete for the Unit 1 Nuclear Island is complete. The ONR's prior approval was required for this phase, to release the hold point for the first nuclear island concrete pour. Approval was granted on 8 November 2018 following the freeze of the final design.

At end 2018, the expenditure to date for the project as a whole stood at £6.8 billion (at current values), excluding interim interest. Work is ongoing to identify opportunities arising from the action plans referred to above.

##### Exchanges with the UK office for nuclear safety and regulation (ONR)

Discussions with the ONR are ongoing.

Next ONR Hold Point will be the delivery of fuel on site. In addition, an agreement from ONR will be needed for the despatch of the first components coming from Framatome.

##### Contract for Difference (CfD) <sup>(5)</sup>

Regarding the risks identified in the deferral of delivery (15 months for Unit 1 and 9 months for Unit 2), these are below the deadlines set out in the signed contract.

The HPC project company, NNB Generation company (HPC) Limited and the Department of Energy and Climate Change (DECC) have agreed, on October 2015, on the full terms of the CfD for HPC, which was approved by the European Commission in October 2014.

The CfD was signed on 29 September 2016 alongside all the other contracts with the UK Government and it is a contract to provide security in respect of revenues generated from electricity produced and sold by HPC through compensation based on the difference between the Strike Price and the market price, for a period of 35 years from commissioning.

From the plant's start date, if the reference price at which the generator sells electricity on the market is lower than the strike price set under the terms of the contract, the generator will receive an additional payment. If the reference price is higher than the strike price, the generator will be liable for the difference.

(1) Please refer to the press release of 3 July 2017 "Clarifications on Hinkley Point C project".

(2) Excluding interim interest and the currency effect compared with a benchmark project exchange rate (£1 = €1.23).

(3) Net of action plans.

(4) IRR calculated at the July 2017 exchange rate (£1 = €1.16). Any changes to the exchange rate could affect the IRR. The exchange rate at 31 December 2018 was €1.12.

(5) Terms of the contract are available on the UK government website: <https://www.gov.uk/government/publications/hinkley-point-c-documents>.

# 1. PRESENTATION OF EDF GROUP

## Description of the Group's activities

The key elements of the CfD are:

- the strike price for HPC is set at £<sub>2012</sub>92.50/MWh or £<sub>2012</sub>89.50/MWh if the Sizewell C project is launched (i.e. if a final investment decision is taken), in order to reflect the fact that the first of a kind costs of EPR reactors are shared across the HPC and Sizewell C sites;
- the strike price is fully indexed to UK inflation through the Consumer Price Index (CPI);
- the lifespan of the contract is 35 years; any delay on Unit 2 of more than 8 years after the date of the contractually stipulated date of commercial commissioning may result in a change to the CfD profits. The adjustment is partial if one of the two reactors is commissioned within its specific window;
- the project is protected against certain unfavourable regulatory and legislative changes; provision has also been made to review the costs (up or down depending on the assumptions used) in the fifteenth and twenty fifth years, and to review certain conditions for the costs corresponding to decommissioning and waste management operations (Funding Decommissioning Programme);
- should there be savings from the construction of the HPC project, these will be shared with consumers through a lower electricity price.

There is no explicit volume guarantee in the CfD, nor is there a ceiling; however, the contract is protected against the risk of erasure in case of changes to regulations or to the market.

HPC project is protected against power market price changes during the CfD period.

### Principal project risks

These risks are detailed in section 2.1.5 "Specific risks related to the Group's nuclear activities".

As with any project of this scope, and even though the CfD has a protective role, the project presents risks in terms of timing and budget overruns at the end of the project.

In terms of foreign exchange, it is important to note that c.1/3 of the project costs are denominated in Euro. This exposes both the project and EDF group to the GBP/EUR exchange rate.

Should sterling fall against the euro, the sterling cost of the project will go up and its IRR will therefore drop. At a Group level, this will trigger a fall in euro funding requirements and therefore lower Group debt.

Given the long-term investment horizon in the HPC project, the EDF Group is implementing a gradual strategy to cover the risk of an increase in sterling value for its HPC investment. Beyond the commissioning phase, the IRR of the euro investment is dependent on fluctuations in sterling and UK inflation (in relation to the July 2017 baseline), as revenue is generated in sterling and linked to inflation.

### Funded Decommissioning Programme (FDP)

Contracts for the Funded Decommissioning Programme (FDP) were signed on 29 September 2016. A statutory requirement for nuclear operators requests having a FDP under which an independent Fund Company will collect contributions and manage the money built up to pay for decommissioning of the nuclear reactor at the end of the generation.

The Nuclear Decommissioning Fund Company (FundCo) was set up in compliance with the Energy Act 2008 as its purpose is to provide costs of decommissioning by implementing the FDP.

The overall objective of the FDP is to ensure that operators make prudent provision for:

- the full costs of decommissioning their installations;
- their full share of the costs of safely and securely managing and disposing of their waste (including long term storage); in doing so, the risk of recourse to public funds is remote.

### Sizewell C

EDF and CGN signed the Sizewell C Project equity documents on 29 September 2016 alongside the HPC contracts, agreeing in principle to develop Sizewell C project in Suffolk, until a final investment decision is made in order to build and operate two EPR reactors (3.2GW), subject to third party funding.

During development phase previous to final investment decision, EDF's share is of 80% and CGN of 20%. After the final investment decision, the project is not aimed to be controlled at EDF Level. Other investors and lenders should step in in due course.

Final investment decision is expected end of 2021.

Project development is based on a replication strategy from HPC. The Sizewell C project will therefore also be based on EPR technology, and will also benefit from feedback and experience from HPC as well as a fully-developed UK supply chain.

Phase 3 of the consultation began on 4 January 2019. For three months, residents, local authorities and stakeholders will be able to take part in various meetings and interactions. Key topics for discussion will include transport, accommodation options and the environmental impact assessment.

### Bradwell B

EDF and CGN signed an agreement on 29 September 2016 for the joint submission to the British safety authority of a British version of the HPR1000 third-generation Hualong reactor in order to get a design certification (Generic Design Assessment). The HPR1000 would be based on Unit 3 of the CGN plant in Fangchenggang (China), which is the reference power plant for both companies developing the British design of Hualong.

During the development phase, CGN has a stake of 66.5% and EDF of 33.5%.

In November 2018, the project has entered a new phase in the approval process for the "UK HPR1000" nuclear technology design, with the start of the third step (out of four) in the process of Generic Design Assessment.

## 1.4.5.2 Italy

### 1.4.5.2.1 EDF group market and footprint in Italy

Italy is one of EDF's four key markets in Europe alongside France, the UK and Belgium.

The Group is mainly present in Italy through its 97.446% shareholding in Edison <sup>(1)</sup>, which is a major player in the Italian electricity and gas markets and a well-known Italian brand.

In 2016, Fenice, a wholly-owned EDF subsidiary specialised in energy services, was integrated into Edison to further the latter's strategic objective of becoming a key player on the Italian market for energy services with a more complete and diversified offering.

The EDF group is also present in Italy through Citelum and the Italian subsidiary of EDF Renewables.

### 1.4.5.2.2 Edison strategy

Like the majority of European energy systems, the Italian market is currently facing a certain number of challenges. Thanks to its current position and integrated presence in the gas and electric power value chain, Edison is well-placed to seize opportunities created by market changes, while pursuing efficiency and profitability, in line with the CAP 2030 priorities.

In 2018 Edison focused on implementing its transformation strategy aimed at reorienting it towards low carbon renewable energy generation and developing downstream energy services. Four areas received particular attention:

- Regarding supply, Edison has the objective of fortifying its position on the Italian market by providing innovation in its offering. Relying on the strong positioning of its brand and the broad range of services it provides, such as home automation, mobility and residential solar panels, Edison aims to grow its portfolio of individual gas and electricity customers. The high quality offering in particular through the development of energy services and low-carbon energy offer has an objective of strengthening ties with the end market, in particular in the industrial customer, tertiary and public administration segments;

(1) Equity stake; 99.484% share of voting rights.

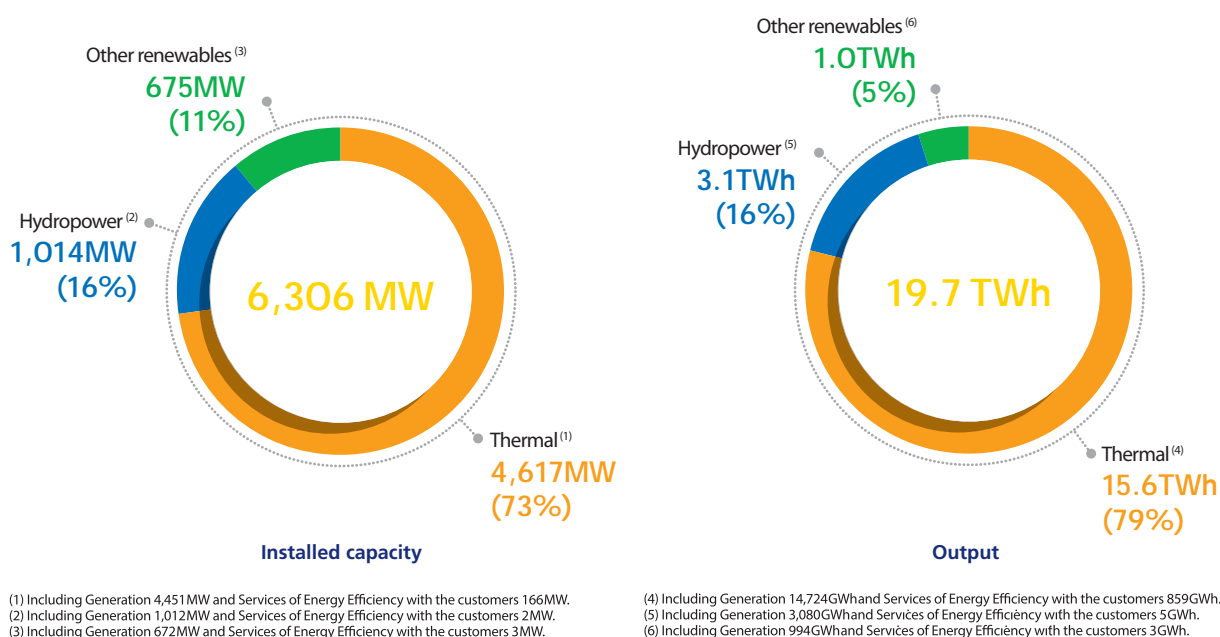
- Regarding power generation, Edison aims to increase its renewable energy generation by promoting specific capital investments in hydroelectricity and the development of wind and solar projects to optimise its electricity generation portfolio in Italy and to reduce its carbon emissions. Moreover, it intends to make the most of its high-efficiency and low carbon thermal power plants alongside renewable means of generation. The company is looking to concentrate its resources on its most efficient assets and develop new high-efficiency gas power plants if the country's energy goals enable favourable market conditions;
- Regarding gas, Edison is the EDF group's gas platform. Drawing on a varied and extensive skill set under EDF's supervision, Edison manages all of EDF's gas activities and resources in an integrated model in conjunction with EDF Trading,

which optimises its assets and undertakes short-term transactions in the European and United Kingdom wholesale markets. With effect from 1 August 2017, EDF entrusted Edison, through a contract for services, of the asset management and the development of its upstream activities (including gas and LNG supply, contract management and medium-long term optimisation, transport and storage). Beyond optimising its current portfolio, Edison also aims to contribute to the growth of the Italian gas market to improve its own competitiveness and that of the EDF group, and to enhance flexibility and security of supply;

- Regarding Exploration and Production (E&P), in 2018 Edison streamlined its operations into a new entity, Edison Exploration & Production.

#### 1.4.5.2.3 Edison's business

##### → 2018 Installed capacity and output of Edison in Italy



In 2018 Italian energy consumption amounted to 321.9TWh, only 0.4% higher than in 2017.

Net output of 280.2TWh covered 87% of national consumption, compared with 89% the previous year, with net imports of 43.9TWh (16.3% up from 2017) making up for the difference. Compared with 2017, lower thermal power output (185TWh in 2018, down by 15.3TWh), solar power output and wind power output (40.2TWh in 2018 vs 41.6TWh in 2017) were partially offset by higher hydroelectric production (49.3TWh in 2018 vs 37.56TWh in 2017) as a result of more favorable weather conditions. Based on power generation data for 2017<sup>(1)</sup>, Edison is the third-largest producer at the national level, after Enel and Eni. In 2018 its net power output in

Italy was 18.8TWh<sup>(2)</sup> which accounted for around 7% of net Italian electricity generation.

National demand for gas was 72.1Gm<sup>3</sup>, down by 3.4% in comparison with 2017 due to an 8.1% decrease in the use of gas for electricity production linked to an increase in net electricity imports and higher hydraulic production. Residential consumption fell by 1% as a result of higher end-of-autumn temperatures.

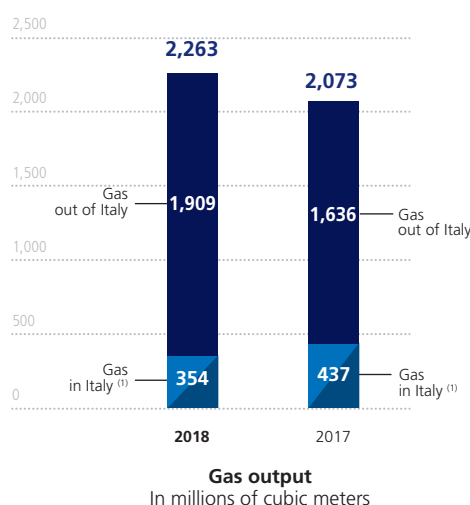
Natural gas imports in Italy represented 93% of the country's demand, and Edison made 22% of these imports, i.e. 14.6Gm<sup>3</sup>.

(1) Data published by the AEEG (ARERA report, vol. 1, p. 48, fig 2.1); 2018 data will be released in mid-2019.

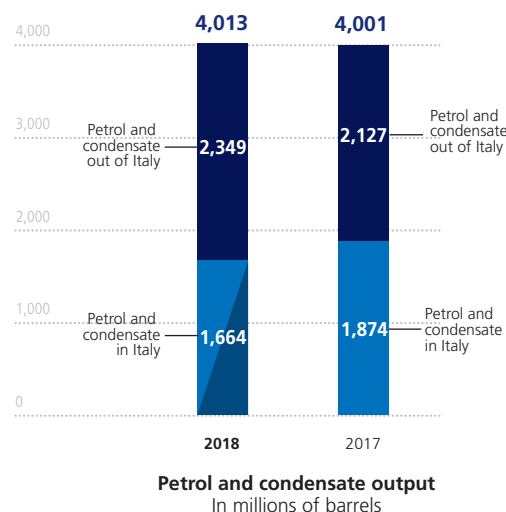
(2) See detailed output data (excluding energy efficiency services) in the chart below.



➔ **Edison's gas and hydrocarbon output**



(1) Includes a part of output from Croatia (Izabela gas field) imported into Italy since July 2014.



In Italy and abroad, the Group's gas production business through Edison increased by 9% compared with 2017, reaching 2.3Gm<sup>3</sup>.

Production of oil and condensates remained steady at 4 million barrels, of which 1.7 million barrels in Italy.

#### 1.4.5.2.3.1 Electricity generation

At 31 December 2018, Edison's installed generation capacity was 6.1GW, with net electricity output of 18.8TWh for 2018, down by 4.8% compared with 2017. This was mainly due to lower thermal power and wind power output, partially offset by higher hydraulic generation as a result of better weather.

Edison's generation fleet is currently made up of 91 hydropower plants, 14 thermal power plants, 39 wind farms, 8 photovoltaic plants and 1 biomass plant. Combined-Cycle Gas Turbines (CCGT) account for 79% of electricity generation, while hydropower accounts for 16% and combined wind and solar for 5%.

Edison operates around 1,012MW of hydropower facilities in Italy with an output of 3.1TWh (up 39% compared with 2017).

In 2018, Edison continued its venture into mini-hydropower plants with the acquisition in January of a 72.9% stake in Frendy Energy which owns 15 plants situated for the most part on irrigation canals in Piedmont and Lombardy. In late 2018 Edison acquired from Eaux Valdôtaines, a local hydropower producer in Valle d'Aosta, three mini-hydropower plants in service with a capacity of 4.6MW each, one plant under construction and another in the official approval stage.

In the renewable energies sector, Edison maintains critical mass thanks to E2i Energie Speciali srl, an entity created in 2014 in partnership with the F2i fund which has a 70% stake, the remaining 30% being held by Edison Partecipazioni Energie Rinnovabili srl, itself 83.3% held by Edison and 16.7% by EDF Renewables.

E2i holds 661MW of renewable assets and transfers 100% of the energy generated to Edison, which uses it for integrated management of its production portfolio.

EDF EN Services Italia srl, an entity owned by Edison Spa (30%) and EDF Renewables Services SAS (70%), is responsible for operating and maintaining this platform.

With the aim of developing its activities in the wind sector, at the end of 2016, E2i won a public auction for eight projects for the construction, reconstruction or

extension of wind farms, for total installed capacity of 165MW, including 153MW with the guarantee of a subsidised tariff. In 2018 E2i began building and upgrading these wind farms, financed by a 15 year €150 million credit facility granted in late 2017 by the European Investment Bank (EIB). Once the projects are completed in 2019, E2i will have added over 700MW to its installed capacity.

Apart from Edison and the partnership with F2i, EDF Renewables is active in Italy (see section 1.4.1.5.3 "EDF Renewables").

In terms of innovation, in late 2018 Edison set up its first energy storage system, with a capacity of 822kWh, at the 3.3MW solar power plant in Altomonte, Calabria, to test its compatibility with renewable generation.

From an international point of view, Edison benefits from a well-established presence in Greece, where it is one of the main electricity operators in the country, through ElpEdison SA, (Edison owns a 38% equity stake, the remaining 62% belongs to Hellenic Petroleum, Hellenic Energy and Development the Hellactor group and Halcor). ElpEdison owns two CCGT plants: one in Thessaloniki (389MW) and one in Thisvi (410MW), built by Edison and selling electricity on the private users market.

Last, Edison holds a 50% stake in Ibitermo, a subsidiary in Brazil, which operates a 226MW CCGT plant, and a 20% stake in Kraftwerke, which operates 626MW of hydropower in Switzerland.

#### 1.4.5.2.3.2 Hydrocarbons

For the implementation of its gas strategy, the EDF group, through Edison, benefits from experience developed along the entire value chain, from exploration-production through to the direct sale of natural gas.

Edison's gas supply portfolio in Italy is mainly based on long-term contracts and, in 2018, it included around 14.6Gm<sup>3</sup> of imports *via* gas pipelines and LNG, with 0.4Gm<sup>3</sup> of own production in Italy and 5.8Gm<sup>3</sup> purchased on the market.

In 2018, total sales of gas in Italy amounted to 20.7Gm<sup>3</sup> (compared with 21.3Gm<sup>3</sup> in 2017). Edison delivered 4.5Gm<sup>3</sup> of gas to the industrial sector, 2.8Gm<sup>3</sup> to the residential sector, 6.5Gm<sup>3</sup> to the thermoelectric sector (including Edison's own internal needs), and 6.9Gm<sup>3</sup> to the wholesale market.

In order to become more competitive and bolster its gas supply chain in Italy, Edison is further strengthening and diversifying its long-term import contracts.

In exploration and production, Edison possessed, at the end of 2018, 56 concessions and exploration permits in Italy and 41 abroad, and approximately 209 million barrels equivalents in reserves. Abroad, Edison's most significant asset is the Abu Qir gas field in Egypt; in early 2009, Edison purchased the exploration, production and development rights for this field for an initial period of 20 years, extendable by further 10 years. At the end of 2017, the consortium, in which Edison holds an 11.25% stake with Sonatrach, Repsol and DEA Deutsche Erdoel AG, commissioned the output of the Reggane Nord gas fields in Algeria in the Sahara desert. Lastly, Edison is also active in Croatia, the UK and Norway, where it has licences for the North Sea, Norwegian Sea and Barents Sea.

### Gas infrastructures

Edison is involved in various gas import infrastructure projects (see section 1.4.6.2.2.2 "Infrastructures"), such as IGI Poseidon, 50%-owned by Edison, a company involved in the development of several projects that aim to connect Greece and Italy (ITGI-Poseidon), Greece and Bulgaria (IGB, in 50/50 partnership with Bulgaria), as well as Greece and Cyprus (EastMed). In 2018 the final investment decision was taken to invest in the IGB project and construction will begin in 2019.

In 2017, Edison, Depa and Gazprom signed a cooperation agreement to work together in establishing a southern route for Russian gas supplies from the Black Sea, through the development of a gas pipeline project between Greece and Italy under the Ionian Sea. If geopolitical developments allow for the southern pipeline to go through Greece, the project will be able to benefit from the activities already developed on the ITGI-Poseidon project.

Edison also has the right of use of 80% of the Rovigo offshore regasification terminal's capacity (6.4Gm<sup>3</sup> out of 8Gm<sup>3</sup> a year) where LNG imported from Qatar with Ras Laffan Liquefied Natural Gas Company Limited II (RasGas II) is regasified.

Concerning LNG, in 2018 Edison began to build a Small Scale LNG supply chain to sell LNG on the wholesale market and thereby support the development of a sustainable fuel for transport by road and sea. The first stage of the project consists of setting up an onshore depot at the port of Ravenna, where the LNG will be stored via a small dedicated LNG terminal, and will be undertaken by Depositi Italiani GNL, a new entity jointly held by Edison (49%) and Petrolifera Italiana Rumena (51%). Edison will have right of use to 85% of the depot's capacity of over 1Mm<sup>3</sup> of LNG a year and will be able to supply LNG to 12,000 lorries and up to 48 ferries.

### 1.4.5.2.3.3 Sales and marketing

In 2018, Edison sold 29.4TWh of electricity in Italy (compared with 28.2TWh in 2017, i.e. up 4.2%), of which 18.8TWh were generated and 10.6TWh were purchased on the markets. Sales to end-customers amounted to 13.7TWh, up by 25.3% compared with 2017 across all segments. At the end of 2018, Edison was serving around 656,200 electricity customers and around 936,200 gas customers, both in the business and residential segments.

In February 2018, Edison finalised its purchase of GNVI (renamed Edison Energie) from Naturgy (previously Gas Natural Fenosa), thus acquiring a customer base with a very low churn rate located in Central and Southern Italy. This enabled it to extend its activities in the country and increase its customer portfolio by 50%. During the year Edison further integrated Edison Energie in its operations in order to maximise existing synergies. Edison also acquired Servigas, a residential boiler maintenance specialist with 90,000 contracts presenting a number of synergies, especially with Assistenza Casa, a firm that installs and maintains innovative household appliances and smart home systems in which Edison bought a 51% stake in 2017.

Furthermore, Edison continued expanding into the retail market with the purchase in late April 2018 of Attiva, a firm that sells gas to 30,000 end customers in Apulia.

In sales and marketing, Edison continues to grow its electricity and gas sales to individuals and to the SME segment, aiming for excellence in customer relationship and focusing on selected loyal customers. In parallel, Edison intends to maintain its position as a leader in the business-customer market by developing an advisory approach in energy as well as innovative products and services made possible by market and regulatory changes, such as customer aggregation. Improvements in the sales process in recent years have resulted in better service to customers. Growing customer satisfaction, combined with the development of low-carbon offers and value-added services targeted by segment will strengthen ties with the end market and create the conditions for an expansion of the customer base.

### 1.4.5.2.3.4 Energy services

Edison develops, sells and manages energy and environmental services via a dedicated business unit called "Energy Services Market Division" (ESMD).

The activities of Fenice as well as those of Edison Energy Solutions have been integrated into this new unit. The proposed solutions are dedicated to the development of energy efficiency projects intended for major industrial clients, small and medium-sized enterprises and tertiary customers. With the acquisition of two firms active in public services, the ESMD aims to consolidate its position in a sector that is in a growth phase in terms of the demand for energy services. Sersys' environmental activities complete the service offering.

The business models are adapted to the requirements of the customers: the ESMD's entities design, build and manage, on behalf of its customers, assets such as cogeneration/tri-generation plants, photovoltaic installations, electricity substations, thermal power plants for industrial use, cold generation power plants, compressed air generating plants, fluid distribution systems (electricity, gas, hot or refrigerated air, compressed air, industrial gas, water) and industrial water treatment plants. The range of services is completed by a consulting activity in terms of energy, management of environmental securities and internal and external training for customers and partners. The ESMD has around 420 customers; contracts with the FCA group still account for over half of Fenice's business.

The projects are developed in the form of industrial partnerships or performance contracts with customers; the financial model is also adapted to the requirements of the customer and may range from assistance to the customer with third-party financing as far as direct investment by Edison (Esco) in the projects.

As part of its growth strategy of providing an integrated service offering for all segments of the market, Edison is active in the wood pellet heating and urban heating sectors through its 51% stake in Comat Energia, acquired in March 2017. The ESMD's range was further supplemented with the purchase of a 60% stake in Magnoli & Partners, an architecture consulting firm specialising in digital models of buildings to facilitate energy efficiency.

Edison is active in the public services sector via Edison Facility Solutions (formerly Energon Facility Solutions, acquired in 2017) and Zephyro, which specialises in energy efficiency and integrated energy management, most notably for hospitals in Lombardy, Veneto and Lazio regions.

After buying 71.3% of Zephyro Spa's ordinary shares (or 70.66% of its total shares) from Prima Holding Srl in July 2018, Fenice bid for the remaining ordinary shares on the AIM Italia market. As a result of its stock purchases, Fenice now owns 99.93% of Zephyro's ordinary shares and 99.05% of its total share capital. Priced at €10.25 per share, the stock purchases cost around €106 million in total. Consequently, Borsa Italia delisted Zephyro ordinary shares and warrants from the AIM Italia market with effect from 23 October 2018. Given the further purchases, Fenice holds 99.499% of the total share capital of Zephyro.

Energy efficiency operations are carried out abroad (Spain, Poland, Morocco) by Fenice subsidiaries.

# 1. PRESENTATION OF EDF GROUP

## Description of the Group's activities

EDF Fenice Iberica, a wholly-owned subsidiary of Fenice Spa, is growing its business by consolidating its Global Energy Partner business model. It is currently positioning itself as a benchmark in energy efficiency services to industry in the Spanish market. Moreover, in 2016 it set up a subsidiary in Morocco, EDF Fenice Maroc, following the signing of a contract with an international group in the agri-food sector to build and run a wastewater treatment plant.

Fenice Poland, 100%-held by Fenice Spa, operates principally in the field of outsourced management of industrial utilities (cogeneration, heating, cooling, compressed air, electricity grid, industrial gases). It also handles various energy and associated environmental services (potable water, waste treatment, and liquid effluents). Fenice Poland also has the administrative concessions which are necessary to supply customers connected to its distribution networks (electrical, gas, heating).

### 1.4.5.2.3.5 Regulated activities

#### Gas transport and storage

Edison owns 100% of the Edison Stoccaggio company, dedicated to regulated gas-storage activities. Edison also operates three storage facilities in depleted reservoirs (fields which have been depleted of natural gas): Cellino (since 1984), Collalto (since 1994) and San Potito & Cotignola (since 2013). The volume being worked upon on all of the sites is 1Gm<sup>3</sup>.

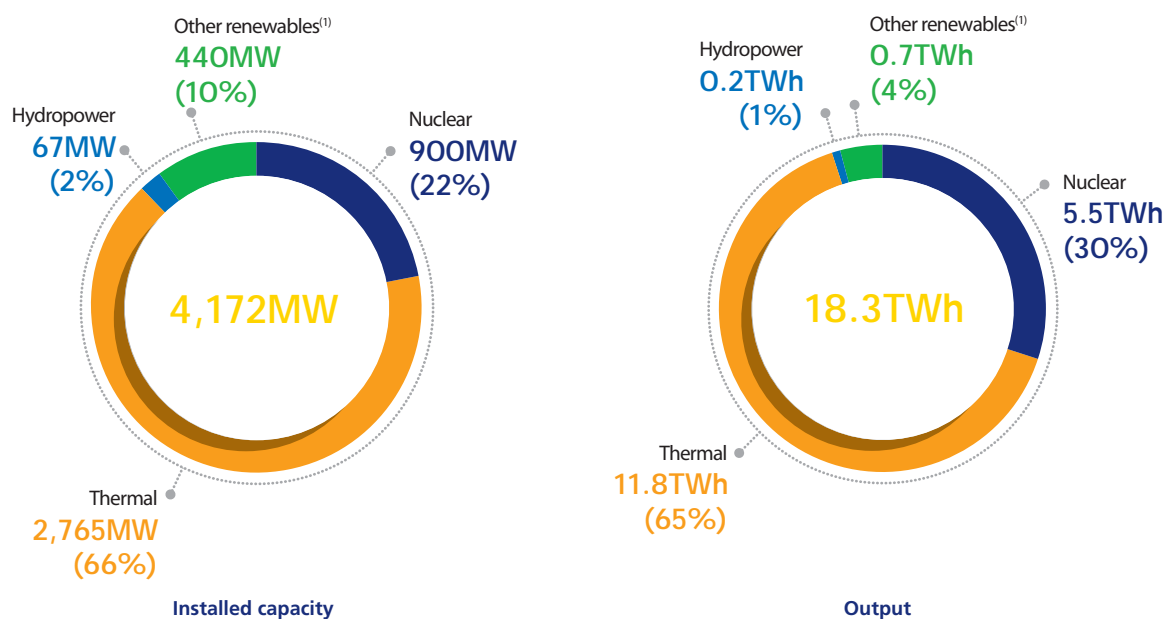
#### Distribution

Gas distribution in Italy is regulated and supervised by ARERA, the electricity and gas authority that establishes, in particular, quality and safety parameters, as well as network access rules.

### 1.4.5.3 Other international

Under "Other international" segment, at end-2018 the Group had a consolidated installed capacity of 4GW, which generated 18TWh of power in 2018.

#### ➔ Installed capacity and Output in 2018 for the "Other International" segment



(1) Excluding international data for EDF Renewables, see section 1.4.1.5.3 "EDF Renewables".

### 1.4.5.3.1 Northern Europe

#### Belgium

The Benelux region features important interfaces with the Franco-German electricity marketplace and projects for new links with Germany and with Great Britain are being examined. Benelux also constitutes an important node in the European gas market because of its numerous import and transit infrastructures, such as the Zeebrugge hub and the Dunkirk LNG terminal nearby.

The EDF group is present in Belgium mostly through its two subsidiaries, EDF Belgium and EDF Luminus. Citelum also entered the Belgian market in late 2018.

#### EDF Belgium

As part of a long-term nuclear energy cooperation agreement with Electrabel, EDF holds 50% in undivided co-ownership of the Tihange 1 nuclear power plant, through its wholly-owned Belgian subsidiary, EDF Belgium. The capacity attributed to EDF represents 481MW (or 2% of Belgian generation capacity). Tihange 1 output, which is attributed to EDF Belgium is sold to EDF (via a long-term contract renewed at the end of 2015 for 10 additional years) which, in turn, resells the electricity to EDF Luminus at a market price.

Belgium's 2003 nuclear phase-out legislation originally provided for the closure of Tihange 1 on 1 October 2015. Nevertheless, it was finally decided to extend its

operation upon 2025, following the adoption in 2012 by the Belgian government of the Equipment Plan, and the Law of 2013 amending the Law of 2003 pertaining to the timeframe for the phasing out of nuclear energy. This extension was the subject of an agreement concluded on 12 March 2014 between Electrabel, EDF and the Belgian State, defining its terms and conditions.

The extension of the lifespan of Tihange 1 requires significant investment, with EDF's share amounting to around €300 million, spread over the period from 2011 to 2020.

### **EDF Luminus**

At the end of 2018, the EDF group held 68.63% of the EDF Luminus company through its subsidiary EDF Belgium, with the remaining equity held by Belgian public shareholders.

EDF Luminus is the second largest player in the Belgian energy market after Electrabel, and it holds a balanced upstream/downstream portfolio. The company, whose market share is close to 20%, possesses almost 10% of total Belgian generation capacity with 2,129MW installed at the end of 2018. The electricity generation of EDF Luminus reached 5.2TWh in 2018. The company has 2,000 employees, including the newly-acquired subsidiaries.

As part of the Group's CAP 2030 strategic plan, EDF Luminus has the ambition of developing its wind farm fleet and accelerating the deployment of its energy services in order to provide its customers with innovative and sustainable solutions, whilst pursuing its objective of reducing costs and rationalising its thermo-electrical generation fleet.

EDF Luminus owns 10.2% (419MW) of Belgium's Tihange 2 and 3 nuclear power plants (commissioned in 1983 and 1985 respectively) and the Doel 3 and 4 plants (commissioned in 1982 and 1985 respectively), which have a lifespan of 40 years. EDF Luminus also has 100MW drawing rights on the French Chooz B nuclear power plant, based on a band of guaranteed output according to the average availability of the French fleet.

In 2018 most of these plants experienced extended unplanned outages:

- Tihange 2 has been down since August 2018 to test for possible concrete degradation;
- Tihange 3 has been down since May 2018 due to concrete degradation;
- Doel 3 was shut down in 2017 and only brought back online in August 2018 after civil engineering works;
- Doel 4 was shut down from August to late December 2018.

Apart from the drawing rights in the nuclear fleet, EDF Luminus also possesses a thermal fleet comprising several power plants (combined cycles and open cycles) for an installed capacity of 1,208MW.

The Seraing steam gas turbine met its strategic reserve obligation for the period from November 2017 to the end of October 2018. The plant came back online after the strategic reserve mechanism was not renewed.

Separately, EDF Luminus decided to postpone the final shutdown of the open cycles of Angleur 3 and Izegem until 31 October 2019 and has informed the competent authorities. EDF Luminus also brought the Ham plant back online on 22 October 2018 in order to help secure Belgium's electricity supply for the 2018/2019 winter.

EDF Luminus is moreover present in renewable energies with 7 hydropower plants and 52 onshore wind farms totalling 189 turbines spread across Wallonia and Flanders. Since the end of 2015, the company has been the leader in onshore wind farms in Belgium and now has an installed capacity of 438.5MW. In 2018, EDF Luminus erected 24 wind turbines for a total capacity of 62.8MW. It also bought MegaWindy CVBA, an onshore wind farm operator in Flanders. MegaWindy owns land titles which should allow for the development of around 40MW in power.

### **Sales and marketing**

Under its "Luminus" brand, EDF Luminus supplies electricity and gas to around 1.7 million residential and business customers (number of delivery points) in Belgium, with a net loss of 25,000 customers in B2C (business-to-customer) in 2018.

### **Energy services**

The company is involved in the energy services segment for residential customers, through its subsidiaries Rami Services, Dauvister, Leenen and Insaver, by installing and maintaining boilers, selling and managing a smart thermostat (Netatmo),

installing solar panels and providing Comfort services in the event of unforeseen damage to housing. At the end of 2018, the B2C portfolio for these last three services exceeded 175,000 contracts due to a sharp increase in sales in 2018.

For its industrial customers, EDF Luminus together with ATS, Vanparijs, Dauvister and Newelec, offers comprehensive integrated electricity and heating solutions to industrial customers. In addition, its subsidiary EDF Luminus Solutions (in which EDF Luminus and Dalkia own a 51% and 49% stake respectively) is dedicated to energy efficiency services for facilities such as administrative buildings, hospitals, schools, sports facilities, swimming pools and apartment complexes on the basis of an energy performance contract.

In 2018, EDF Luminus pursued its strategy to expand into energy services by acquiring HVAC firms such as M. Lemaitre SA (via Newelec) and Holding Léonard SPRL (via Dauvister). Gezel II, a subsidiary of ATS, acquired Acar NV, a heating firm, in order to broaden its market reach. EDF Luminus also set up Demainvest SA with SOGEPA (the Wallonia public investment fund) to undertake energy efficiency and renewable energy projects at firms in receivership in which SOGEPA holds a stake as well as in business districts.

In 2018, under its "Plan Lumières 4.0", SOFICO (the Wallonia infrastructure investment fund) awarded the PPP contract to replace the lights on the highways in Wallonia to the LuWa consortium made up of Citelum, EDF-Luminus, CFE and DIF. The project to refit Wallonia's highway network with "smart" LED lights will take 20 years to complete.

### **The Netherlands**

Through a joint venture, Sloe Centrale BV, the EDF group and PZEM (formerly Delta) (each holding 50%) own an 870MW CCGT power plant in the southwest of the Netherlands, whose two 435MW units were commissioned in 2009. Thanks to its very high technical performance, the Sloe plant was called upon to operate in 2018 for 4,923 hours, an excellent performance under market conditions that were not very favourable to gas power plants.

### **Switzerland**

The EDF group is present in Switzerland through its investments in Alpiq Holding SA (25%), a listed company, and in hydropower facilities in Le Châtelot (50%), Emosson (50%) and Mauvoisin (10%).

Alpiq is a significant player in the European energy market, active in the generation, sale and trading of energy, and supplies more than one third of Switzerland's electricity. At the end of 2018, installed capacity was 6,100MW, broken down as follows: nuclear (738MW), thermal (2,333MW), hydropower (2,701MW) and other renewables (328MW).

In 2018, its sales amounted to CHF 5,186 million. In terms of sales, Alpiq is top-ranked among Swiss electricity companies.

In accordance with its terms, the current consortium agreement between Alpiq's founding shareholders, entered into in 2005, will expire in September 2020 following its termination by EDF.

### **Germany**

EDF Deutschland GmbH, a wholly-owned subsidiary of EDF International S.A.S. based in Berlin, is in charge of the Group's activities in Germany. This entails concentrating on new energy business models and innovative solutions to facilitate Germany's energy shift (Energiewende). EDF Deutschland also represents the Group in leading German political and economic circles.

The EDF group also has storage for natural gas in salt cavities located in Etzel in Lower Saxony. The aboveground facilities are operated through a 50/50 joint-venture with EnBW (see section 1.4.6.2.2 "Gas assets and projects"). Via its subsidiary EDF Gas Deutschland, EDF also holds a 16% stake in BEP gas pipelines (Bunde-EtzelPipelineGesellschaft).

The Group owns 50% of a run-of-river hydropower plant located in Iffezheim on the Rhine River (148MW, 5 turbines, extension work on this plant was completed in 2013).

EDF Deutschland increased its stake in ubitricity from 11.67% to 18.21%. The Berlin startup markets a smart electric vehicle charging solution which will enhance the range of electric mobility services offered by the EDF group.

# 1. PRESENTATION OF EDF GROUP

## Description of the Group's activities

Including the installed capacity of Futuren, EDF Renewables had 185.8MW of gross installed wind power capacity in Germany at 31 December 2018. The Eckölstadt wind farm was also brought back online and repowered. Repowering (or upgrading) consists of replacing old or used plant equipment. EDF Renewables also owns Off-Shore Wind Solutions (OWS), a German firm specialising in the operation and maintenance of offshore wind farms, which it acquired in 2017 via its German subsidiary REETEC, a provider of onshore and offshore wind power services (see section 1.4.1.5.3 "EDF Renewables").

Based in Erlangen (Bavaria), Framatome GmbH has 3,500 employees, making the subsidiary Framatome's second largest engineering concern in the world. Its main business is maintaining, prolonging and upgrading nuclear plants all over the world (especially Instrumentation & Control systems). It is also involved in the building of EPRs in France, Finland, China and the UK. Framatome is also active in electricity and hydrogen storage in Germany. Framatome's other German subsidiary, Advanced Nuclear Fuels GmbH (ANF), makes fuel assemblies for PWRs and BWRs in Germany and Europe and has 430 employees in Lingen (head office) and Karstein.

EIFER, a research centre which reports to EDF's R&D department, is based in Karlsruhe and has more than 110 employees. Its work focuses on the optimisation of energy resources and decentralised generation (integration of renewables), energy in cities and local communities as well as energy conservation and the environment (electro-mobility, Power-to-Gas, Smart Cities).

Electranova Capital holds a stake of around 13.4% in Sunfire, a Dresden-based company which develops high-temperature electrolyzers (Power-to-Gas and Power-to-Liquids).

Lastly, EDF Trading actively participates on commodities market in Germany, especially the intraday and gas markets.

### 1.4.5.3.2 Central and Eastern Europe

#### Poland

On 13 November 2017, EDF finalised the sale of EDF Polska's assets (cogeneration and electricity generation) to PGE Polska Grupa Energetyczna SA after obtaining all the regulatory approvals and authorisations required under the sales contract signed between EDF and PGE on 19 May 2017.

EDF group is present in Poland, through its subsidiaries EDF Renewables, DK Energy Polska and Fenice Poland, and intends to remain the Polish government's partner in the development of the country's energy mix and its nuclear programme.

#### Russia

The EDF group is present in Russia in the energy services sector via Fenice Rus, a subsidiary of Dalkia (see section 1.4.6.1.1 "Dalkia").

### 1.4.5.3.3 Southern Europe

#### Spain

At 31 December 2018, the EDF group held 31.48% of the capital of Elcogas, a 320MW power plant of the ICCG type (Integrated Combined-Cycle Gasification), alongside Endesa Generación (40.99%) and Iberdrola Generación (12.0%). As the profitability of the power plant was no longer assured, it was disconnected from the network in 2016 and its dismantling was initiated. On 25 April 2017, Elcogas agreed to sell land and facilities to Ence, a pulp manufacturer. Ence intends to develop and build a 50MW biomass plant on the site. Given that Elcogas is no longer profitable, the Company will be liquidated in the coming months.

The Group is also present on the Spanish market through the local subsidiary Fenice (EDF Fenice Ibérica, see section 1.4.5.2 "Italy") and the Citelum subsidiary (see section 1.4.6.1.2 "Citelum").

In 2018 Citelum took part in an initiative by the city of Almería in Andalusia to measure and reduce light pollution. In Sant Cugat del Vallès in Catalonia, Citelum is continuing to develop new connected services to improve life in the Spanish smart city and, to that end, installed an innovative noise sensor system connected to street lights.

EDF Trading operates in this market from its trading platform in London (see section 1.4.6.3 "Optimisation and trading: EDF Trading").

Framatome Ibérica is active in Spain through various engineering and maintenance contracts with firms that own nuclear reactors.

Lastly, since 2015, EDF Invest has held a minority stake in Madrileña Red de Gas, the operator of the main gas distribution network in the Madrid region.

### 1.4.5.3.4 North America

The EDF group operates throughout the North American continent, with a strong presence in the United States.

It has more than 8.9GW of installed capacity in North America. It also manages, on behalf of third parties, around 52GW of installed capacity under operation and maintenance or optimisation services contracts.

EDF's activities in North America mainly include:

- investments in nuclear generation, related to its 49.99% stake in CENG ("Constellation Energy Nuclear Group"), a joint venture with the Exelon group (leading American nuclear operator) in three nuclear power plants. CENG has installed capacity of 4GW (i.e. 2GW consolidated by EDF group). These three facilities are operated by Exelon;
- renewable energies, with a net capacity of 6.9GW, mainly located in the United States through EDF Renewables North America, a wholly-owned American subsidiary of EDF Renewables. Equally, EDF Renewables Services (a wholly-owned subsidiary of EDF Renewables North America) manages close to 10GW in North America through operation and maintenance contracts on its own account or on behalf of third parties;
- trading, throughout the entire value chain in North American gas -and electricity markets through EDF Trading North America, and the supply of energy management products in the US and Canada through EDF Energy Services (a wholly-owned subsidiary of EDF Trading North America);
- energy services, local management of energy and energy efficiency, under the management of Dalkia and its subsidiaries Dalkia wastenergy, Groom Energy Solutions and Aegis Energy Services;
- R&D and Innovation, as part of EDF Innovation Lab;
- urban street lighting, via Citelum, a wholly-owned subsidiary of EDF.

#### 1.4.5.3.4.1 Nuclear activities in the United States

##### Nuclear generation: Constellation Energy Nuclear Group (CENG)

On 6 November 2009, the EDF group and CEG established CENG. Since the merger between Exelon and CEG, EDF and Exelon have owned stakes of 49.99% and 50.01% respectively in CENG. EDF and Exelon agreed in 2014 to transfer the power plant operating licenses of CENG to Exelon. Pursuant to this agreement, Exelon manages the day-to-day operations of the three CENG nuclear sites (five nuclear reactors).

As part of the transaction, in 2016, CENG paid EDF US\$400 million in special dividends and EDF was granted a put option to sell its CENG shares to Exelon at fair market value exercisable between 1 January 2016 and 30 June 2022.

CENG is governed by a Board of Directors of ten members, five of whom are appointed by the EDF group and the other five, including the Chairman, by Exelon.

##### CENG's nuclear activities

CENG's nuclear business is under the control of the US Nuclear Regulatory Commission (NRC).

CENG operates five nuclear reactors, spread across three operating sites and representing a combined capacity of 4,272MW. The duration of licences for Units 1 and 2 of Calvert Cliffs, Unit 1 and 2 of Nine Mile Point and RE Ginna is 60 years.



Reactors	Capacity (in MW)	% interest	Company-owned capacity (in MW)	Output <sup>(2)</sup> (TWh)	
				2018	2017
Calvert Cliffs 1	908	100	908	7.29	7.83
Calvert Cliffs 2	881	100	881	7.70	7.27
Nine Mile Point 1	620	100	620	5.31	4.89
Nine Mile Point 2 <sup>(1)</sup>	1,287	82	1,056	8.29	9.11
RE Ginna	576	100	576	4.70	4.70
<b>TOTAL</b>	<b>4,272</b>		<b>4,041</b>	<b>33.29</b>	<b>33.80</b>

(1) CENG owns 82% of this unit (i.e. 1,056MW of the unit's total capacity of 1,287MW). The 18% of Unit 2 of Nine Mile Point not owned by CENG belongs to the Long Island Power Authority (LIPA). LIPA receives 18% of the capacity and electricity generated by Nine Mile Point Unit 2, in consideration for payment to CENG of its share of the costs incurred by the unit, and is responsible for its 18% share of the costs of dismantling the unit. CENG and LIPA are each required to provide specific funding for Nine Mile Point 2.

(2) These values correspond to the sum of the exact values expressed to one decimal place after rounding.

The assets of EDF represented 2% of the US nuclear generation capacity and 0.4% of total electricity generation (2017 data). The principal competitors of CENG on this market are Entergy, AEP, Exelon, Dynegy and NRG.

### Regulations of the State of New York

On 1 August 2016, the New York Public Service Commission (NYPSC) issued an ordinance establishing a new regulation, the Clean Energy Standard (CES), of which one of the aspects is aimed at the preservation of nuclear resources in the State of New York, by the recognition of their zero-carbon electricity generation environmental characteristics. The mechanism includes the creation of a programme of zero emission credits (ZEC: Zero Emission Credit) in order to preserve the low-carbon nuclear generation installations, which comply with the criteria determined by the NYPSC. The New York State Energy Research and Development Authority (NYSDERDA) centralises the award of ZECs to eligible power plants via a 12-year contract, administered in six tranches of two years, with effect from 1 April 2017 until 31 March 2029. The payment of ZECs to eligible producers will be made on the basis of the number of megawatt-hour produced, subject to caps and minimum performance requirements. The price to be paid for the ZEC for each tranche will be determined administratively using a formula based on the social cost of carbon estimated by the federal government in 2016. This formula also includes downward adjustments related to price fluctuations in the energy market and capacity. For the first tranche (from 1 April 2017 to the end of March 2019), the price of a ZEC was fixed at \$17.48 per MWh generated. For the following tranches, the price will be updated every two years.

Each electricity supplier ("Load Serving Entity") is required to purchase a ZEC volume consistent with its market share in the State of New York. Recovery of program costs from customers who benefit from regulated tariffs is included in their electricity bills.

The NYPSC has established that Ginna and Nine Mile Point nuclear facilities are eligible for the ZEC program. On 18 November 2016, agreements for the sale of ZECs for Ginna and Nine Mile Point were signed with NYSDERDA. During the 2018 fiscal year, CENG recognised \$312.5 million for the sale of ZECs.

Environmental groups filed a petition, aimed at invalidating the ZEC program, in a New York state court on 30 November 2016. The petition was amended on 13 January 2017. This petition contends that NYPSC is not empowered to set up this program, that it violated state environmental law, and that it violated certain technical provisions of New York State law on administrative procedures (SAPA). On 15 February 2017, CENG filed a motion to have this case dismissed. On 22 January 2018, the court dismissed the environmental claims and the majority of the plaintiffs from the case but denied the motions to dismiss with respect to the remaining five plaintiffs and claims, without commenting on the merits of the case. The case is now proceeding to summary judgment with the full record. CENG's answers and briefs were filed on 30 March 2018. After briefing is completed, the court will decide whether or not to set the case for hearing.

On 19 October 2016, a coalition of thermal energy generation companies filed a complaint before the New York federal district court against NYPSC, alleging that the ZEC program would violate certain provisions of the US constitution, and more specifically that it would interfere with regulatory requirements of the Federal Energy Regulatory Commission concerning wholesale tariffs and that it would constitute discrimination against competitors from other states. On 9 December 2016, CENG

filed a motion to intervene in the case and to dismiss the lawsuit. The State also filed a motion to dismiss. On 25 July 2017, the court granted both motions to dismiss. On 24 August 2017, the plaintiff appealed the decision to the U.S. Court of Appeals for the Second Circuit. On 27 September 2018, the U.S. Court of Appeals for the Second Circuit affirmed the lower court's dismissal of the complaint against the ZEC program.

### 1.4.5.3.4.2 EDF Trading in North America

EDF Trading operates in the North American markets for electricity (including transmission rights), gas, coal and environmental products. EDF Energy Services is the commercial and industrial retail arm of EDF Trading and provides management and optimisation services to large-scale energy intensive commercial and industrial customers throughout North America (see section 1.4.6.3 "Optimisation and trading: EDF Trading").

### 1.4.5.3.4.3 EDF Renewables in North America

EDF Renewables, through its subsidiaries EDF Renewables North America, EDF Renewables Canada and EDF Renewables Mexico continued its expansion in North America, commissioning 272.6MW gross of wind, solar photovoltaic and biogas capacity in 2018.

EDF Renewables Services manages wind and solar projects, both for the company's own accord and on behalf of third parties (see section 1.4.1.5.3 "EDF Renewables").

### 1.4.5.3.4.4 Dalkia in North America

Dalkia, a wholly-owned subsidiary of the EDF group, is present in the North American energy services markets (local management of energy and energy efficiency) with 521 employees. Dalkia operates through its companies Dalkia Wastenergy in Canada, Groom Energy Solutions and Aegis Energy Services in the United States (see section 1.4.6.1.1 "Dalkia").

### 1.4.5.3.4.5 Research & Development

EDF has an R&D and Innovation team (EDF Innovation Lab) located in Los Altos, California, which assists EDF group with research, development and innovation as well as with its development in the United States (see section 1.6.3 "International business and partnerships"). To this end, EDF Innovation Lab analyses new technologies and start-ups, develops products and tests solutions locally. In 2016, this team identified the Company Off Grid Electric (OGE), EDF's partner in the supply of competitive off-grid solar energy in the Ivory Coast (see section 1.4.5.3.9 "Off-grid energy").

### 1.4.5.3.4.6 Citelum in North America

Citelum, an EDF subsidiary in the field of urban street lighting, is also present in the United States (see section 1.4.6.1.2 "Citelum"). In 2018, Citelum has implemented more than 20,000 LED streetlights in the city of Albuquerque and developed an Internet of Things (IoT) architecture and deploy a central management system. Through this contract, Citelum USA is committed to reducing energy consumption and maintenance costs for a 15-year period, as well as providing better lighting and services. Citelum has been awarded by the city council of Dover (Delaware) for the 1<sup>st</sup> phase of their planned streetlight project (inventory and photometric analysis).

#### 1.4.5.3.4.7 Framatome in North America

Operating in nuclear energy in the United States since the 1950s, Framatome holds a large share of the market, involved in providing power to some 36 million American households. Its mission consists of ensuring the maintenance and modernisation of the American nuclear plants in operation and provide it with the fuel required and support the construction of new plants (also see section 1.4.1.3 "Framatome").

#### 1.4.5.3.5 South America

In South America, the EDF group is present in the Brazilian and Chilean markets, and is extending its ambitions in certain countries in the region, in which it is prospecting for development opportunities.

##### 1.4.5.3.5.1 Brazil

Since April 2014, the Group has held 100% of EDF Norte Fluminense (EDF NF), following the buyback of the 10% equity interest held by Petrobras in the share capital of EDF Norte Fluminense. The company, which built and has operated since the end of 2004 the Combined-Cycle Gas plant of Norte Fluminense, with installed capacity of 826MW, located in the region of Macaé, has a supply contract for 725MW to the Light distribution company over a 20-year period. In 2018, the power plant's generation increased to 4.9TWh. When Brazil's market conditions and electricity grid permit, the remaining balance is sold on the open electricity market. In 2018, EDF Norte Fluminense sold 219GWh, between its own generation (167GWh) and other energy transactions.

EDF Norte Fluminense has an additional solar power plant, intended for industrial consumption, comprising 1,764 photovoltaic modules which generated 370MWh in 2018, helping to reduce its CO<sub>2</sub> emissions by around 155 tonnes.

In addition, on 11 December 2014, through its subsidiary EDF Norte Fluminense, EDF acquired a 51% stake in Companhia Energetica de Sinop (CES), which is responsible for building the Sinop hydropower plant with an installed capacity of 408MW. Construction of the dam began in spring 2014 and is now complete with the reservoir ready for filling since 1 October 2018. In late January 2019, EDF obtained permission to begin filling the reservoir following an agreement between the stakeholders on the operating procedures to do so. The resulting delay of a few months has in turn resulted in the opening of the plant being postponed and thereby raised its costs under the terms of its power purchase agreements (PPAs). Filling of the dam began on 30 January 2019 and reached 292 metres by 19 February, which corresponds to a level that allows for a technical observation of the facilities and the start of technical testing prior to commissioning. Following the first analyses, additional work was undertaken and Sinop Energia hopes to commission the dam before the end of the second quarter 2019.

In the first quarter of 2018, EDF NF won the call for tenders to operate and maintain the Sinop plant. The agreement between EDF NF and CES came into effect in April 2018 to give time for preliminary requirements to be met before the plant is commissioned.

In line with the CAP 2030 strategic plan, the EDF Renewables subsidiary is accelerating its development in Latin America and notably in Brazil, where it entered the solar energy market with the two-stage acquisition from Canadian Solar Inc. of the Pirapora I (399MWp) solar project in the north of the state of Minas Gerais. EDF Renewables has been present in the country since February 2015, following the acquisition of more than half of the portfolio of Ventos da Bahia. See section 1.4.1.5.3 "EDF Renewables".

EDF is also present in Brazil via:

- Edison, of which the 50%-held subsidiary Ibiritermo operates a CCGT of 226MW in the state of Minas Gerais;
- a subsidiary of Citelum created in 1999 and specialising in street lighting. EDF's main competitors in Brazil are ENGIE, Neoenergia, CPFL, ENEL and EDP. In 2018 Citelum won the street lights contract in Macapá, the capital of the northern state of Amapá, and renewed its contracts in Sobral in the state of Ceará, Poá in the state of São Paulo and São Luis in the state of Maranhão.

##### 1.4.5.3.5.2 Chile

Since 2013, EDF is jointly developing with its Chilean partner Andes Mining & Energy (AME) a gas to power project combining the design, construction, and operation of a CCGT-type power plant with a power output of around 600MW, a storage infrastructure and an LNG Floating Storage Regasification Unit (FSRU). Via

its subsidiary EDF Chile, created in 2014 for this purpose, the Group has a 50% shareholding in the two project companies (Penco-Lirquén LNG terminal and El Campesino power plant), alongside BiobioGenera (50%) of which AME is the controlling shareholder.

This "gas to power" project is part of Chile's energy policy, aimed at a balanced mix of gas, hydraulic and renewable energy generation. The project nonetheless suffered a setback when the Chilean Supreme Court, in a decision on 30 January 2017, revoked the permit for the Penco Lirquen regasification terminal. At this stage, various measures have been taken to further the Group's expansion into electricity generation in Chile, including resuming the process to obtain a permit. It should be granted in the first half of 2019. In addition, in December 2017, the El Campesino power plant signed an agreement to acquire ESSA, the owner of a 750MW generation asset. The agreement was signed in May 2018.

EDF Renewables is also active in Chile via the Boléro solar plant (146MWp) in the Atacama Desert, the Santiago Solar photovoltaic project (115MWp) which is jointly held with AME and opened in January 2018, and the Cabo Leones 1 wind farms (115MW) which came online in June 2018. See section 1.4.1.5.3 "EDF Renewables".

Lastly, Citelum, a wholly-owned subsidiary of the EDF group, is also present in the country, in the street lighting market (see section 1.4.6.1.2 "Citelum"). In 2018, Citelum replaced 95% of street lights in Independencia (Santiago Province), helped reduce the town's electricity consumption by 50% and designed various artistic lights to illuminate its most iconic sites and monuments. In Lo Barnechea, Citelum renewed and won several contracts and currently manages 23,315 street lights.

#### 1.4.5.3.6 Asia-Pacific

The EDF group's activities in the Asia-Pacific region are focused on China and fast developing countries. The presence in the sectors of electricity generation, networks and services constitutes an industrial challenge for the Group. In nuclear power, in addition to the project to build and operate two EPR reactors in Taishan, new projects should provide the Group with access to technological innovation and enable it to exploit its industrial expertise.

EDF's objective is, thus, to maintain its competitive and technological advantages in the international arena focused on the global nuclear programme, the equipping of emerging countries, and the perspective of the French fleet renewal.

##### 1.4.5.3.6.1 China

The EDF group has been present in China for more than 30 years through its advisory services in nuclear, thermal and hydraulic technologies. Today, it is one of China's most significant foreign investors in electricity generation, with investments in coal-fired thermal power plants that have a total installed capacity of 2,000MW<sup>(1)</sup>. With the Taishan project Phase I (two 1,750MW reactors), EDF also became an investor with a 30% stake in an electricity generation project involving an EPR-type nuclear power plant. Lastly, the EDF group has been involved in renewable electricity generation in China since 2016 and is developing partnerships which open up new prospects for investment in the nuclear industry, renewable energies, energy services and engineering.

#### Nuclear power generation activities

##### Daya Bay, Ling Ao and Taishan EPR Phase I power plants

After having led the design, construction and commissioning in 1994 of Daya Bay (two nuclear reactors of 1,000MW each) and then assisted the Chinese group China General Nuclear Power Co. (CGN) in the construction of the Ling Ao Phase 1 power plant (two reactors of 1,000MW commissioned in 2002 and 2003), followed by Phase 2 (two additional reactors of 1,000MW commissioned in 2010 and 2011), EDF is currently providing assistance to the CGN group with the operation of its entire fleet. The performance achieved by these power plants since commissioning is one of the Group's main benchmarks in China. In addition, EDF owns a 30% shareholding in Taishan Nuclear Power Joint Venture Company Ltd., which was set up to fund, build and operate two EPR nuclear reactors in Taishan, in the province of Guangdong. Through this project, the Group represents the first foreign investor in Chinese nuclear power generation. The project's success will rest on the complementary expertise of the EDF and CGN groups. The project reached two milestones in 2018 with the reactors reaching first criticality on 6 June and coming online on 29 June. Unit 1 came into commercial operation on 13 December 2018 and the same is planned for Unit 2 in 2019 (see section 1.4.1.2.2 "Other "New Nuclear" projects").

(1) Share in the capacity corresponding to EDF's stake.

### Partnership agreements

The General Partnership Agreement between EDF and CGN was signed in 2007 and complemented in 2014 by implementation of agreements related to engineering, R&D, and plant operation. The EDF group has set up a facility based in Beijing and Shenzhen (the Group's front office for China's nuclear industry) with the aim of promoting the EDF model of an integrated architect-assembler operator while acting as a flagship for French industry and positioning itself to support the Group's projects, in partnership with the Chinese nuclear sector. Experts in this facility are working, in particular, to further promote French codes and standards, as well as the Group's nuclear safety guidelines. The organisation also hosts the representative of the *Partenariat France Chine Électricité* (PFCE) association chaired by EDF and made up of qualified suppliers of EDF which are seeking to develop in China.

In 2010, the Group concluded a partnership framework agreement with China National Nuclear Corporation (CNNC), extended in March 2014, aimed at developing their cooperation along deeper, global lines. Also in 2013, the Group signed an agreement with CGN and AREVA - Framatome, which prepared the terms for the construction of future reactors and provided for EDF's contribution to CGN's operating fleet and its evolution.

The partnership with CGN enabled the initiation of discussions concerning its participation in joint nuclear projects in Great Britain, which resulted in the signature by EDF and CGN of the final contracts for the Hinkley Point C power plant on 29 September 2016. An agreement covering the development of the UK Hualong technology was also signed at that time.

Lastly, in the context of the Franco-Chinese governmental declaration of June 2015, tripartite agreements (EDF and AREVA - Framatome with CGN and CNNC) were signed in 2015, providing for the continued EPR construction in Taishan, the participation of the Chinese industrial customers in Great Britain, as well as a partnership for the development of medium- and large-sized reactors. In addition, an agreement between AFCEN and NEA (National Energy Administration) covering cooperation as regards codes and standards was signed in November 2017. Its objective is to promote mutual recognition of nuclear codes and standards and to establish a basis for cooperation between France and China enabling both countries to operate on the international nuclear market.

The joint statement endorsed by the French and Chinese Presidents in January 2018 welcomes the cooperation between French and Chinese industrial players on EPR, particularly in Taishan, and calls for further joint efforts on British projects (Hinkley Point C, Sizewell, Bradwell).

### Framatome

With 35 years' experience in China, Framatome offers its customers boiler safety instrumentation & control systems, equipment, services and fuel. As the designer of the EPR, Framatome is building the Taishan 2 reactor and providing some equipment as well as the fuel for Chinese-designed Hualong reactors. Framatome operates in China via joint ventures with Dongfang Electric Corporation (FDJV) and China National Nuclear Corporation (CAST) and through its wholly-owned subsidiary Framatome Nuclear Services (FNS). Framatome conducts its business from Beijing with offices in Lianyungang, Shanghai, Qinshan, Fuqing, Daya Bay and Taishan.

### Coal-fired thermal power generation activities

#### Shandong Zhonghua Power Company Ltd. (SZPC)

The EDF group holds 19.6% of SZPC, a company which owns three coal-fired power plants in the Shandong province, commissioned between 1987 and 2004, with a total capacity of 3,060MW. The other shareholders are the Guodian group (which merged with Shenhua in 2017 to form a new group, State Energy Investment Group) and the Hong Kong electricity producer CLP.

#### Datang Sanmenxia Power Generation Company Ltd. (DSPC)

The EDF group holds 35% of DSPC, the Company that owns the Sanmenxia 2 power plant in Henan province, commissioned in 2007, with an installed capacity of 2x600MW, using a technology known as "supercritical coal". This investment was made through a joint venture with a fixed lifespan, established by the Chinese authorities, running until 2039. The other shareholders are two Chinese companies, including the Datang Group, which has a majority stake in which DSPC.

#### Fuzhou Power Generation Company (FZPC)

The EDF group holds 49% of FPC, a joint-venture created in 2014 with a subsidiary of the Datang group to build and operate an "ultra-supercritical" coal-fired thermal power plant (2x1,000MW) in the Jiangxi province. The first unit was commissioned

in December 2015, the second in April 2016. Fuzhou is thus the first power plant of the "ultra-supercritical" type (in other words, having increased output and a limited environmental impact) in which the EDF group has a stake. This technology makes it possible to reach high levels of temperature and pressure in the boiler, assuring a better output (close to 44% for Fuzhou) than a traditional power plant, while decreasing coal consumption and CO<sub>2</sub> per kilowatt-hour generated.

### Renewable energies

EDF Renewables holds an 80% interest in UPC Asia Wind Management (AWM) which develops and builds wind projects in China with a team of 100 employees. Through AWM, the EDF group has an equity stake in six wind power plants (including two under construction) for total installed capacity of 315.3MW (140.2MW in proportion to EDF's equity) as well as a project pipeline under development representing several hundred MW. In 2018 EDF Renewables diversified into distributed solar power by setting up a joint venture with ACC aimed at developing rooftop solar panels for industrial customers (EDF owns 15.7MW of the planned capacity of 20.9MW, in proportion to its stake). EDF Renewables also set up a joint venture with Qilu Transportation to install ground-mounted solar panels along highways operated by Qilu in Shandong province. See section 1.4.1.5.3 "EDF Renewables".

### Research & Development (R&D) activities

Seven years after its creation, EDF's R&D centre in China has stepped up support to EDF China's Divisions and is deploying its expertise on priority thematic areas for EDF's development in China. The Centre's activities involve the generation and storage of low-carbon electricity, innovative electricity grids, local multi-energy systems, energy engineering, electric mobility and open innovation. Modelling and digital simulation capacities are a strong component in each one of these fields.

### Energy services

In the city of Sanmenxia (Henan province), EDF set up a joint venture (of which 65% is held by EDF) for the construction and operation of an urban heating network using the recovery of unavoidable heat emitted by thermal power plants of its partner Datang. The concession agreement, for a period of 30 years, was signed on 9 August 2016 and the network entered into commercial operation on 15 November 2016. After the success of the first heating season, the municipality of Sanmenxia decided on 29 August 2017 to extend the concession area granted to the joint venture and to reduce CO<sub>2</sub> emissions by 200,000 to 240,000 tonnes per year starting from 2021.

In the city of Lingbao (Henan province), EDF set up a joint venture on 13 November 2017 with the municipal investment company (of which 65% is held by EDF) to build and operate a heating network powered by a 35MW biomass cogeneration power plant. The 30-year concession agreement was subscribed on 9 January 2018 as part of the French President's state visit to China. Construction on the power plant is expected to begin in Q1 2018. This project will provide additional income to local farmers and will allow for the controlled elimination of agricultural waste and the avoidance of 150,000 tonnes of CO<sub>2</sub> per year.

In the city of Sanya (Hainan province), EDF and its partner Changfeng Energy were chosen on 8 August 2017 by the municipal government to complete a network of multi-energy plants in the city's tourist areas under a 30-year concession agreement. This initiative will make it possible to supply cooling (air conditioning) and sanitary hot water to hotels, shopping centres and hospitals. The joint venture (of which 50% is held by EDF) was set up on 6 November 2017 and the concession agreement was signed on 9 January 2018 in the presence of the French and Chinese Presidents. This project will enable the avoidance of 20,000 to 70,000 tonnes of CO<sub>2</sub> per year.

Concerning energy services, the contract signed with Dongfeng Peugeot Citroën Automobile in Wuhan in 2013 for street lighting was extended in 2014 and 2015. EDF is also working with the municipality of Wuhan for the planning, development and operation of energy services in the Franco-Chinese eco-district of Caidian. An initial contract was signed in 2016 for the completion of two pilot projects covering street lighting and the energy efficiency of a test building.

The Group also proposes to bring innovative solutions to industrial customers and eco-districts by drawing on EDF's expertise in Europe, particularly in the fields of smart grids, cogeneration, waste heat recovery and decentralised renewable energies (heat pumps, district solar, biomass and geothermal power).

### Engineering services

EDF is looking at ways to support investments in new engineering-based business models, for example "incremental" distribution networks and the sale of electricity. EDF also offers on-demand engineering services to its Chinese partners to foster long-term partnerships and access Chinese technology such as supercritical carbon dioxide and concentrated solar power (CSP).

### Other EDF group activities in China

Citelum subsidiary is also present in this country for public lighting, through the contract signed with Kunming city.

#### 1.4.5.3.6.2 Southeast and Southern Asia

The EDF group's activities in Southeast and Southern Asia are focused on the development of the electricity sector, particularly through involvement in projects for the design, construction and operation of new thermal gas and hydraulic generation plants in countries offering Independent Power Plant (IPP) type opportunities, as well as in the field of renewable energies, nuclear, smart cities and innovation.

#### Vietnam

At 31 December 2018, EDF owned 56.25% of Mekong Energy Company Ltd. (MECO), the company owning Phu My 2.2, a combined cycle gas power plant with a capacity of 715MW. The other shareholders are TEPCO (JERA) and SGM2 (Sumitomo). This is the first IPP project financed exclusively by foreign investors in Vietnam. The BOT (Build, Operate, Transfer) contract has a term of 20 years. In 2005, EDF provided "turnkey" delivery of the power plant, and operations are now managed by MECO.

New milestones in the building of the Son My 1 thermal power plant in Vietnam were reached in 2018. Once built, the high-efficiency and environmentally-optimised CCGT plant with a capacity of 2,250MW in Binh Thuan province, situated north-east of Ho Chi Minh City will be operated by EDF for a period of 20 years. It forms part of Vietnam's efforts to diversify its sources of energy and will help satisfy the country's growing hunger for electricity while reducing the share of coal in its energy mix (currently 34%) in favour of gas and renewable energy. In March 2018 the EDF group was chosen to head the consortium tasked with studying the project alongside local partner Pacific Corporation and Japanese partners Sojitz Corporation and Kyushu Electric Power Co. with stakes of 37.5%, 25%, 18.75% and 18.75% respectively. A memorandum of understanding setting out the general terms of the project was signed with Vietnam's Ministry of Industry and Trade on 2 November 2018.

#### Laos

At 31 December 2018, the EDF group held a 40% stake in Nam Theun 2 Power Company (NTPC), which owns the hydropower complex Nam Theun 2 with an installed capacity of 1,070MW, built by the EDF group under a "turnkey" contract, commissioned in 2010 and which represents approximately 17% of the installed capacity of the country. The other shareholders are a Thai company, EGCO (Electricity Generating Public Company Limited), which holds 35%, and a Lao State company, LHSE (Lao Holding State Enterprise), which holds 25%. NTPC company operates the power plant on a 25-year concession agreement concluded with the government of Laos.

In its latest report published in September 2018, the World Bank's Panel of Experts (POE) overseeing the Nam Theun 2 hydropower project noted that objectives under the concession agreement to assist displaced people had been successfully reached. Consequently, the POE recommended the Resettlement Implementation Period be brought to a close. In fulfilling its environmental and social objectives, the Nam Theun 2 project is an example of responsible hydroelectric development.

In December 2018, EDF acquired EDF International's minority stake in Nam Theun Power Company (NTPC), part of which was allocated by EDF Invest to dedicated assets at the time, with the remainder to be allocated in 2019.

### India

Concerning nuclear energy, following the memorandum of cooperation relating to the plan to build 6 EPR reactors in Jaitapur signed in January 2016, EDF and the national Indian electricity company Nuclear Power Corp of India Ltd. (NPCIL) furthered their discussions in 2017 to better define the framework of their cooperation, which culminated on 10 March 2018 with the signing of an Industrial Way Forward Agreement under which EDF acts as the supplier of EPR technology and undertakes to organise the industrial subsidiary around the project. Also see section 1.4.1.2.2 "Other "New Nuclear" projects".

EDF continued developing its smart meters and smart grid business. After winning a contract in 2016 to supply 75,000 smart meters to the New Delhi Municipality Council, in Sep-Nov 2018 the Group won a call for tenders issued by Energy Efficient Services Limited (EESL), an Indian energy services company (ESCO), to install nearly 5 million smart meters in five Indian states.

EDF Renewables continued growing its solar and wind power businesses in India, the latter established in 2016 (see section 1.4.1.5.3 "EDF Renewables").

For its part, Citelum manages 178,000 street lights in Ahmedabad and will upgrade the lighting infrastructure of Noida in partnership with Tata Projects Ltd.

### Myanmar

On 5 September 2018, the government of Myanmar granted a consortium led by EDF exclusive the rights to build a hydroelectric dam on the Shweli River in the north-east of the country. Negotiations, begun in 2018 and set to continue in 2019, will hopefully lead to a concession agreement under which the plant will come online in 2025 at the latest. The dam is subject to the same strict standards observed by the Group in all its projects in terms of corporate and social responsibility. It will supply responsibly-sourced, low-carbon electricity to a country in dire need of power for economic development where 60% of the population currently has no access to electricity.

### Research & Development

Following an agreement signed in June 2013 with the Singapore Housing and Development Board, the city's largest construction firm, with the aim of developing an innovative urban modelling tool, the EDF group, in 2014, opened a centre of excellence for sustainable cities in Asia: EDF Lab Singapore. This R&D centre dedicated to urban planning has as its mission to reinforce existing collaboration and to initiate new collaborative relationships with Singapore and other cities of the region.

In October 2018, Nanyang Technical University, EDF, Enedis and Nanyang Technological University Singapore inaugurated the Microgrid for Affordable and Sustainable Electricity in Remote Areas (MASERA) demonstrator as part of Singapore International Energy Week (SIEW) and the France-Singapore Year of Innovation 2018. The demonstrator will allow the EDF group to offer affordable and efficient microgrids for remote areas in Southeast Asia.

In June-Aug 2018 the Group also moved its Asia Head Office from Bangkok to Singapore to better manage its interests in Southeast Asia, strengthen its synergies with the R&D lab and embed itself in the development and innovation ecosystem of smart cities which is particularly vibrant in Singapore.

#### 1.4.5.3.7 Africa

The Group wishes to develop on the African continent by assisting countries with high-energy demand, on a selective basis appropriate to each geographic region, and by building sustainable and multi-industry partnerships. EDF is also intensifying its action in the supply of competitive off-grid energy.



## South Africa

The EDF group established a subsidiary in 2007 in Johannesburg, initially with a view to preparing the relaunching of the South African nuclear programme. The energy guideline plan for the country, promulgated in May 2011, provided for the commissioning of 9.6GW of nuclear power capacity by 2030. This programme is in the process of being reviewed. Several scenarios integrating nuclear, renewable energies and liquefied natural gas are being discussed with a view to promulgation in 2019. The South African subsidiary is also responsible for developing EDF's business activities in Southern Africa, particularly as regards generation projects as well as the sale of services relating to thermal engineering, hydropower, transmission and distribution.

In October 2018 the EDF group announced that it had bought a 30% stake in GIBB Power, an energy subsidiary of South African firm GIBB Engineering and Architecture. The acquisition should enable the EDF group to sharply increase its activity in thermal, hydropower, transport and distribution engineering services in the region over the next three years. GIBB Power will also enable the EDF group to identify and undertake targeted investments in Southern Africa.

In addition, EDF Renewables has gained a foothold in the South Africa wind power market during the course of the various phases of the request for bids launched by the Ministry of Energy since 2011. The company was selected through its subsidiary InnoWind, renamed EDF Renewables South Africa in 2018 (in which EDF Renewables has a 94% stake), and operates a gross capacity of 110.6MW. See section 1.4.1.5.3 "EDF Renewables".

The Group is also present in South Africa via the Company KES (Kukhanya Energy Services), created in 2002 (see section 1.4.5.3.9 "Off-grid energy").

## Mozambique

The Group has been active in Mozambique since the end of the 1980s involving the provision of engineering services and has formed preferred partnerships with EDM (Electricidade de Moçambique).

The EDF group and EDM have entered into a cooperation agreement signed in June 2017 with the aim of promoting exchanges in all areas of connected and non-connected electricity systems for hydraulic, thermal and renewable generation as well as in networks and training.

The EDF group, in conjunction with WLE - World Leading Education, was selected within the framework of a call for tenders relating to professional training and the renewal of EDM's training centres.

## Morocco

The EDF group has been active in Morocco since the 1970s, and has formed preferred partnerships with Morocco's national electricity and water office (ONEE), electricity distribution authorities, and industrial players. To help support its development, the Group created EDF Maroc in 1997, EDF EN Maroc in 2012 as well as EDF Fenice Maroc in October 2016.

The Group and ONEE continued their cooperation, pursuant to the general agreement signed in January 2012, in the areas of renewable, thermal and hydraulic generation, as well as in networks and training.

After having been selected by ONEE through a call for tenders, the consortium led by EDF Renewables in partnership with the Japanese group, Mitsui & Co., is developing the 150MW Taza wind farm. With the acquisition of Futeren in 2017, the Group's total gross installed capacity in Morocco reached 50.4MW. See section 1.4.1.5.3 "EDF Renewables".

The Group is also involved in energy efficiency activities in Morocco with the Fenice subsidiary (EDF Fenice Maroc, see section 1.4.5.1.2 "Activities of EDF Energy") and in public lighting with the Citelum subsidiary. Together with NABILUM, a local firm, Citelum won the call for tenders organised by the city of Fez. Carried out by a public-private vehicle (called an SDL in Morocco) controlled by the City of Fez (51%) and Citelum/NABILUM (49%), the 15-year contract involves upgrading, expanding and maintaining the city's approximately 68,000 street lights.

## Senegal

The Group is also present in Senegal, through the ERA company, the operator of the rural electrification concession in Kaffrine-Tambacounda-Kédougou (see section 1.4.5.3.9 "Off-grid energy"). It is also present through a service contract involving generation with an independent power producer and several service

contracts through its subsidiary EDF International Networks, responsible for implementing contracts to improve the performance and ensure the reliability of the local operator Senelec's distribution network.

## Cameroon

The consortium comprising EDF (40%), IFC (20%), the Republic of Cameroon (15%), Africa50 (15%) and STOA (10%) have begun construction of the Nachtigal 420MW hydropower dam, situated on the Sanaga River, close to Yaoundé. In July 2016, Nachtigal Hydro Power Company was created to assist with the project and signed a Concession Agreement for Electricity Generation in April 2017. The final investment decision was made in late July 2018 and financing was agreed on 8 November 2018. The Nachtigal project was given the go-ahead on 24 December 2018.

The Nachtigal hydroelectric power plant is a sizeable project for the country and will, on commissioning, be the most important generation resource in Cameroon. It will provide around one third of the electricity needs and will generate numerous economic benefits for the local economy.

## Republic of the Congo

EDF International Networks, a wholly-owned subsidiary of the EDF group, opened a branch in September 2017 to further develop its activities in the country in support of SNE.

## Egypt

The EDF group entered into the renewable energy generation market in Egypt. EDF Renewables, in a 50/50 partnership with the Egyptian company Elsewedy, to finance, build and operate two 50MWp photovoltaic plants in Benban near Assouan. These projects will benefit from a Power Purchase Agreement (PPA) for a period of 25 years (see section 1.4.1.5.3 "EDF Renewables").

In 2017, EDF was awarded two contracts for consulting services, one with EETC for engineering and supervising construction of the dispatcher in the Delta, and another with EEHC to manage the deployment of 53,000 smart meters that its subsidiary EDF International Networks complete in a consortium led by the French industrial company Sagemcom and including the Egyptian company Globaltronics.

Since the mid-1990s, the EDF group has been present in Egypt in Exploration and Production (E&P) of hydrocarbons through its subsidiary Edison (see section 1.4.5.2.3.2 "Hydrocarbon business").

The Group has also been active in Egypt since 2016 via EEES, a wholly-owned subsidiary of Edison, which is pioneering energy services in the country.

## Ivory Coast

EDF group is developing the "Biovéa" project for a biomass electricity power plant with two 23MW units in partnership with SIFCA, an Ivorian agro-industrial group in West Africa, and Meridiam, an investment firm which joined the project in January 2018. This project is already included in the Ivorian State's development master plan and an agreement on the transfer price of generated energy was signed on 30 November 2017. The final investment decision is scheduled to be made in mid-2019.

In August 2016, the Group created a local subsidiary to support its development strategy in the Ivory Coast.

In October 2016, EDF created the ZECI company, a joint-venture with the US company Off Grid Electric (OGE), for the deployment of an off grid energy project for rural and peri-urban populations (see section 1.4.5.3.9 "Off-grid energy").

## Ghana

In October 2017, the EDF group opened a local branch to support its development strategy in this country. It is also present in Ghana through the ZEGHA company (see section 1.4.5.3.9 "Off-grid energy").

### 1.4.5.3.8 Middle East

The EDF group is present in the Middle East, with a regional office based in the United Arab Emirates (UAE) covering the area's development and project monitoring activities.

In addition, the Group has offices in Qatar, Doha, Saudi Arabia (Riyadh), Lebanon (Beirut), Bahrain and the United Arab Emirates (Abu Dhabi and Dubai).



These offices manage the commercial activities and projects in these various countries.

The area's major projects are in the UAE with the customer DEWA (responsible for water and electricity in the city of Dubai):

- a development project for a 800MW solar photovoltaic power plant. EDF, through its subsidiary EDF Renewables, is developing this project alongside Masdar, an Abu Dhabi-based company belonging to the Mubadala group and the customer DEWA. With 200MW already brought online and 300MW put under construction in 2018, once completed it will be the biggest solar power plant in the world (see section 1.4.1.5.3 "EDF Renewables");
- an assistance project for the management of a 250MW dam pumping station, planned for the Hatta mountains in the Emirate of Dubai, for the customer DEWA.

The EDF group has sought to establish a long-term relationship with Nawah, the operator of the Barakah nuclear plant in the UAE. On 21 November 2018, EDF and Nawah signed a long-term master agreement under which EDF will assist the Emirates Nuclear Energy Corporation (ENEC) subsidiary with the operation and maintenance of the Barakah plant through various services such as safety, radiation protection, fuel cycle management and environmental monitoring.

Another major project is in the process of being completed in Doha: engineering consultancy for the customer Kahramaa (water and electricity in Qatar) in connection with the completion of electricity substations and high-voltage cable networks (project falling under "Phase 13").

In 2014, in Saudi Arabia, the EDF group signed a partnership agreement with the Saudi Electricity Company (SEC), the country's benchmark electricity operator, enabling a broad cooperation between the two groups, including training initiatives. In the extension of this agreement, the GOC "Generation, Optimisation Center" contract signed in February 2016 provides for support by EDF for the implementation of regional generation optimisation centres.

#### Israel

The EDF group has been present in Israel since 2010 through its subsidiary EDF Renewables, which operates photovoltaic power projects connected to the grid with gross installed capacity of 295.1MW, and launched in 2018 the construction of an additional 87MW (see section 1.4.1.5.3 "EDF Renewables").

The Group also supports its Italian subsidiary Edison's efforts to expand into gas exploration and develop the EastMed gas pipeline connecting Israel to Italy.

Furthermore, EDF Hydro's Hydraulic engineering centre supplies services to the first Israeli project for the storage of electricity through pumping, on Mount Gilboa.

#### 1.4.5.3.9 Off-grid energy

The EDF group has 15 years' experience in off-grid power provision in Africa *via* companies created for that purpose based on territorial concessions. Since 2017, the EDF group has joined forces with innovative startups to supply power and services to customers in rural areas and on urban outskirts in line with their income and needs. Solutions include supplying power to central grids, installing minigrids and providing solar power kits.

Such services enable thousands of people in South Africa, Ivory Coast, Ghana, Senegal and Togo to light and power their low-consumption household appliances such as a television or a radio proposed within the offer, or to recharge their mobile phones. Our customers in Kenya can buy solar-powered water pumps and thereby significantly improve their crop yields.

The EDF group, via EDF Pulse Croissance Holding with a 17% stake, teamed up with investment firm Meridiam to create NEoT Offgrid Africa with the aim of financing our energy supply and services solutions.

#### BBOX

EDF bought a 50% stake in BBOX Togo from BBOX UK in November 2018 to undertake the sale, installation and maintenance of solar kits for rural households in Togo.

#### KES

In South Africa, the KES (Kukhanya Energy Services) company, created in 2002, is 50% owned by EDF, 15% by the local operator, Calulo, and 35% by Total. It initially developed its business through photovoltaic kits in KwaZulu-Natal, and then extended its activities into the Eastern Cape region.

#### ERA

In Senegal, the EDF group holds a 70% stake in the ERA company, alongside Matforce, a local partner. Since 2014, ERA has been the operator of the rural electrification concession of Kaffrine-Tambacounda-Kédougou (25% of Senegal's surface area). Having received a grant from the French Development Agency, with a third and last tranche expected to be released soon, ERA is developing the electricity grid, installing photovoltaic panels in rural areas and currently provides electricity to around 6,000 customers. The tariff review process initiated in June 2017 by the Regulator at the request of concession holders should be completed in early 2019 with the publication of new tariffs which should ensure the concession's financial equilibrium and enable its long-term development.

#### SunCulture

On 18 July 2018, the EDF group took a stake in SunCulture, a Kenyan firm, to undertake the sale, installation and maintenance of solar-powered water pumps for rural households in Kenya and rapidly expand into other African countries.

#### ZECI

The EDF group and Off Grid Electric (OGE) – an American company involved in the distribution of solar energy in Africa, in which Electranova Capital, EDF's cleantech venture capital investment fund, holds a shareholding – created in October 2016 a joint company in the Ivory Coast, ZECI, for the supply of competitive off-grid solar energy in Africa.

Within the framework of this joint venture, the EDF group and ZolaElectric assume the cost of the installation and maintenance of solar kits intended for households in rural areas and on urban outskirts.

#### ZEGHA

Off Grid Electric, the Ghanaian company CH group and EDF decided to create ZEGHA and launched the pilot phase in December 2017 on the Ivorian model before entering the current development phase in 2019.

## 1.4.6 ENERGY SERVICES AND OTHER ACTIVITIES

### 1.4.6.1 Energy services

In a changing legislative, technological and social context increasingly turned to combating global warming and increasing energy efficiency, the EDF group must adapt its energy services to offer its customers solutions that work.

These solutions draw on the Group's expertise implemented through its various subsidiaries. In June 2017, they were grouped under "EDF Solutions énergétiques" with the aim of optimising their activities under the EDF brand.

The Group's energy services are designed to meet the needs expressed by local governments, firms and individuals in a wide range of applications such as urban services (e.g. electric mobility and smart lighting), distributed generation, heating and cooling network management, affordable private investment in new energy equipment (e.g. boilers and indoor lighting), and smart building management. All these solutions share the imperative to reduce carbon emissions and increase energy efficiency.

In 2018, EDF focused on electric mobility to help lower carbon emissions in the transport industry, which accounts for 20% of greenhouse gas emissions in Europe. To that end the Electric Mobility Plan announced by EDF on 10 October 2018 outlines the Group's goal of becoming the energy industry's leading electric mobility service provider in Europe by 2022. The plan has three objectives:

- be the leading supplier of electricity for electric vehicles by 2022;
- be the leading operator of charging stations;
- be the leading provider of smart charging services in Europe by 2020.

EDF is convinced that partnerships with reliable automotive stakeholders, such as carmakers, equipment manufacturers and rental companies, are vital to the rapid expansion of electric mobility. Accordingly, partnerships have already been formed with firms such as Renault and Valéo.

The EDF group's wholly-owned subsidiary IZIVIA (formerly Sodetrel) is already working to achieve these goals.

#### **1.4.6.1.1 Dalkia**

The EDF group has held a 99.94% equity interest since July 2014 in Dalkia, a leading player in the European energy services market with a full range of services and an excellent sales network in France, that contribute to developing renewable energy and energy recovery, reducing energy consumption and improving the performance of the installations.

#### **Dalkia's operations**

Dalkia now operates in the face of three major challenges: the fight against global warming and the need to reduce greenhouse gas emissions, energy efficiency as a source of savings, and the territories transformation in an increasing urbanisation context.

Dalkia brings expertise to its customers in order to design, realise, and manage innovative energy solutions, which are more ecological and more economical, for sustainable development of cities and businesses.

From decentralised energy generation to demand-side management, while optimising distribution, Dalkia is present at each stage of the energy chain, in order to improve system performance. Thanks to its 80 years of experience in managing heating and cooling networks, optimising industrial utilities, improving the energy performance of a building, or using alternative and renewable energies, Dalkia offers its customers tailor-made solutions to reduce their energy consumption and to improve the environmental and economic performance of their installations.

In this way, in 2018, Dalkia (including its subsidiaries) has allowed its customers to avoid 4.2 million tonnes of CO<sub>2</sub> emissions and realised 6.3 TWh of energy savings.

Dalkia manages over 80,000 energy installations in the following three customer segments:

#### **Heating and cooling networks**

The development of the networks was an important growth engine in the last few years for Dalkia which established a reproducible model, resting upon numerous optimisation levers:

- improvement of the efficiency of teams and organisations, optimisation of the performances of operations upon the takeover of networks;
- modification of the energy mix for greater efficiency and less CO<sub>2</sub>, with the optimisation of cogeneration and the development of renewable energies and energy recovery (biomass, geothermal energy, waste-to-energy, biogas, recovery of unavoidable energy, etc.);
- additional services in order to better enhance assets (e.g. digital).

Thus, Dalkia is one of the leaders in France in the management of district heating and cooling networks, operating over 300 district and local installations, and providing heat to over 2 million homes. Deploying this model across its geographic targets will constitute a significant part of its future growth.

#### **Industrial utilities**

Dalkia is active in the industrial utilities business for over 2,300 industrial sites. The challenges are to improve environmental performance (particularly by controlling CO<sub>2</sub> emissions and the valuation of recovering energy), competitiveness and security of supply.

Dalkia's strategy is to allow its industrial customers to concentrate on their core processes, by assuming responsibility for the generation of their utilities and the technical management of their facilities, while optimising their energy use and their greenhouse gas emissions. Dalkia differentiates itself by a large and coherent range of services, which includes the optimisation of industrial utilities (steam, electricity, cold, compressed air); adjustment of usage to requirements, and identification of

sources of unavoidable energy and recoverable co-products, optimisation of industrial building usage, and reduction of greenhouse gas emissions.

#### **Building energy services**

Building energy services consist of managing energy installations in buildings: optimisation of local thermal energy generation, transformed energy supply, operation and maintenance of technical facilities. They also seek to improve the operation of existing systems in order to maximise their effectiveness and to reduce their CO<sub>2</sub> emissions. Dalkia provides integrated energy services ranging from the design, construction and upgrading of installations, to transformed energy supply and management and maintenance of installations, for tertiary, industrial, public-sector and private-sector customers.

#### **Main subsidiaries of Dalkia in France**

##### **Dalkia Smart Building (formerly Optimal Solutions)**

Dalkia Smart Building, a wholly-owned subsidiary of Dalkia, specialises in designing and implementing solutions to help its customers adapt to the energy shift and digital transition in France. Complementing Dalkia's regional scope, Dalkia Smart Building designs and implements solutions to upgrade existing school, government, indoor pool and office facilities and build new buildings and neighbourhoods (smart buildings, smart thermal and electric grids, green data centres, smart pools).

##### **Dalkia Wastenergy (formerly Tiru)**

Dalkia Wastenergy, a wholly-owned subsidiary of Dalkia since 29 March 2018, specialises in waste recovery serving local authorities and industrial customers:

- waste recovery *via* incineration, anaerobic digestion and boilers running on solid recovered fuel (SRF) able to generate steam, electricity or biogas;
- materials recovery *via* compost, the sorting and packaging of recyclable materials and solid recovered fuel generation.

Dalkia Wastenergy designs, builds and currently operates facilities located in France, Great Britain and Canada.

##### **Dalkia Froid Solutions (formerly Cesbron)**

Dalkia Froid Solutions, a wholly-owned subsidiary of Dalkia, specialises in the design, installation and maintenance of cooling solutions for industrial and tertiary customers. It also provides cooling solutions, air treatment, reversible heating and processes for bakeries and industrial kitchens.

##### **Dalkia Biogaz**

Dalkia Biogaz, a wholly-owned subsidiary of Dalkia, specialises in the generation and recovery of biogas. It is present in France and Belgium and provides the following services: agricultural, territorial or industrial anaerobic digestion, biogas processing (drying and filtration), biogas recovery by cogeneration or treatment and biomethane injection.

##### **CRAM**

The CRAM group is a regional player mainly specialised in building energy services.

##### **Techsim**

Techsim, a wholly-owned subsidiary of Dalkia, specialises in energy solutions for the generation of compressed air, nitrogen and breathable air in the industrial and nuclear sectors.

##### **Asteriot**

The Asteriot company provides solutions dedicated to fluids management and energy optimisation in collective-use buildings (housing units, tertiary, administrative buildings) by using information collected from connected objects.

#### **Main subsidiaries of Dalkia abroad**

##### **Matex Controls, now operating under the Dalkia name and brand**

The Matex Controls company, based in Poland, designs, builds and maintains technical facilities (ventilation, heating, air conditioning, fire protection, etc.) for commercial buildings and industrial customers. It also provides innovative solutions for the building's energy performance management, including VEMS® (Virtual Energy Management System).

**ZEC, now operating under the Dalkia name and brand**

The ZEC company is mainly specialised in the generation and distribution of heat in the region of Katowice in Poland (Upper Silesia). It has recognised expertise in the energy recovery of mine gas as an alternative to coal to be used by heating networks and electricity distribution facilities.

**Fenice Rus, now operating under the Dalkia name and brand**

Specialised in energy efficiency for industrial customers, Fenice Rus is one of the pioneers in the energy services sector in Russia.

**Imtech**

Imtech, jointly held by Dalkia and EDF Energy, is specialised in thermal and electrical engineering, technical maintenance of facilities and the integration of acquisition and data control systems in the United Kingdom and Ireland. Imtech provides its services to the construction, industry and tertiary sectors and local authorities.

**Groom Energy Solutions**

Groom Energy Solutions LLC provides companies and industrial customers with a comprehensive approach to consultancy, project management and the performance of energy efficiency work, with nationwide coverage in the United States.

**Aegis Energy Services**

Based in Holyoke, Massachusetts, and acquired in August 2018, Aegis Energy Services LLC specialises in designing, building and commissioning small gas cogeneration plants in Northeastern United States. The firm has installed just under 1,000 cogeneration plants since it was founded in 1985.

**1.4.6.1.2 Citelum**

Citelum is the subsidiary of the EDF group dedicated to smart lighting and connected services, and one of the leading players in the field in France and throughout the world.

With roughly 500 employees in France, Citelum employs 2,500 people, mainly in Europe (including France, Italy, Spain and Denmark) and in America (including the United States, Mexico, Brazil and Chile), which enables it to manage the services of leading cities throughout the world (Mexico City, Copenhagen, Barcelona, Rome, etc.). At the end of 2018, Citelum managed over 3 million street lights all over the world, lighting the way for 30 million residents.

The technological changes in lighting equipment currently enable it to make use of an existing connected infrastructure, thereby facilitating energy savings, remote management of installations and improvements to security as well as showcasing cultural heritage. In addition, this lighting equipment, connected to other devices (sensors, cameras, etc.), offers new value-added services in the areas of the prevention of pollution, video-monitoring of the territory, information to users or the management of urban mobility and parking.

Citelum operates on the following three value chains:

- increasing attractiveness for customers through the optimisation of lighting, while limiting energy expenditure;
- improving perceived security by optimising the use of the allocated resources;
- creating more fluid mobility and parking, promoting an increase in receipts from customers.

Citelum marks out its difference through its capacity to assist in all phases of a project, from design and completion of the works to operation and maintenance, by incorporating into its service offer: financing solutions, innovation with its Citegestion subsidiary's digital urban space management platform, MUSE®, and strong skills in contractual engineering.

In 2018 Citelum finished upgrading the lighting in 10 Renault plants in France. By upgrading 115,000 lights to LEDs and removing 35,000 others, general lighting was optimised and lights were better positioned, enabling Renault to save 60% a year on its energy bill and improve working conditions while ensuring worker safety. Now the plants are better suited to workers' needs and production quality targets in an environment where precision and safety are paramount.

Greater Dijon received delivery in due course of the following MUSE® platform services for its connected public spaces management project: MUSE® GMAO (computerised maintenance management system), MUSE® GCI (centralised action management system) and MUSE® Main Courante (record-keeping system).

In 2018 Citelum, together with Viola, won the contract to design, upgrade, operate and maintain the street lights and traffic lights of the commune of Asnières-sur-Seine for a period of eight years. Once upgraded, 76% of the lights will be LEDs, resulting in energy savings of over 80%. During the contract, new connected services will be rolled out through the MUSE® platform, such as pedestrian crossing lights, smart parking, IoT infrastructure, and lighting of heritage sites and high streets.

In 2018, under its *Plan Lumières* 4.0, SOFICO (the Wallonia infrastructure investment fund) awarded the PPP contract to replace the lights on the highways in Wallonia to the LuWa consortium made up of Citelum, EDF-Luminus, CFE and DIF. The project to refit Wallonia's highway network with "smart" LED lights will take 20 years to complete.

In Mexico Citelum was chosen for the lighting of the BBVA Bancomer Tower in the heart of Mexico City and won the highway lighting contract for the road network linking 10 cities in the State of Mexico.

In Chile, Citelum undertook lighting works under a PPP with the city of Independencia. Under the 10-year project, 7,300 street lights were replaced with LEDs.

In Brazil in 2018 Citelum won the contract to manage 34,000 street lights in Macapá, the capital of the state of Amapá.

In India Citelum partnered with Tata Projects to win a new contract to install and operate 70,000 street lights in Noida, a satellite city of New Delhi.

In Italy in 2018 Citelum won two CEV master agreements to install indoor lighting in public buildings in Lombardy, Emilie Romagne and Tuscany.

In Denmark Citelum added Copenhagen's traffic lights to its portfolio in the country which also includes the street lights of Copenhagen, Frederiksberg, Hillerød, Albertslund and Furesø.

During the year Citelum introduced new innovative services such as a smart parking system in Toulouse (France), a noise sensor & street light modulation system in Sant Cugat (Spain) and a biodiversity protection programme to measure and reduce light pollution in Almeria (Spain).

**1.4.6.1.3 EDF Pulse Expansion**

Innovation has always been at the core of EDF's strategy. In June 2017, in order to broaden the scope of its activities, the EDF group created a new structure called EDF New Business to act as EDF's startup incubator.

In October 2018 EDF New Business was renamed EDF Pulse Expansion to bring it under the Group's innovation arm (EDF Pulse) and raise its profile.

The purpose of EDF Pulse Expansion is to look into the energy shift and digital transition and create new growth drivers for the Group by providing innovative and competitive products and services to households, businesses and local authorities. With a financing capacity of €30 million a year (not counting extraordinary projects), EDF Pulse Expansion plans to invest in at least ten startups by the end of 2019.

Four areas will be prioritised:

- business and manufacturing efficiency;
- residential services;
- sustainable town and country planning;
- decentralised energy systems.

As both an investment fund and an intrapreneurship incubator, EDF Pulse Expansion boasts a tight-knit team that works closely with EDF's R&D and functional Divisions as well as all of the Group's resources committed to open innovation and partnerships with startups.

## Incubator

As an intrapreneurship incubator, EDF Pulse Expansion draws on the ideas and expertise of the Group's employees and is in a position to provide them dedicated support to assist them in developing their project as part of an entrepreneurial approach benefiting the Group and its employee entrepreneurs.

## Investor and partner

To succeed in developing new business activities and innovative solutions in new technologies, EDF Pulse Expansion can invest directly in fledgling startups or put them in contact with the Group's ecosystem – particularly dedicated funds such as Electranova Capital in which EDF Pulse Expansion has a stake. The entity can also create joint ventures with start-ups able to explore new business models and set out to conquer new markets in France or abroad. Essentially, investment is seen as part of a comprehensive business and industrial partnership.

EDF Pulse Expansion finances startups active in various fields linked to the digital transformation and the energy shift. Examples include the third-party funding of energy efficiency with Perfesco, data security with Seclab, energy management systems with EDF Store & Forecast and zinc-air batteries with startup Znr Batteries.

Since it was set up, EDF Pulse Expansion has invested in 13 startups and built up stakes in 13 investment funds. At 31 December 2018, EDF Pulse Expansion helped eight new companies start trading:

### Agregio

Agregio is an aggregator serving electricity producers with renewable generation capacities and corporate customers with load shedding capacities. For electricity producers, Agregio offers tailored solutions to optimise and sell their production on the markets and secure income over time. This is a strong expectation of renewable electricity producers, who no longer benefit from purchase obligations. Agregio is also aimed at industrial and tertiary consumers, who are willing to reduce or shift their consumption in exchange for compensation, according to the needs of the electricity system. Agregio will finally position itself as a local optimisation platform for regional projects to optimise production and consumption in a region. Agregio hopes to be the benchmark player in this sector.

### Metroscope

Metroscope was founded in December 2017 out of an intrapreneurship project. Through a system of artificial intelligence, Metroscope provides real-time diagnostics allowing industrial customers to increase and/or optimise the performance of their industrial facilities, by identifying random disturbances, failures and efficiency loss affecting their operating systems. Industrial operators are thus able to optimise the maintenance of their production facility and reduce operating costs. This "factory 4.0" solution was chosen by the Executive Management of EDF's nuclear fleet and is currently being deployed in all 58 nuclear generation units in France. The Group also plans to market Metroscope's solutions outside the company to its industrial customers by 2019.

### NEoT Capital N Green Mobility and NEoT Offgrid Africa

NEoT Capital was set up in 2016 to finance innovative energy storage projects and technology. It is held by EDF Pulse Croissance Holding (42.5%), Mitsubishi Corp (42.5%) and Forsee Power (15%). NEoT Capital has developed two businesses housed in separate companies created in 2017:

- N Green Mobility provides B2B on-board energy services over several years, supplying, running and maintaining electric mobility equipment (batteries, charging infrastructure, electric buses and so on) and ensuring energy efficiency. It is jointly held by EDF Pulse Croissance Holding, Caisse des Dépôts et Consignations and Mitsubishi Corp;
- NEoT Offgrid Africa develops B2B and B2C stationary storage services in Africa and is working on several projects together with EDF. It is held by Meridiam (64.28%), Mitsubishi Corp (17.86%) and EDF Pulse Croissance Holding (17.86%).

## McPhy

With its hydrogen production, storage and distribution applications, McPhy is spreading low-carbon hydrogen as a way to drive the energy transition in the world. Boasting a complete range of power-to-gas, zero-emissions mobility and industrial hydrogen products, McPhy offers its customers turnkey solutions suited to their applications, such as electric vehicle charging, fuel cells and industrial power supply. In business since 2008, McPhy designs, makes and integrates hydrogen equipment at its three development, engineering and production centres in France, Italy and Germany. International subsidiaries market the firm's innovative hydrogen solutions to a global market. McPhy is listed on the Euronext Paris exchange (Compartment C, ISIN code FR0011742329, ticker symbol MCPHY).

## Oreka Solutions

Oreka Solutions develops and markets tools to simulate and assess industrial and nuclear plant operations in a multi-criteria model. Its flagship decision-making and simulation software DEMplus® is based on real-time 3D technology that analyses costs, delays, waste and dosimetry.

## Hoppy

Hoppy is a home management digital platform in the UK making it possible for users to easily manage their subscriptions (TV, Internet, mobile, electricity/gas), organise tasks and chores, and book tradespeople.

## Zenpark

In early 2019 <sup>(1)</sup> EDF group announced that it had bought a stake in Zenpark. Zenpark runs an automated shared parking platform whereby drivers can use previously inaccessible private parking spaces. The service opens up unused parking spaces and encourages new modes of mobility via its extended smart parking network.

## Startup funding

One illustration of EDF Pulse Expansion's commitment to funding startups – especially in France – is the three calls for projects it put out for ideas relating to nuclear decommissioning, home autonomy & safety for the elderly, and residential services which resulted in 12 paid-for proofs of concept now in progress with the support of EDF's relevant Divisions.

### 1.4.6.1.4 Other service subsidiaries of the EDF group

Other subsidiaries within the EDF group complete the range of energy services that EDF offers. These focus on specific areas, targeting different categories of customers (residential, professionals, businesses and local authorities) and cover a wide range of activities including research, construction, equipment maintenance, investment financing and assistance with obtaining permits and subsidies.

## Energy management

To help customers manage their energy and fluid consumption, the EDF group provides facility monitoring and management solutions. Its subsidiaries Netseenergy and Edelia are active in this strategic area.

## Netseenergy

Netseenergy, a wholly-owned subsidiary of EDF, designs, develops, makes and implements a range of solutions that enable business customers and regional municipalities to manage and optimise the energy and operating performance of their property assets. This company is a major player in the digitalisation of energy management via service offers such as:

- performance management of energy and real estate property: automated data collection, mobile applications, customised energy management by an energy manager;
- innovative energy audits: algorithmic control of customers' energy and real estate property data; data science and big data.

(1) See press release of 29 January 2019 "Zenpark lève plus de 10 millions d'euros, avec la participation des groupes EDF et RATP".

# 1. PRESENTATION OF EDF GROUP

## Description of the Group's activities

Netseenergy processes nearly 9 million data inputs every day from 20,000 points. A specialist in the IoT collecting data from 60,000 connected objects every day, Netseenergy has managed the energy and property dimensions of a surface area of over 120 million m<sup>2</sup> for over 16 years.

Netseenergy's value proposition is automating the collection of property and energy data and analysing them, improving energy efficiency and digitising property management.

### Edelia (Edev Téléservices)

Edelia is a wholly-owned subsidiary of EDF that designs and implements solutions for individuals and businesses to monitor and control their energy consumption. Its online platform provides a range of innovative digital services to over 10 million EDF group customers. Edelia also offers modular tools based on the IoT (Internet of Things) that can be adapted to users' own ecosystems, thus getting the most out of connected objects in smart homes and enhancing digital customer tools.

### Connected home

Products offered by Sowe, a Group subsidiary and the only French firm to link the sale of energy to a connected station, have expanded the range of options available to residential customers. For its business and local authorities customers, the Group continues to expand its range of offers related to remote monitoring and analysis of consumption through to managing energy use.

### Electric mobility

Today, the transportation sector is very dependent upon fossil energies and is one of the most significant sources of CO<sub>2</sub> emissions. Yet, low-carbon electricity constitutes a lever for developing eco-friendly mobility and transports in a territory. This is why the EDF group is investing in this field, particularly through its subsidiary IZIVIA (formerly Sodetrel).

The Group's solutions include:

- consulting services for regional authorities and businesses on the positioning and scale of electric vehicle charging infrastructure;
- installation of recharging infrastructure for all customer segments: residential, local authorities and businesses, car parks and supermarkets;
- remote management and supervision of charging stations.

The Group has also participated in experimental ride-sharing in Grenoble, Nice and Monaco.

### IZIVIA (formerly Sodetrel)

Created in 1998 as a wholly-owned subsidiary of EDF under the name Sodetrel, today IZIVIA is a leading provider of electric mobility services in France. For over 20 years IZIVIA has assisted local authorities, energy consortia and businesses at every stage of their electric mobility projects, from installing, operating and maintaining charging stations to managing relations with their users.

IZIVIA owns and runs its own network of 200 Corri-Door highway quick charging stations<sup>(1)</sup> (compatible with all electric vehicle models on the market, spread out every 80km or so) and through PASS positions itself as a mobility services provider for drivers of electric or hybrid electric vehicles. IZIVIA also makes its own compatible smart charging equipment designed to optimise energy consumption related to charging.

In 2018, the city of Nice in France awarded the contract for maintenance and works on its network of electric vehicle charging stations to Citelum-IZIVIA (formerly Sodetrel).

### Electrical engineering: HTMS

HTMS, a wholly-owned subsidiary of EDF, is involved in the operation and maintenance of high-voltage and medium-voltage equipment and substations, the supply and replacement of circuit breakers and transformers, troubleshooting, project management support and training. The company's core business is the optimisation of maintenance operations to ensure operator safety, the availability of facilities and the sustainability of plant and equipment.

The company also provides independent assessments and consulting (operational audits, definition of maintenance policies and equipment upgrades) and monitoring assignments for major projects.

Its activity is organised around three agencies (Lorette, Audruicq and Nantes), to which the operational branches are attached (Bordeaux, Lyon and Avignon).

### Heating: CHAM

A wholly-owned subsidiary of the EDF group, CHAM installs, maintains and repairs small and medium-sized thermal equipment, from boilers to renewable energy. It develops innovative online maintenance solutions and offers connected home management services.

With more than 900 employees across France, CHAM completes upwards of 700,000 tasks a year, meeting the needs of homeowners, private and public collective housing, and businesses.

In its relentless pursuit of growth CHAM is positioning itself as a specialist energy services provider based on three key strengths: professional staff, network expertise and strong local markets.

### Third party investment in energy efficiency: Perfesco

Perfesco, a wholly-owned subsidiary of EDF, provides eco-energy efficiency services that include design, investment, installation and operation backed up by a performance guarantee. Perfesco helps its customers make their energy shift. To do so, this company identifies high-energy consumption items at major economic players and offers to install more economical equipment, making profit based on the savings generated.

## 1.4.6.2 Gas activities

In Europe, the EDF group uses over 25 billion cubic metres of gas. As such, EDF has developed a gas strategy to ensure the security of gas supply for its more than 5.1 million customers<sup>(2)</sup>, its cogeneration plants and its gas power plants.

The Group is active in the natural gas market in France and Europe via its subsidiaries EDF Energy and EDF Luminus and more particularly in Italy via its subsidiary Edison. The latter on 1 August 2017 became EDF's gas platform by virtue of a service contract to manage its assets and develop its upstream activities (see section 1.4.5.2.2 "Edison's strategy"). It also relies on EDF Trading for its short-term operations relating to transactions on the continental and United Kingdom wholesale markets, as well as on Dalkia (for cogeneration plants).

Lastly, the Group is present outside Europe, especially in the United States, where EDF Energy Services is an important natural gas supplier of major industrial customers and distributors.

In 2018, EDF Trading Limited and JERA Co. Inc. agreed to set up a joint venture under the name JERA Global Markets in which EDF Trading will have a 33.33% stake and JERA Trading International Pte Ltd, itself a wholly-owned subsidiary of JERA Co. Inc. will have a 66.67% stake. JERA Global Markets will be the sole entity in charge of managing the short and medium-term performance of EDF's and JERA's LNG assets.

### 1.4.6.2.1 Natural gas end-market

In Europe, on 31 December 2018, the downstream customer portfolios were as follows:

- in France (EDF and ÉS): around 1.7 million customers (retail and key accounts) and over 31TWh in 2018;
- in Italy (Edison): around 0.9 million customers, 7.3 Gm<sup>3</sup> of gas and about 77.5TWh;
- in the UK (EDF Energy)<sup>(3)</sup>: around 1.9 million customers and about 29TWh;
- in Belgium (EDF Luminus): around 600,000 customers and about 14TWh.

(1) A project funded by a consortium made up of EDF, IZIVIA, Renault, Nissan, BMW, Volkswagen and ParisTech with additional funding from the EU Commission.

(2) Customers are broken down by number of delivery points at end 2018.

(3) Excluding Northern Ireland.



#### **1.4.6.2.2 Gas assets and projects**

##### **1.4.6.2.2.1 Supply sources**

In Europe, the Group's gas and LNG supply comes from short- and long-term gas markets and from a diversified portfolio of long-term contracts, originating from Qatar, Russia, the North Sea and North Africa.

In the United States, the majority of the supplies originates from the gas markets.

In the rest of the world, specific contracts have been concluded to ensure the supply of the Group's gas power plants.

In order to continue being able to supply its customers, the Group aims to strengthen and diversify its medium and long-term sources of gas.

##### **1.4.6.2.2.2 Infrastructures**

###### **Gas pipelines**

Apart from its various rights to transport capacity in the European network, the EDF group participates, through its Edison subsidiary, in infrastructure projects for gas importation (see section 1.4.5.2.3.2 "Hydrocarbon business").

###### **LNG regasification terminals**

On 30 October 2018, EDF sold its 65% stake in the Dunkirk LNG terminal (in which Fluxys holds a 25% stake and Total a 10% stake) to Fluxys, in partnership with Axa Investment Managers – Real Estate and Crédit Agricole, and a financial consortium made up of Samsung Securities Co. Ltd., IBK Securities Co. Ltd. and Hanwha Investment & Securities Co. Ltd. EDF remains the terminal's main long-term shipper in line with the Group's gas strategy.

EDF also retained the right to use 80% of the Rovigo offshore terminal's regasification capacity, i.e. 6.4Gm<sup>3</sup> a year, through Edison (see section 1.4.5.2 "Italy").

The Group also holds regasification capacities in the terminal of Zeebrugge (Belgium).

###### **Small Scale LNG supply chain**

In 2018 Edison began to build a Small Scale LNG supply chain to sell LNG in Italy comprising an onshore depot and a small scale LNG terminal in order to help develop a low-carbon sustainable fuel for transport by road and sea (see section 1.4.5.2.3.2 "Hydrocarbon business").

###### **Storage**

In Germany, the EDF group has storage for natural gas in salt cavities situated in Etzel. The aboveground facilities are operated through a 50/50 joint venture with EnBW. EDF has around 190 million cubic metres of volume capacity in this salt cavity storage.

With respect to storage activities of the Group in Italy and in the United Kingdom, see respectively, sections 1.4.5.2.3.5 "Regulated activities" and 1.4.5.1.2.2 "Thermal generation and gas storage".

The Group also holds storage rights in the Netherlands, Belgium and France.

##### **1.4.6.2.2.3 Exploration and Production (E&P)**

The Group is developing its upstream activities in hydrocarbons exploration and production, through Edison (see section 1.4.5.2 "Italy"). Proven reserves amounted to 209 million barrels of oil equivalent, with 18.1 million barrels of oil equivalent produced in 2018.

#### **1.4.6.3 Optimisation and trading: EDF Trading**

EDF Trading (EDFT) is the EDF group's exclusive interface with the wholesale energy markets providing market, optimisation and risk management services to the EDF group as well as third parties. The company operates across Europe, North America and Asia in the wholesale markets for electricity, natural gas, LNG and LPG, environmental products and coal and freight (through its partnership with JERA Trading). EDF Trading is one of the largest wholesale energy market traders in Europe and in North America. Through its EDF Energy Services subsidiary, it is one of the main independent providers of energy management services for power generation companies and retailers and a top five retail electricity supplier to commercial and industrial users in North America.

EDF Trading's registered office is located in London. The company has around 870 employees and is governed by the UK's financial market regulator, the Financial Conduct Authority.

Among other things, EDF is responsible for accessing wholesale markets on behalf of DOAAT (see Section 1.4.3 "Optimisation activities for EDF in France").

#### **European Electricity market**

EDF Trading is a leading participant in the European electricity wholesale market trading over 2,000 TWh annually. The company provides a full range of risk management services to EDF group's asset operators and to third parties. It has an extensive geographic footprint and scale of activity which makes it able to adapt quickly to changes in the market and to develop new business where appropriate. In 2018, EDF Trading continued its optimisation services for the Group's French flexible assets. The company also developed bespoke risk management structures for EDF in France to help it manage exposure to the ARENH regulation. EDFT increased its services in Italy following the launch of its power partnership with Edison in 2017. The company also concluded a large number of transactions for EDF's C&I customer business.

#### **European Gas**

EDF Trading is also a leading participant in the European gas wholesale market trading over 764 bcm annually. It optimises EDF group entities' gas assets including production, transmission rights, long-term supply contracts and re-gasification and storage capacities. This enables it to support the EDF group and third party customers with complete gas wholesale market solutions. In 2018, EDF Trading increased its oil and gas hedging business with Edison and extended its optimisation services of the Dunkirk LNG terminal. The company also provided market access to EDF's Commercial Division and Dalkia including flexibility services following the new French regulation around gas storage.

#### **North American power and gas**

EDF Trading is a leader in the North American wholesale electricity markets with an extensive geographic footprint. It is also one of the top power and gas marketers, trading with over 700 counterparts across North America. It serves a portfolio of customer contracts including long-term electricity, natural gas and environmental products. EDFT NA contracts or manages on average 215 million cubic metres of natural gas storage capacity and transacts approximately 140 million cubic metres per day. Additionally, it provides (financial and physical) hedging and congestion management services to a portfolio of 300GW spread across five ISOs. In 2018, EDF Trading increased activity with the E&P sector, building relationships with producers to purchase their production and optimise the company's supply obligations.

#### **EDF Energy Services**

EDF Energy Services is EDF Trading's dedicated customer platform in North America providing comprehensive energy risk management services to C&I businesses, power generators and retail energy aggregators. It offers environmental products, natural gas and electricity to a portfolio of non-residential customers and is ranked in the top five of retail electricity suppliers in North America. Additionally, it has supply agreements with retail energy aggregators who supply electricity and gas to residential and small commercial customers throughout the US and Canada. EDF Energy Services is one of the top providers of generation services to third-party power stations in the US, dispatching over 41GW of generation output across 147 power stations and more than a dozen Load Demand Response customers. Some of the EDF ES customers are European entities or are present in Europe, allowing EDF to serve their needs on a global scale. In 2018, EDF Energy Services continued to expand its footprint signing or renewing a significant number of contracts. The company now serves 26 of EDF's Global Top customers who have a presence in Europe and North America. In 2018, EDF Energy Services acquired TransCanada's Power Marketing retail portfolio giving the company access to a wider set of customers and progressing its strategy of expanding its customer base to include smaller commercial and industrial customers.

## Environmental products

EDF Trading is committed to the environmental products marketplace and, as part of a leading renewable generator, offers a broad range of multi-commodity structured solutions that help the EDF group and third party customers around the world. EDFT is active in the compliance and voluntary carbon markets, including guarantees of origin certificates in Europe, Renewable Energy Certificates in the US, and International Renewable Energy Certificates in the rest of the world. In addition, it is a recognised leader and provider of risk management products in the European weather market. In 2018, EDF Trading executed the first I-REC (International Renewable Energy Certificate) for the EDF group and expanded its guarantees of origin business.

## Global Fuels

In April 2017, EDF Trading concluded the sale of its coal and freight business to JERA. EDFT now holds a 33% financial stake of JERA Trading, one of the largest coal traders globally.

EDF Trading offers a complete range of LNG and LPG services including supply, delivery and nominations into the appropriate network. In 2018, EDF Trading and JERA announced the signing of binding agreements to form an LNG optimisation and trading joint venture where JERA's and EDFT's LNG optimisation and trading activities will be merged into JERA Trading. This transaction is expected to complete in early 2019. The Company continued to develop its global LPG activities.

## 1.4.6.4 Equity interests

### 1.4.6.4.1 EDF Trading Logistics

With a fuel oil supply volume of approximately 1 million tonnes and 1.8 million tonnes of coal delivered in 2018, EDF Trading Logistics acts as EDF's vehicle for fuel oil purchases. It organises fuel oil and coal supply logistics operations for all of the EDF group's thermal plants in mainland France, Corsica and France's overseas departments, in close collaboration with JERA Trading, and controls the coal terminals in the ports of Le Havre and Saint Nazaire.

In addition, EDF Trading Logistics provides the Group its expertise in regard to managing risks relating to the transport of fuel oil (hazardous materials), an activity that has received ISO 14001 certification, and in the management of environmental crises arising from this activity.

### 1.4.6.4.2 Other equity interests

As well as interests in local distribution companies or LDCs (SMEG, Enercal, Électricité de Mayotte, EDSB), the EDF group has industrial subsidiaries and holdings. These companies contribute, within their specific field of activities (generation, fuel, engineering) to the Group's missions, and more specifically, to those of generation and engineering: namely to ensure the short- and medium-term performance of EDF's portfolio of generation assets in France.

These companies include SAE, which specialises in fuel transport and trading operations on behalf of the EDF group; SHEMA, which specialises in hydropower generation by small power plants; and SOCODEI, a wholly-owned subsidiary of EDF specialising in the treatment and packaging of low- and intermediate-level radioactive waste.

In continental Europe outside France, EDF has launched a strategic review of its energy generation assets based on fossil fuels.

For recent changes in the dedicated asset portfolio, see section 5.1.6.1.6 "Management of financial risk on EDF's dedicated asset portfolio".

## 1.5 LEGISLATIVE AND REGULATORY ENVIRONMENT

EDF group entities are subject to a wide variety of regulations in the conduct of their business activities. In particular, EDF is subject to the European legislation on the electricity and gas markets, which has been transposed into French law, as well as to the applicable environmental, nuclear power, health and safety regulations.

The following review of legal and regulatory provisions is not designed to be an exhaustive description of all such provisions that are applicable to the EDF group.

### 1.5.1 EDF AS A PUBLIC UNDERTAKING

As of 31 December 2018, the French State held 83.67% <sup>(1)</sup> of EDF's share capital and 88.83% of EDF's voting rights and, pursuant to Article L. 111-67 of the French Energy Code, must at all times hold at least 70% of EDF's capital.

As an undertaking in which the French State holds a majority share, EDF is subject to the provisions of Order no. 2014-948 of 20 August 2014 on the governance and equity transactions of companies with a public shareholding and its Application Decree no. 2014-949 of the same date.

The French Government Shareholding Agency (APE), which was founded by Decree no. 2004-963 of 9 September 2004, fulfils the State's remit in its capacity as EDF's shareholder and, in this respect, proposes and implements the State's decisions and guidelines, in consultation with the ministers concerned.

In accordance with the legislation that applies to all undertakings of which the State is a majority shareholder, EDF may have to undergo certain State audit procedures, in particular through an economic and financial evaluation assignment, pursuant to Decree no. 55-733 of 26 May 1955 on State economic and financial evaluation and Decree no. 53-707 of 9 August 1953 on State evaluation of national public undertakings and certain organisations, the purpose of which has an economic or social component.

EDF also has to undergo the audit procedures performed by the French General Accounting Office (*Cour des Comptes*) and Parliament. Thus, in addition to the control performed by the Statutory Auditors, the Company's accounts and management and, where applicable, those of its directly-held majority subsidiaries, fall under the control of the French General Accounting Office, in accordance with Articles L. 111-4, L. 133-1 and L. 133-2 of the French Code of Financial Jurisdictions.

Moreover, the Legislative Decree of 30 October 1935 laying out the State's control over firms, consortia and organisations or companies of any kind calling on State financial aid allows the Minister for the Economy to have EDF audited by the General Finance Inspection Office.

Lastly, the disposal of EDF shares by the State, or the dilution of the State's stake in EDF's capital, is subject to a specific procedure under Order no. 2014-948 of 20 August 2014 on the governance and equity transactions of companies with a public shareholding.

### 1.5.2 PUBLIC SERVICE IN FRANCE

#### Statutory definition of public service in France

Articles L. 121-1 *et seq.* of the French Energy Code outline the framework for the public electricity sector (see section 1.5.3.2 "French Legislation: The Energy Code" below for a description of this regulation).

#### Public service missions

Articles L. 121-1 *et seq.* of the French Energy Code state that the public electricity service must develop a balanced supply of electricity, develop and operate public electricity networks and supply electricity at regulated sales tariffs.

#### Balanced development of electricity supply mission

The purpose of developing a balanced supply of electricity, which is defined in Article L. 121-3 of the French Energy Code, is to achieve the objectives defined in the multi-year energy programme (PPE). The PPE was defined by decree, and sets out priority courses of action for the public authorities for the management of all forms of energy in continental metropolitan France. It must be compatible with the greenhouse gas emission reduction targets set in the carbon budget and the low carbon strategy, which are defined by Decree no. 2015-1491 of 18 November 2015.

The PPE contains sections on (i) the security of supply, (ii) improving energy efficiency and reducing primary energy consumption, in particular fossil fuel, (iii) developing the utilisation of renewable energies and energy recovery, (iv) the balanced development of energy networks, storage and conversion, and managing the demand for energy, (v) the preservation of consumer purchasing power and the competitiveness of energy prices, in particular for undertakings that are exposed to international competition, (vi) the evaluation of the needs for professional skills in the field of energy and how training courses can be adapted to these needs, and (vii) the strategy for developing clean mobility.

It defines the quantitative objectives for the plan and the maximum indicative budget for the public funds that the State and its public institutions will mobilise in order to attain them. It may be broken down by objective and by industry sector.

The first PPE must cover an initial period of three years (2016-2018), then a second period of five years (2018-2023). Subsequent PPEs will be drawn up for two, successive five-year periods.

The first PPE was defined by Decree no. 2016-1442 of 27 October 2016 on the multi-year energy programme. Pursuant to the law, on 6 April 2017, EDF prepared a Corporate Strategy Plan (PSE) presenting the actions that the Company commits to implementing in order to meet the security of supply and electricity generation diversification objectives defined in the first period of the PPE. The PSE was submitted for approval by the Minister for Energy who, after reviewing its compatibility with the PPE, asked EDF to develop a new plan.

The balanced development of electricity supply mission also involves guaranteeing the supply of areas that are not interconnected to continental metropolitan France (Corsica, and the overseas départements and territories), as well as some islands in Brittany, Corsica, Guadeloupe, Guyana, Martinique, Mayotte, La Réunion, and Saint-Pierre-et-Miquelon will each have their own specific PPE. Other areas that are not interconnected with the continental metropolitan network, except for Saint Martin and Saint Barthélemy, will be subject to a section appended to the PPE for continental metropolitan France.

As a power producer, EDF, along with the other producers, contributes to the performance of this mission.

Between 19 March and 30 June 2018 the public was invited to comment on the draft PPE covering the 2019-2023 and 2024-2028 periods.

On 25 January 2019 France's environment Ministry published the full text of the draft PPE which will form the basis of the country's energy future in the coming years. First, the draft PPE will be debated and approved, amended or rejected by various national bodies having official remit over the energy shift, energy policy, electricity tariffs and electricity supply networks (the *Conseil National de la Transition Écologique*, *Conseil Supérieur de l'Énergie*, *Comité d'Experts pour la Transition Énergétique*, *Comité de Gestion des Charges de Service Public de l'Électricité*, and *Comité du Système de Distribution Publique d'Électricité*). The public will then be invited to comment online on the PPE in light of the opinion issued by the national environmental authority. Neighbouring states will also be invited to comment. The PPE is expected to be adopted and the corresponding decree issued in 2019.

(1) Including the EPIC Bpifrance allotment of 389,349,361 EDF shares held since January 2018.

### Mission to develop and operate public transmission and distribution networks

The mission to develop and operate the public electricity transmission and distribution networks, which is defined in Article L. 121-4 of the French Energy Code, involves ensuring:

- a rational electricity distribution service in France through the public transmission and distribution networks, in a way that is environmentally friendly, the interconnection with neighbouring countries;
- connection and access to the public transmission and distribution networks, under non-discriminatory conditions.

Public network operators are designated by law to carry out this duty: RTE for transport, Enedis and Local Distribution Companies (*Entreprises Locales de Distribution*, or LDCs) for distribution, EDF in zones that are not interconnected to the continental metropolitan network.

### Mission to supply electricity

The public service mission to supply electricity, which is defined in Article L. 121-5 of the French Energy Code, involves ensuring the supply of electricity throughout France to customers who benefit from regulated electricity sales tariffs.

By law, this mission has been entrusted to EDF and to the LDCs.

The conditions under which customers can benefit from regulated electricity sales tariffs are defined in Articles L. 337-7 *et seq.* of the French Energy Code.

The mission to supply electricity also involves the application of the special "basic necessity" rate (TPN). This public service mission is assigned to all electricity suppliers. The Law 2015-992 of 17 August 2015 ("energy Transition law") provides for the gradual replacement of the TPN by "energy vouchers". These vouchers are a special means of payment that allow households that are experiencing financial difficulties to cover part of their energy consumption expenses (electricity, gas, fuel oil, etc.) or their expenditure on improving the energy efficiency of their home.

The mission to supply electricity moreover includes supplying emergency power to customers who are connected to the public networks. The relevant administrative authority designates emergency suppliers through one or more tendering procedures. As the implementing regulations had not yet been adopted on the date of this Reference Document, this provision has still not entered into force.

### Social cohesion

Article L. 121-5 of the French Energy Code provides that the supply of electricity at regulated tariffs must contribute to social cohesion, in particular through the national equalisation of regulated electricity sale tariffs and tariff entitlement.

Article L. 115-3 of the French Social Action and Families Code prohibits electricity suppliers from cutting off electricity supplies to the primary residences of individuals or families during the winter period (from 1 November to 31 March) due to unpaid bills, including through contract termination. Electricity suppliers may, nevertheless, in certain cases, reduce the power supplied, except with regard to customers who benefit from "energy vouchers".

In its capacity as an electricity supplier, EDF is required to maintain electricity supplies under the conditions laid down by said Article and by Decree no. 2008-780 of 13 August 2008 on the procedure that is applicable in the event of unpaid electricity, gas, heating and water bills, implemented in its amended form pursuant to Decree no. 2014-274 of 27 February 2014.

### Public Service Contract

On 24 October 2005, a Public Service Contract was signed by the State and EDF pursuant to Article L. 121-46 of the French Energy Code. This contract, which details the commitments made by EDF and the State and specifies the rules governing the financial compensation for service commitments, will remain in force until a new contract is signed, as provided for in the contract itself.

### Commitments by EDF (excluding network managers)

EDF's public service commitments include:

- access to the public electricity service and the supply of electricity to customers who choose to remain at regulated tariffs;
- production and sales. These areas include the implementation of the energy policy and maintaining secure power generation that is environmentally friendly;
- contributing to the safety of the electricity network. In this regard, EDF undertakes to enter into several contracts with RTE, in particular concerning the optimisation of work on generation facilities and the availability of the resources required to maintain network balance.

### Commitments by network managers

In the Public Service Contract, the Enedis and RTE network managers made commitments concerning the management of the public networks for the transmission and distribution of electricity and the safety of the electricity system. These commitments are financed by the Tariff for Using the Public Electricity transmission and distribution Networks (TURPE).

These commitments concern, above all, network safety, supply quality, third party safety and the preservation of the environment – four areas where customers' and local authorities' expectations are especially high.

### More accessible services

On 28 September 2010, the State and EDF, as well as eight other major public service operators, signed a partnership agreement entitled "+ de services au public" ("more services to the public"), which aims to develop access to a set of services intended for rural populations in France (information on bill payment, general information, travel ticket sales, etc.).

Reception staff and internet access points are some of the many resources made available to users through shared facilities such as Multiservice Conciliation and Information Points (PIMMS), Public Service Relays (RSP) and other structures such as town halls. Following the experimental phase, during which these services were deployed in twenty-two French départements, in July 2013, the Inter-Ministerial Committee for the Modernisation of Public Action (CIMAP) decided to extend this initiative throughout France.

## 1.5.3 ELECTRICITY MARKET LEGISLATION

### 1.5.3.1 European legislation

Three European Directives, which form the basis for the current organisation of the electricity market in France, were successively adopted in order to lay down the common rules for the generation, transmission, distribution and supply of electricity. Directive no. 96/92/EC of 19 December 1996 laid the foundation for opening up the electricity market to competition.

Directive no. 2003/54/EC of 26 June 2003 reiterated the major principles and took an additional step on the path to opening up the market, by progressively expanding eligibility to all customers.

Directive no. 2009/72/EC of 13 July 2009, known as the "Third Directive", was adopted as part of the third "Energy Package". This Directive primarily strengthens the guarantees of the independence of transmission system operators and increases the power of the national regulatory authorities. These provisions were incorporated into the French Energy Code.

Moreover, the rules that govern the conditions for access to the network for cross-border exchanges in electricity are currently defined by regulation (EC) no. 714/2009 of the European Parliament and Council of 13 July 2009, which is part of the third Energy Package. This regulation, *inter alia*, provides for a compensation mechanism between transmission system operators for the costs incurred by hosting cross-border flows of electricity on their networks. This compensation is paid by the operators of the national transmission systems from which cross-border flows originate and the systems where those flows end.

Finally, the "Security of Electricity Supply" Directive no. 2005/89/EC, which was adopted on 18 January 2006, is designed to provide a better definition of the responsibilities of the various operators, ensure that minimum operational standards are respected, maintain balance between demand and supply, and channel investments toward the systems. The objectives of this Directive have been taken into account in various French laws and regulations.

## Energy Union

On 30 November 2016, the European Commission presented a legislative package entitled "Clean Energy for All Europeans", which is a proposal to revise all legislation on electricity. This package is made up of 11 legislative texts and a considerable number of communications documents that accompany the European Commission's proposals. These proposals concern the organisation of the wholesale and retail markets for electricity, and are designed to give increased importance to consumer-centred measures. The legislative proposals are also an opportunity to confirm or propose new European targets for 2030 in terms of energy efficiency (a 30% target proposal) and renewable energy (a 27% target proposal). A new regulation is proposed for security of supply, and a revised regulation is proposed concerning the Agency for the Cooperation of Energy Regulators (ACER). All the proposed provisions are intended to create a more cohesive organisational framework for the electricity markets, for the benefit of the European energy and climate policies, as part of the planned European Energy Union. A technical memo on Energy Union Governance completes the package and specifies the method for monitoring the achievement of objectives by the Member States that will be implemented by the Commission. The parliamentary debate began in early 2017, and the Council was also involved in negotiating these texts. Apart from Directive (EU) 2018/844 of 30 May 2018 on the energy performance of buildings, the final texts are not expected to be adopted before mid-2019 after *trilogues* between the European Parliament, the Council of the European Union and the European Commission. The (new or revised) provisions are therefore expected to enter into force between 2019 and 2021, depending on whether they are immediately applicable in the Member States (regulations) or have to be transposed into domestic law (default time of 18 months).

## The Agency for the Cooperation of Energy Regulators

Regulation (EC) no. 713/2009 of the European Parliament and Council of 13 July 2009, established an Agency for the Cooperation of Energy Regulators (ACER). The ACER plays a role in developing network codes in the electricity and gas sectors, and can make decisions relating to cross-border infrastructures (on this subject, see also section 1.5.6.2.5 "Regulations applicable to renewable energy generation").

### 1.5.3.2 French legislation: the Energy Code

The various pieces of legislation on energy<sup>(1)</sup> were incorporated into the French Energy Code by Order no. 2011-504 of 9 May 2011, with the exception of the majority of the provisions on nuclear energy, which were incorporated into the French Environment Code, pursuant to Order no. 2012-6 of 5 January 2012. Moreover, Decree no. 2015-1823 of 30 December 2015 organised the regulatory section of the French Energy Code. Consequently, around one hundred decrees on energy law have been repealed.

The Law of 17 August 2015 on Energy Transition for Green Growth amended numerous provisions of the French Energy Code, and in particular the objectives of the energy policy, which are now focused on the emergence of a competitive economy that creates an abundance of jobs through the mobilisation of all the industrial sectors (in particular the green growth sectors), security of supply and the reduction of reliance on imports, competitive and attractive energy prices, the preservation of human and environmental health, social and territorial cohesion, the fight against fuel poverty, and contributing to the implementation of a European Energy Union.

## Generation facilities

Anyone can operate an electricity generation facility provided that, above a certain power threshold determined by decree, an operating licence issued pursuant to Article L. 311-5 of the French Energy Code is obtained. The powers and responsibilities of local authorities with regard to electricity generation are defined in Articles L. 2224-32 and L. 2224-33 of the French Local Authorities Code, and in Article 88 of Law no. 2010-788 of 12 July 2010 on the national commitment to the environment.

## Regulated Access to Electricity from the Existing Nuclear Fleet (ARENH)

The rules governing Regulated Access to Electricity from the Existing Nuclear Fleet (ARENH), provided for in Articles L. 336-1 *et seq.* of the French Energy Code, have been implemented since 1 July 2011. See section 1.4.3.3 "Regulated access to historic nuclear power (*Accès Régulé à l'Énergie Nucléaire Historique*, or ARENH)" on this point.

## Choice of electricity supplier

All customers, without exception, have been eligible since 1 July 2007, i.e. they may freely sign a contract for the purchase of electricity with a producer or supplier of their choice that is established on the territory of the European Union or on the territory of a State that is party to an international agreement with France (Article L. 331-1 of the French Energy Code).

Customers can choose to benefit from regulated electricity sales tariffs under the conditions set out in Articles L. 337-7 *et seq.* of the French Energy Code. Pursuant to these provisions:

- household and non-household final consumers whose power demand is less than or equal to 36 kVA benefit, at their request, from regulated sales tariffs; this is also true for all customers in areas that are not interconnected to continental metropolitan France;
- household and non-household final consumers whose power demand is greater than 36 kVA, who had not exercised their eligibility on 7 December 2010 were able to benefit from regulated sales tariffs until 31 December 2015. Since 1 January 2016, these consumers no longer benefit from regulated tariffs. Article 25 of Law no. 2014-344 of 17 March 2014 on consumption provided for a six-month transitional period, during which customers who had not signed a new contract with the supplier of their choice before 31 December 2015 could, in order to guarantee the continuity of their electricity supply, continue to benefit from a contract with EDF<sup>(2)</sup> during a maximum transitional period of six months, at the end of which they would no longer be supplied (i.e. on 30 June 2016). During this period, customers had the opportunity to terminate this contract at any time without having to pay an indemnity. EDF had an obligation to inform the customers concerned, by letter, of the expiration of the transitional contract three months and one month before it ended. Order no. 2016-129 of 10 February 2016 introduced, from 1 July 2016, a mechanism ensuring the continuity of the gas and electricity supply: customers who, on 30 June 2016, have not subscribed to the market offering are deemed to have accepted a new contract proposed by the designated supplier, following a competition procedure, by the CRE in its decision of 4 May 2016. In November 2016, the CRE organised a new call for tenders for the lots that could not be allocated in May 2016. This call for tenders was unsuccessful for the lots concerning electricity supply contracts.

Article L. 111-84 of the French Energy Code requires internal accounts to be kept that make it possible to distinguish between supply to customers who exercised their right to eligibility and supply to customers at regulated tariffs. The State and the CRE have a right of access to the electricity companies' accounts.

## Third-party access to networks

Article L. 111-91 of the French Energy Code provides that network managers must guarantee access to the public transmission and distribution networks in order to:

- perform the public service missions to supply electricity at regulated electricity sales tariffs and at basic necessity special rates;
- perform electricity procurement contracts;
- perform electricity export agreements signed by a producer or by a supplier who is located on French national territory.

(1) Law of 15 June 1906, law no. 46-628 of 8 April 1946, law no. 2000-108 of 10 February 2000, law no. 2003-8 of 3 January 2003, law no. 2004-803 of 9 August 2004, law no. 2006-1537 of 7 December 2006, law no. 2010-1488 of 7 December 2010

(2) Or their Local Distribution Company.



Disputes concerning third-party access to networks are heard by the Settlement of Disputes and Sanctions Committee (CoRDiS), which is part of the Energy Regulation Commission (CRE).

The tariffs for using the Public Electricity Transmission and Distribution Networks (TURPE) referred to in Articles L. 341-2 *et seq.* of the French Energy Code entered into force on 1 August 2017. They have been defined, with regards to transmission (TURPE 5 HVB) through a decision of the CRE of 17 November 2016 and a decision of the same date concerning distribution (TURPE 5 HVA/LV). Through its decision of 26 October 2017, the CRE added to its decision of 17 November 2016 on TURPE five distribution of a decision determining the conditions for covering the costs associated with customer management ("supplier commissioning").

### Subsidy mechanisms for certain production sectors

EDF is subject to electricity purchase obligations that result in contracts being signed with facility operators. The purchase obligation system, which was created by Law no. 2000-108 of 10 February 2000 on the modernisation and development of the public electricity service, was amended by Law no. 2015-992 of 17 August 2015 on Energy Transition for Green Growth, which clarified some aspects of this system and created a new form of subsidy in the guise of additional remuneration. The subsidy mechanism for certain production sectors that results from the aforementioned Law of 17 August 2015 now has three separate systems.

Firstly, the purchase obligation regime provided for by Articles L. 314-1 *et seq.* of the French Energy Code. These articles provide that EDF (as well as the LDCs that are responsible for supply in their service area) must sign purchase contracts, at the request of producers, for the electricity generated by technology sectors, the development of which the public authorities wish to support, either because they use sources of renewable energies, or because they have a specific form of energy efficiency (e.g. cogeneration). The eligible facilities are listed in Article D. 314-15 of the French Energy Code.

Article R. 314-2 of the French Energy Code provides that producers who benefit from the purchase obligation must sell all of their production to EDF under agreements entered into on the basis of indicative models approved by the Minister for Energy. Purchasing terms and conditions, specifically the electricity purchase prices, are set by order of the Ministers for Energy and the Economy.

Secondly, the additional remuneration regime, which was introduced by Law no. 2015-992 of 17 August 2015 on Energy Transition for Green Growth and is governed by Articles L. 314-18 *et seq.* of the French Energy Code. The additional remuneration takes the form of a premium that is paid to producers as a complement to their income from selling the electricity they produce on the market, as well as the assignment of their capacity certificates. In this respect, EDF is obliged to enter into an additional remuneration contract with eligible producers who request one and with certain producers who currently benefit from a purchase obligation and who wish to benefit from an additional remuneration agreement for the remainder of the term of their initial purchase contract. The eligible facilities with additional remuneration are listed in Article D. 314-23 of the French Energy Code.

Thirdly, the tendering procedure which, pursuant to Articles L. 311-10 *et seq.* of the French Energy Code, may be launched by the Minister for Energy when production capacities do not meet the targets of the multi-year energy programme. EDF is then required, outside the areas served by LDCs, to enter into an electricity purchase contract or a contract that provides for additional remuneration with the selected bidder(s) (this is a memorandum of understanding in the event that it is EDF itself in the capacity of "producer" that is chosen following the call for tenders).

The additional costs for EDF and the LDCs that result from contracts signed pursuant to the obligation to purchase energy are compensated by the State and financed, in particular, by the "Energy Transition" special purpose account, created by the Amending 2015 Finance Law. For 2018, Article 50 of Law no. 2017-1837 of 30 December 2017 (the Finance Act for 2018) substitutes these TICC and TICPE percentages with an amount in order to overcome the return forecast uncertainties of these taxes as well as the revenue expansion of the CAS which will incorporate the income generated by the auctioning of the guaranteed sources provided for in Article L. 314-14 of the French Energy Code. Likewise, the 2019 Finance Act stipulates a slight increase in the TICPE share from €7,166.3 million to €7,246.4 million in line with spending levels budgeted for 2019.

## Mechanism for compensating the additional costs of public service

### Compensation of Public Electricity Service costs (CSPE)

Article L. 121-6 of the French Energy Code lays down the principle that the State must compensate in full the costs that are attributable to the public service duty to generate and supply power (electricity and gas) assigned to EDF in particular, to other power producers and to the LDCs.

For electricity generation, the expenses defined by Article L. 121-7 of the French Energy Code include:

- the additional costs that result both from electricity purchase agreements entered into by EDF and the LDCs after tendering procedures (Articles L. 311-10 *et seq.* of the French Energy Code) and from purchase obligation agreements signed within the framework of Articles L. 314-1 *et seq.* of the French Energy Code, as well as additional remuneration agreements that are entered into pursuant to Articles L. 314-18 *et seq.* of the French Energy Code;
- in areas that are not interconnected to mainland France:
  - additional generation costs that are not covered by the generation portion in regulated sales tariffs, the costs of storage facilities managed by the electricity system manager, within the limits of the additional generation costs they help to avoid,
  - additional electricity procurement costs (other than those, mentioned above, linked to the purchase obligation) that are not covered by the generation portion in regulated sales tariffs, within the limit of the additional generation costs they help to avoid,
  - the costs paid by electricity suppliers in respect of energy demand control initiatives, less any income received through these initiatives, within the limit of the additional generation costs they help to avoid,
  - the costs of studies paid by a producer or supplier with a view to implementing electricity supply projects that are identified in the Decree on the multi-year energy programme;
- and, since the Amended Finance Act for 2016, the direct costs for EDF and the LDCs directly induced by the signing and managing of purchase contracts, contracts for additional remuneration and contracts signed following tendering procedures, within the limit of the costs that an average undertaking that would have incurred if properly managed and adequately equipped.

For the supply of electricity, the costs defined in Article L. 121-8 of the French Energy Code include:

- revenue losses and additional costs incurred by suppliers due to the implementation of "energy vouchers";
- costs incurred by suppliers as a result of their participation in the smart meter display plan established for low-income persons.

Moreover, in accordance with the provisions of Article L. 121-8-1 of the French Energy Code, the purpose of the CSPE is to finance the costs incurred by operators of public electricity transmission networks in respect of the calls for tender they may initiate if the load shedding capacities do not meet the targets stipulated in the multi-year energy programme.

The mechanism for compensating public service costs, governed by Articles L. 121-9 *et seq.* of the French Energy Code, was reformed as of 1 January 2016, pursuant to Law no. 2015-1786 of 29 December 2015 (the Amended Finance Act for 2015), which aims to secure the financing of the costs of the public energy service.

The electricity (and gas) public service costs are now financed in full, as follows:

- the costs linked to energy transition, which correspond to the subsidy mechanisms for renewable energies, as well as the reimbursement of the "long-term" compensation deficit incurred by EDF as it stands on 31 December 2015, are registered in a special purpose account (CAS) for "energy transition" that was created by the Amended Finance Act for 2015. Since early 2017 the CAS has been funded by a percentage of the revenue from the TICPE and to a lesser extent by the TICC. Fossil fuels are thus helping to pay for the energy shift;

- the other public service costs – excluding the costs associated with the subsidy mechanisms for renewable energies – (fuel poverty, tariff equalisation in areas not interconnected to metropolitan France, cogeneration, and the budget for the energy conciliator, etc.) are entered directly in the general budget under “Public Electricity Sector”;
- revenue from the domestic tax on the final consumption of electricity (TICPE), which was renamed the “Contribution to Public Electricity Service” (CSPE), is directly affected to the general budget. The CSPE is collected directly from final consumers of electricity in the form of an additional levy on the electricity sale price or directly from electricity producers that produce electricity for their own uses. Before 1 January 2017 it had been used to fund renewable energy and cogeneration plants, offset cost overruns in island territories and subsidise welfare policies.

The amount of the CSPE was set at €22.50/MWh as from 1 January 2016. This amount has been maintained for 2017, 2018 and 2019. As an exception, for electro-intensive and hyper-electro-intensive undertakings and distribution companies, reduced tariffs of between €0.50/MWh and €12/MWh have been defined.

The Decree no. 2016-158 of 18 February 2016 specifies the rules for determining the costs that can be attributed to public service energy missions, the procedure for determining the amount of the costs to be compensated for each operator, and the transactions for paying the compensations to the operators who bear the expenses.

Each year, the CRE records the amount of the costs that can be attributed, in respect of the previous year, to public service energy missions that are the responsibility of the operators and assesses, for the following year, the provisional amount of the same costs, and updates its cost forecast for the current year. Doing so, it distinguishes between the costs that are allocated to the “energy transition” special purpose account and those financed directly by the general budget.

Each year, before 15 July, the CRE sends the Minister for Energy its assessment of the amount of these costs.

The massive expansion of facilities that generate electricity using renewable energy sources (mainly wind power and photovoltaic facilities) and that benefit from the purchase obligation, for several years, has led to a significant increase in the costs to be compensated. Yet, since 2007, the amount of the CSPE that is actually applied to consumers has not made it possible to cover these costs, thus leading to an offsetting shortfall, for which EDF alone pays and that adversely impacts the group’s indebtedness. It therefore became necessary to design a new balanced mechanism (*i.e.* that avoids a new structural deficit being created), the financing of which is not based exclusively on electricity consumers alone (electricity is by far the least carbon-heavy energy and yet an imbalanced tax situation penalises its ability to compete with other energy forms, which is in contradiction with the CO<sub>2</sub> emissions reduction targets of the “Energy Transition” Law). Accordingly, since 1 January 2017 a share of TICPE revenue has been allocated to the “Energy Transition” CAS while the CSPE is allocated directly and solely to the general budget.

EDF and the public authorities have reached an agreement for the repayment of the debt formed by the offset deficit as it stands on 31 December 2015 *i.e.* €5,779.8 million. Under the new mechanism that has been in force since 1 January 2016, this debt shall be paid off by 31 December 2020, according to a progressive repayment schedule that was defined by an Order of 13 May 2016, which was amended on 2 December 2016.

On 22 December 2016, EDF sold part (26.40%) of this debt to a pool of investors comprised of a bank and a dedicated Special Purpose Entity (SPE). The proceeds of this sale without recourse totalled €1.542 billion. The debt sold includes a component which is not classified as dedicated assets. The sale of this component has led to an improvement of the Net Indebtedness of approximately €645 million. The remainder corresponds to the portion of the debt that was allocated to Dedicated Assets. It will be reinvested in these assets.

### Compensation for additional distribution costs

The purpose of the Electricity Equalisation Fund (FPE), the accounting management of which is entrusted to EDF under Article L. 121-29 of the French Energy Code, is to distribute the charges incurred as a result of public service missions assigned for managing the electricity distribution networks among the operators concerned, in

particular those linked to the specificities of the networks operated and that will not be covered by the portion relating to the use of those networks in the regulated tariffs or by the tariffs for using the public electricity distribution networks. The costs linked to involvement in the development of areas with particular geographical, economic or social difficulties, as defined by Article 42 of Law no. 95-115 of 4 February 1995, are also concerned. Note 4 to the consolidated financial statements at 31 December 2018 (section 6.1) describes the financial impact on the Group of the law’s application.

### Capacity guarantees

Articles L. 335-1 *et seq.* of the French Energy Code, which are taken from the NOME Act (New Organisation of the Electricity Market – *Nouvelle Organisation du Marché de l’Électricité*), obligate each electricity supplier to contribute to the security of electricity supply in continental metropolitan France, in light of its customers’ power and energy consumption patterns. Each supplier must therefore provide annually, under penalty of an administrative sanction, an amount of capacity guarantees according to its customers’ consumption at peak periods. Suppliers will obtain these capacity guarantees from generation or load operators, which must first have their capacities certified by the public distribution network manager.

The aims of this mechanism are:

- to make it possible to maintain or develop generation or load shedding capacities that ensure the level of security of supply set by the public authorities;
- to improve the remuneration of these capacities;
- to share the expense of this security of supply among all suppliers.

The “capacity mechanism rules” proposed by RTE were approved by a ministerial order of 22 January 2015 after consulting the CRE. Following the publication of Decree no 2018-997 of 15 November 2018 on the required capacity mechanism in the electricity sector, RTE sought consultation on a new draft set of rules.

The Law of 17 August 2015 on Energy Transition for Green Growth has adapted the capacity mechanism to small players allowing LDCs to transfer their capacity obligations, no longer just to other LDCs but “to any other supplier” and allowing electricity suppliers to transfer their capacity obligations to a final consumer for its consumption or to a public network operator for its losses (Article L. 335-5 of the French Energy Code).

Moreover, Article L. 335-3 of the French Energy Code introduced the possibility for all capacity operators to transfer to a third party their liability for discrepancies between effective capacity and certified capacity, and the payment of the penalties in respect of said discrepancies.

On 13 November 2015, the European Commission opened an in-depth investigation in light of European rules on State aids, with respect to the planned French capacity mechanism.

On 8 November 2016, the European Commission approved French plans for a capacity mechanism. During the investigation, France agreed to amend the mechanism as follows: introduction of long-term contracts (7 years) for new capacities, taking into account foreign capacities and measures to prevent any manipulation of the market.

Revisions made for the improvement of market transparency and surveillance led to the publication of the Order of 29 November 2016 amended by the Order of 12 October 2018. This made it possible for the mechanism to enter into force on 1 January 2017.

Over-the-counter transactions remain possible.

The implementation of the commitments concerning the opening of the mechanism to foreign capacity providers and long-term contracts requires a revision of the 2012 Decree, adopted in 2012 by the Council of State after reviewing the opinions delivered by the Higher Energy Council, the National Council for Standards Assessment, the Energy Regulation Commission and the Competition Authority. Decree no. 2018-997 of 15 November 2018 on the required capacity mechanism in the electricity sector provides for the explicit inclusion of some cross-border contributions to France’s security of supply of electricity as well as the setting up of a multi-year contractual system for new capacity.

## Electricity load shedding

The Law of 17 August 2015 on Energy Transition for Green Growth amended the legal rules on load shedding and, in particular, Articles L. 271-1 *et seq.* of the French Energy Code on this subject.

These provisions amend the previous legal rules and stipulate, in particular:

- that load shedding is defined as *"the action to reduce temporarily the effective withdrawal level of electricity from the public electricity supply and distribution networks by one or more consumption sites, compared to a forward-looking consumption plan or an estimated consumption, when an ad hoc request is sent to one or more final consumers by a load manager or an electricity supplier"*;
- that there is the possibility for consumers to monetise each of their demand responses, either vis-à-vis their supplier as part of a demand response offer that is inseparable from the supply, or via the intermediary of load managers;
- that the Government will organise calls for tenders if the load management capacities do not meet the targets of the multi-year energy programme (this mechanism replaces that of the load shedding premium);
- finally, for load shedding that leads to significant energy savings, the law provides that the administrative authority may require the payment to the supplier to be shared between the load manager and RTE.

The terms and conditions for applying these provisions are specified in Articles R. 271-1 *et seq.* of the French Energy Code, last completed by Decree no. 2017-437 of 29 March 2017 and by the rules for valuing the demand response on the wholesale energy markets (known as the "NEBEF 3.1" rules) approved by the CRE on 14 December 2017 and applicable for 2018 and the rules concerning scheduling, the balancing mechanism and the recovery of balancing charges, in their version approved by a decision of the CRE of 14 December 2017 and applicable for 2018.

## Self-consumption of electricity

Article 119 of Law no. 2015-992 of 17 August 2015 on Energy Transition for Green Growth authorised the Government to take, by way of an order, the necessary measures to ensure the controlled and secure development of facilities intended to consume all or some their own electrical output.

Following Order no. 2016-1019 of 27 July 2016 on the self-consumption of electricity came the publication of Articles L. 315-1 to L. 315-8 of the French Energy Code on 28 July 2016, which were ratified and completed by the Law of 24 February 2017 and distinguish between individual and collective self-consumption and in particular:

- require network operators to facilitate self-consumption operations, to implement the necessary technical and contractual arrangements, particularly with regards to the metering of electricity and to enable the realisation of self-consumption operations under transparent and non-discriminatory conditions;
- provide that the CRE establish special tariffs for public distribution networks for consumers participating in self-consumption operations when the installed capacity of generation facilities supplying them is less than 100 kilowatts.

The provisions of Decree no. 2017-676 of 28 April 2017 amending the French Energy Code specifies the conditions for applying these provisions, particularly with regards to collective self-consumption (no measurement used to qualify self-consumption, procedures for assessing the 100kW threshold provided for by law for the eligibility of TURPE "self-consumption" facilities to be defined by the CRE, general principles of distributing generation between each consumer participating in a collective self-consumption operation, link between the legal entity responsible for a collective self-consumption operation and the public distribution network managers, maximum capacity of the generation facilities eligible for derogation from the obligation to be attached to a balance group, which is set in the decree at 3kW).

At this stage, the implementation methods for self-consumption operations are still to be decided and in autumn 2017 the CRE organised self-consumption workshops with stakeholders and launched three calls for contributions on self-consumption: tariff issues, contractual framework and support mechanisms.

As such, on 15 February 2018 the CRE gave its decision presenting its recommendations and opinion on matters relating to self-consumption.

In its decision of 7 June 2018, the CRE set the TURPE (Tariff for using the public transmission network) for collective self-consumption.

As part of considering the PACTE business reform bill, the Assembly passed an amendment to permit, on a trial basis, for a period of five years, collective self-consumption *"within a limited geographic scope defined by Order on the opinion of the CRE"*.

## Closed distribution networks

Article 167 of Law no. 2015-992 of 17 August 2015 on Energy Transition for Green Growth authorised the Government to take any measure, by way of an order, arising from the law in order to add a section on closed distribution networks to the French Energy Code to provide a framework for a practice made possible by Article 28 of Directive 2009/72/EC.

Following Order no. 2016-1725 of 15 December 2016 on closed distribution networks, Articles L. 344-1 *et seq.* of the French Energy Code specify the definition of the closed distribution networks, their legal regime, missions assigned to the manager of the closed distribution network and the sanctions applicable if these provisions are not adhered to.

Article L. 344-13 of the French Energy Code provides that the terms and conditions for applying these provisions are defined by decree of the Council of State. To date, this decree has not been adopted.

A draft law to ratify the order was registered in the French Senate on 15 February 2017.

## Domestic networks

Law no. 2017-1839 of 30 December 2017 ending the research and use of conventional and non-conventional hydrocarbons and introducing various provisions relating to energy and the environment was published in the *Journal Officiel* of 31 December.

Its purpose, in particular, is to define and authorise the creation and operation of domestic building networks which constitute a new category of networks alongside public electricity distribution or transmission networks, and closed electricity distribution networks.

Pursuant to Articles L. 345-1 *et seq.* of the French Energy Code, domestic networks can now only be legally created if four criteria are met: the domestic building from which the network will be created must i) stand alone, ii) belong to a single owner, iii) be used primarily for offices, iv) not contain any dwellings.

Decree no. 2018-402 of 29 May 2018 on domestic building networks sets out the conditions under which these networks may exist as well as the rights and duties of office building owners and managers, network users and electricity public distribution networks managers.

## Electricity sector regulation

### The Energy Regulation Commission (CRE)

CRE is an independent administrative authority created by Article 28 of the Law of 10 February 2000.

Articles L. 131-1 *et seq.* of the French Energy Code give a general definition of the remit of the CRE, which is tasked with contributing to the correct functioning of the electricity and natural gas markets for the benefit of final consumers. In this respect, the CRE ensures, in particular, that the conditions for access to electricity and natural gas transmission and distribution networks do not impede the development of competition.

The CRE has significant powers: the power to make proposals, advisory powers and decision-making powers (approval power and regulatory power).

The CRE makes proposals, in particular, to the Ministers for the Economy and for Energy regarding the amount of the costs that are attributable to the public service missions assigned to power producers, and the net amount of the related contributions. Once the Decree has been published that specifies the methods for identifying and recognising the costs that are taken into account for the calculation of the ARENH price, the CRE will also propose the ARENH price. Moreover, since 7 December 2015, it has been the CRE's responsibility to send its justifiable proposals for changes in the regulated sales and transfer tariffs for electricity (on which it previously could only issue an opinion) to the Ministers for the Economy and Energy. The decision is deemed to have been made in the absence of any objections by one of the Ministers within the three months following the receipt of these proposals.

The CRE now has significant decision-making power to set the Tariffs for Using the Public Transmission and Distribution Networks (TURPE): it sends its reasoned decision to the administrative authority, which can only ask the CRE for a new decision in the event of non-compliance with energy policy guidelines. Under its residual regulatory power, the CRE also takes network connection decisions, as well as decisions to define the rules for calculating and adjusting the rights of suppliers to the ARENH.

The CRE is also vested with very broad powers that enable it to obtain any information that it may deem useful for the fulfilment of its remit, as well as authority to settle disputes and to apply penalties, through the Settlement of Disputes and Sanctions Committee (CoRDiS).

The Law on Energy Transition for Green Growth also gives the CRE the possibility of having the information it obtains through its remits audited, at the expense of the audited undertakings.

Organic Law no. 2017-54 of 20 January 2017 on Independent Administrative Authorities and Independent Public Authorities and Law no. 2017-55 of 20 January 2017 on the General Statute of Independent Administrative Authorities and Independent Public Authorities, provided these authorities, including the CRE, with a common legal status. These laws mainly lay down the rules relating to the mandate of members, the ethics of members, the operation and organisation of these authorities and parliamentary control.

## **Regulatory framework**

### **Tariff for Using the Public Transmission and Distribution Networks (TURPE)**

Pursuant to Article L. 341-3 of the French Energy Code, the tariff for using the public electricity transmission network is set by way of a reasoned decision by the CRE.

The tariff for using the public transmission network (TURPE 5 HVB) entered into force on 1 August 2017 for a period of four years. This tariff was set by the decision of the CRE of 17 November 2016 and was published in the *Journal Officiel* on 28 January 2017. This decision provided for an increase of 6.76% on 1 August 2017, followed by an inflation-based change on 1 August of each year (apart from corrections arising from the income and expense regularisation account). On 1 August 2018 the tariff was raised by +3% indexed to inflation.

The financial remuneration of RTE's assets is derived from the product of the regulated asset base (RAB), estimated on 1 January 2018 at €14,119 million, by a fixed remuneration rate. This remuneration rate corresponded to a nominal rate before tax of 7.25% for the 2013-2016 tariff period. For the 2017-2021 period, this rate is 6.125% before tax.

Concerning the transmission and distribution of natural gas (Law no. 2003-08 dated 3 January 2003), see section 1.5.4.2 "French legislation: The Energy Code".

### **Tariff for using the public electricity distribution networks (distribution TURPE)**

Over 90% of Enedis' sales are made up of revenues made from electricity transmission. The tariff for using the public electricity network (TURPE), in terms of levels and structure, is set by the CRE in a transparent and non-discriminatory manner, in order to cover all the costs borne by the efficient network operators.

On 17 November 2016 the CRE set a new TURPE 5 HVA/LV. The new tariff came into force on 1 August 2017 for an initial period of about four years and provided for increases indexed to inflation on 1 August of each year between 2018 and 2020 (excluding corrective effects from the regularisation account for income and expenses).

The Minister for Energy, who has a two-month deadline, by a decision of 12 January 2017 published in the *Journal officiel* dated 17 January 2017, requested a new decision, considering that the CRE's project did not take into account the country's energy policy.

Through a new decision dated 19 January 2017, the CRE confirmed its initial decision of 17 November 2016. Both decisions were published in the *Journal Officiel* of 28 January 2017.

The CRE completed its decision on 17 November 2016 with a decision of 26 October 2017, published in the *Journal Officiel* of 14 December 2017, on the remuneration to be paid by Enedis to suppliers for their management of single contract customers ("supplier commissioning"). Taking into consideration the changes made to the French Energy Code by Law no. 2017-1839 of 30 December 2017 ending the research and use of conventional and non-conventional hydrocarbons and introducing various provisions relating to energy and the environment, particularly those concerning the competence of the CRE in relation to supplier commissioning, the CRE has, in a new decision of 18 January 2018 published in the *Journal Officiel* on 25 January 2018, included all of its decisions of 26 October 2017.

On 2 February 2017, Enedis appealed to the Council of State to set aside the two TURPE 5 HVA/LV decisions.

On 3 February 2017, EDF also appealed to the French Council of State to set aside these CRE decisions.

By a judgment dated 9 March 2018, the French Council annulled the TURPE 5 deliberations in so far as they did not apply the "risk-free rate" to the corresponding assets in determining the cost of capital invested, to works for which provisions for renewal have been allocated during the tariff period covered by the so-called "TURPE 2" tariffs (for their as yet unamortised fraction), and to works handed over by the licensing authorities to the grid operator during the same tariff period (for the same fraction). Such annulment shall not take effect until 1 August 2018.

In response to the French Council of State's judgment, on 28 June 2018 the CRE issued a decision, published on 29 July 2018 in the *Journal Officiel*, on the TURPE 5a HVA/LV and its increase at 1 August 2018. Seeing as no aspect of the TURPE 5 HVA/LV is challenged by this decision, the TURPE 5a differs from the TURPE 5 only in taking the principles set out in the Council of State's judgment and the expected increase in the corporate tax rate into account.

These changes were accounted for by a 0.06% increase on 1 August 2018 which when also taking inflation and adjustment entries into account led to a 0.21% decrease on average.

The new tariff will be valid for a period of about three years and indexed to inflation on 1 August of each year (excluding adjustment entries and to a lesser extent the latest effects of accounting for the Council of State's judgment).

In the context of TURPE 5 HVA/LV, Enedis' financial remuneration is derived from the sum of the remuneration on managed assets (RAB paid at 2.5%) and the remuneration of regulated shareholders' equity (remunerated at 4.0%).

This decision encompasses the CRE's previous decisions on costs relating to the management of single contract customers, via the management component, and on collective consumption (decision of 7 June 2018) introducing a new tariff for collective self-consumption connected to the low voltage network with no changes to the tariff for individual self-consumption.

### **Linky regulation**

The Linky project is subject to a specific regulatory framework regarding meters operating life (20 years), with a dedicated regulated asset basis (RAB) for the meters installed between 2015 and 2021 and the associated systems.

The CRE's decision dated 17 July 2014 also set a nominal return rate before tax of 7.25% and a 3% additional premium in return for an incentive regulation to better meet costs and system performance, targets as well as deadlines bringing the return on the RAB to 10.25%. The incentive regulation can also trigger penalties potentially lowering the return, although not below a floor of 5.25%.

In addition, the implementation of a postponed tariff, set up to guarantee a neutral impact of Linky on the tariff for customers, means that payments for the 2014-2022 period will be made during the 2023-2030 period. This postponed tariff, which is attached a 4.6% compensation covering the cost of financial carry, will be totally paid by 2030.

At 31 December 2018, the deferred amount is +€950 million (this represents a receivable from Enedis in relation to their network users, which is not recognised on the Group's balance sheet at 31 December 2018, pursuant to the accounting standards in force on this date).



### 1.5.4 GAS MARKET LEGISLATION

#### 1.5.4.1 European legislation

Directive no. 98/30/EC of 22 June 1998 and Directive no. 2003/55/EC of 26 June 2003 were the major steps towards opening up the gas market to competition.

New rules aimed at improving the functioning of the internal natural gas market were defined in Directive no. 2009/73/EC of 13 July 2009, and by regulation (EC) no. 715/2009 of 13 July 2009 on conditions for access to the natural gas transmission networks.

Pursuant to this legislation, the network codes for capacity allocation mechanisms (CAM) and (balancing) rules officially entered into force on 1 November, and 1 October 2015 respectively. The first requires the capacities at interconnection points between transmission networks to be commercialised by bundling the output capacity of the first network with the input capacity of the second network, and by selling these interconnection capacities via auction. This first code has been replaced by a new code from regulation (EU) 2017/459 of 16 March 2017. The purpose of the second is to harmonise the balancing rules on transmission networks.

These codes have been completed by a network code on the standardisation of tariff structures for the transmission of gas from regulation (EU) 2017/460 of 16 March 2017.

#### 1.5.4.2 French legislation: the Energy Code

Directive no. 2009/73/EC of the European Parliament and of the Council of 13 July 2009 was transposed into French law by Order no. 2011-504 of 9 May 2011, which organised the legislative section of the French Energy Code. The French Energy Code entered into force on 1 June 2011.

#### Access to natural gas networks

The French Energy Code provides that customers, suppliers and their agents have a right to access natural gas transmission and distribution infrastructures, as well as LNG facilities, under the terms and conditions set forth in an agreement with the operators that run them.

Natural gas network operators must refrain from discriminating between users or categories of users in any way.

#### Customers

Since 1 July 2007, all customers can freely choose their supplier.

Pursuant to the provisions of Article L. 445-4 of the French Energy Code, household and non-household customers who consume less than 30,000kWh per year may benefit from regulated tariffs, at their request and without having to meet any conditions. Household customers who are entitled to the special "basic necessity" rate for electricity may benefit from a special solidarity tariff that is applicable to the supply of natural gas for part of their consumption. This special tariff will gradually be replaced by the "energy voucher" system (see section 3.2.3.2 "Contribution to the fight against energy poverty").

Customers whose consumption exceeds 30,000kWh per year can only benefit from regulated gas sales tariffs for a site if no market-based offer has been accepted for the site concerned, pursuant to Article L. 445-4 paragraph 2 of the French Energy Code.

Non-household final customers who consume more than 30,000kWh per year and who still benefit from the regulated tariffs for the sale of natural gas that are stipulated in Article L. 445-3 of the French Energy Code are no longer eligible for these tariffs:

- for non-household consumers who are connected to the transmission network, since 18 June 2014;
- for non-household consumers whose consumption level has exceeded 200,000kWh per year, since 31 December 2014;
- for non-household consumers whose consumption level has exceeded 30,000kWh per year, since 31 December 2015.

Article 25 of Law no. 2014-344 of 17 March 2014 on consumption introduced a six-month transitional period, during which customers who had not signed a new

contract with the supplier of their choice before 31 December 2015, were allowed, in order to ensure the continuity of their electricity supply, to continue to benefit from a contract with their incumbent supplier during a maximum transition period of six months, at the end of which they would no longer be supplied (i.e. 30 June 2016). During this period, customers had the opportunity to terminate this contract at any time without having to pay an indemnity. The supplier was under an obligation to remind the customers concerned, by letter, of the term of the transitional contract three months and one month before it would automatically come to an end. Order no. 2016-129 of 10 February 2016 introduced, from 1 July 2016, a mechanism ensuring the continuity of the gas and electricity supply: customers who, on 30 June 2016, have not subscribed to the market offering are deemed to have accepted a new contract proposed by the designated supplier, following a competition procedure, by the CRE in its decision of 4 May 2016. In November 2016, the CRE organised a new call for tenders for the lots that could not be allocated in May 2016 and for newly-concerned and for the newly concerned consumption sites. This call for tenders made it possible to award one lot for gas supply contracts.

Through a decision of 19 July 2017, the Council of State annulled the Decree of 16 May 2013 on regulated natural gas sales tariffs on the grounds that maintaining such tariffs is contrary to European Union law. Indeed, regulated natural gas sales tariffs do not fulfil the conditions laid down in Directive 2009/73/EC and, in particular, do not pursue any objective of general economic interest. However, that decision only annulled the disputed decree and not the regulatory provisions of the Energy Code relating to regulated natural gas sales tariffs in force since 1 January 2016. As such, regulated natural gas sales tariffs remain as long as the Prime Minister does not repeal these provisions.

The PACTE business reform bill gives the government the authority to take any measures falling within the scope of the law, by decree within six months of the law's promulgation, bringing regulated gas and electricity sales tariffs in line with European Union law, and to apply them to affected contracts in force according to the terms and conditions it sets out under which said tariffs are cancelled and, as the case may be, market tariffs are set in their place at those dates. Regulated sales tariff contracts will be terminated on 1 July 2023.

The government is further authorised to take measures, by decree, so as to provide a supply of last resort to domestic consumers without a natural gas supplier as well as to provide an emergency supply in replacement of a supplier incapable of or barred from doing business in order to ensure continuity of supply to end consumers.

#### Suppliers

Article L. 443-4 of the French Energy Code defines suppliers as persons who (i) are established on the territory of a Member State of the European Union or on the territory of another State pursuant to international agreements, and (ii) hold a licence issued by the Minister for Energy.

EDF is authorised to supply natural gas to non-household customers that do not provide services in the public interest, pursuant to an Order of the Deputy Minister of Industry of 14 September 2004, and, pursuant to an Order of 9 August 2005, to non-household customers that provide services in the public interest, as well as to natural gas distributors and suppliers, and, pursuant to an Order of 15 June 2007, to household customers.

EDF only supplies its customers at market-based prices. Regulated sales tariffs can only be proposed by Engie and LDCs responsible for gas supply.

#### Underground storage and third-party access to natural gas storage facilities

Article L. 421-4 of the French Energy Code requires all suppliers to hold, on 31 October of each year, directly or indirectly through an agent, sufficient inventories of natural gas in France to meet their direct or indirect contractual obligations to supply household customers and other customers that provide services in the public interest or that have not contractually accepted an interruptible gas supply, during the period between 1 November and 31 March.

Articles R. 421-1 *et seq.* of the French Energy Code specify the legal framework that applies to underground storage facilities for natural gas.

The Order of 31 July 2017 defined the terms and conditions for taking into account other modulation instruments for the implementation of the obligation of natural gas suppliers to declare and hold stocks and their storage capacities.



Law no. 2017-1839 of 30 December 2017 ending the research and use of conventional and non-conventional hydrocarbons and introducing various provisions relating to energy and the environment, published in the *Journal Officiel* of 30 December 2017 amends the rules for accessing underground natural gas storage facilities necessary for the security of supply, to establish a regulated access framework, guaranteeing the coverage of the costs borne by the operators of these facilities through the natural gas transmission network access tariffs. Suppliers will be able to subscribe to storage capacities via an auction system, the terms of which will be defined by the CRE. Obligations to hold natural gas stocks by suppliers provided for in Article L. 421-4 of the French Energy Code have therefore been abolished.

Decree no. 2018-221 of 30 March 2018 on building additional natural gas stores, mentioned in Article L. 421-6 of the French Energy Code, and Decree no. 2018-276 of 18 April 2018 amending various provisions of the regulatory section of the French Energy Code on the natural gas sector, amended the regulatory section of the French Energy Code on access to natural gas underground storage to take legislative changes introduced by Law no. 2017-1839 of 30 December 2017 into account.

The Order of 9 May 2018 on taking storage capacity rented from another member state of the European Union into account when applying Article D.421-12 of the French Energy Code repealed the decree of 31 July 2017.

Lastly, the CRE implemented the reform of natural gas storage by means of three decisions issued on 22 February 2018 pertaining to (i) the tariff for using natural gas underground storage infrastructure, (ii) the terms under which storage capacity may be sold, and (iii) the introduction of a storage tariff payment in the tariff for using GRTgaz's and TIGF's transmission networks, to which was added, after the storage capacity auction, the CRE's decision on 27 March 2018 to set the amount of the storage tariff payment in the tariff for using natural gas transmission networks.

### **Control and penalties**

The French Energy Code grants the Minister for the Economy, the Minister for Energy and the CRE, power to oversee the gas market. The Minister for Energy may also levy a fine, or withdraw or suspend an authorisation to supply natural gas. The CRE can carry out investigations into whether offences that breach the provisions of the French Energy Code have been committed (Article L. 135-13 of the French Energy Code).

## **1.5.5 PUBLIC ELECTRICITY DISTRIBUTION CONCESSIONS IN FRANCE**

### **French legal system applicable to concessions**

In accordance with Articles L. 121-4 *et seq.* and L. 322-1 *et seq.* of the French Energy Code, and Article L. 2224-31 of the French Local Authorities Code, the public distribution of electricity is operated under a system of public service concessions. Pursuant to this body of law, the contracting authorities organise the public electricity distribution service through concession agreements and general specifications that set forth the respective rights and obligations of the contracting authority and the operator. Currently, the contracting authorities are most often public institutions formed by associations of several municipalities cooperating together, however contracting authorities at *département* level are becoming more common.

The separation of supply and network activities imposed by Community Directives has led to the identification of a public service with two distinct missions: on the one hand, the regulated tariff supply mission entrusted to EDF and the LDCs in their exclusive service areas and, on the other hand, the development and operation of the public electricity distribution networks, entrusted to Enedis and the LDCs in their service areas, and EDF for areas not interconnected to the continental metropolitan network.

Article L. 334-3 of the French Energy Code provides that the signature of new concession agreements and amendments, as well as renewals of existing concession agreements, must be executed by three parties: the contracting authority, the distribution network manager (for the provisions relating to management of the public distribution network) and by EDF (or the LDC that has the authority in the geographic area) for supply at regulated tariffs. The other current concession agreements in force are deemed to have been signed jointly by these three entities.

Pursuant to Order no. 2016-65 of 29 January 2016 on concession agreements and its Application Decree no. 2016-86 of 1 February 2016, transposing Community Directive no. 2014/23/EU of 26 February 2014 into national law, concession contracts for the operation of the public distribution network and the supply of electricity at regulated tariffs are concluded by mutual agreement, that is to say without publicity and competitive bidding procedures.

The ELAN Housing bill adds chapter 5 about rising mains to the section of the French Energy Code on accessing and connecting to electricity networks. Rising mains put into service after the law is published will belong to the public distribution network. Those put into service before the law is published must be integrated into the public distribution network within two years of the law's publication. Owners and joint owners can apply to have their rising mains integrated ahead of time. They can also choose to retain ownership of the mains.

### **Rights of the contracting authorities**

The rights of the contracting authorities are detailed in section 1.4.4.2.2. ("*Distribution Activities*") of this Reference Document.

## **1.5.6 REGULATIONS APPLICABLE TO THE ENVIRONMENT, NUCLEAR POWER, HEALTH, HYGIENE AND SAFETY IN FRANCE**

EDF's business in France, as well as in other countries where EDF operates, is subject to regulations that are applicable to the environment, nuclear power, health, hygiene and safety. Compliance with these increasingly strict and continuously changing regulations exposes the Group to significant costs in order to ensure it does business compliantly.

### **1.5.6.1 General regulations applicable to the environment, health, hygiene and safety**

#### **Environmental regulations**

##### **Public involvement in environmental matters**

The general framework for the public's involvement in the preparation of regulatory and individual decisions by the public authorities that have an impact on the environment is laid down in Articles L. 120-1 *et seq.* of the French Environment Code. These provisions apply in the absence of specific provisions that are laid down by specialised legislation.

This legal framework has recently evolved with the adoption of Order no. 2016-1060 of 3 August 2016 reforming procedures to ensure public information and involvement in the development of certain decisions that may have an impact on the environment, completed by Decree no. 2017-626 of 25 April 2017. This order, which was adopted pursuant to Law no. 2015-990 of 6 August 2015 on Growth, Business and Equal Opportunities (known as the "Macron Law"), (i) introduced an opening chapter into the French Environment Code that defines the targets for public involvement and the rights of those involved, (ii) expanded the consultation procedure ahead of the decision-making process and (iii) modernised the procedures for downstream consultation.

##### **Environmental Liability (the "LRE" Law)**

The purpose of the Law of 1 August 2008 on Environmental Liability (LRE), which is incorporated into the French Environment Code under Articles L. 160-1 to L. 165-2, is to promote the prevention and remedying of environmental damage to water, soil and biodiversity that reaches a certain level of seriousness. The remedy must be environmental only and must allow the natural environment to return to its previous state or an equivalent state.

##### **Balanced management of water resources**

The Water Framework Directive of 23 October 2000 is the foundation of Community water policy. It defines a framework for the management and protection of water, for each major river basin, and sets targets for maintaining and restoring the status of surface waters, in particular to ensure the correct ecological and/or chemical status of water by 2015.

In France, the Directive was primarily transposed into law through the Water and Aquatic Environments Act of 30 December 2006, which stipulates the measures that are designed to ensure that the Directive's targets are attained. These targets are determined for each river basin in the master plans for water development and management (SDAGEs). All EDF's activities that could impact water and aquatic environments must be compatible with the targets set in the SDAGEs.

The Water Act also requires the various uses of water to be reconciled. The requisite balanced, sustainable management of water resources therefore has consequences for the operating rights of hydropower plants, and indirectly for all EDF's activities that affect aquatic environments.

The EU Water Framework Directive makes provision for its re-examination by the EU Commission no later than 19 years after its entry into force i.e. by 2019.

### Protection of biodiversity

As an occupant and user of natural land and water areas, EDF is directly concerned by biodiversity issues.

Law no. 2016-1087 of 8 August 2016 on the Restoration of Biodiversity, Nature and Landscapes has improved the protection of biodiversity. The main provisions of the Law on biodiversity incorporate new guidelines that are set forth in the French Environment Code (the principle of non-regression of environment Law, the principle of prevention and the objective of "zero net loss" of biodiversity). It has created new institutions for preserving biodiversity, including the French Agency for Biodiversity (AFB). It has also introduced also introduced new rules on the compensation of environmental harm into the French Civil Code.

### Single environmental authorisation

Order no. 2017-80 of 26 January 2017 and Decrees no. 2017-81 and 2017-82 of 26 January 2017 (codified in Articles L. 181-1 and R. 181-1 *et seq.* of the French Environment Code) on environmental authorisation were published in the *Journal Officiel* on 27 January 2017. Order no. 2017-80 of 26 January 2017 on environmental authorisations aims to perpetuate the attempts to consolidate the authorisation procedures implemented since March 2014. It definitively incorporates into the French Environmental Code a single environmental authorisation system. The comprehensive authorisation system allows for a coordinated appraisal of authorisation applications and the issuance in a single document, for a given project, of all the decisions required of the State (see section 1.5.6.2.1 "Regulations applicable to facilities classified for the protection of the environment (ICPEs)"). It is likely that the single authorisation procedure will apply to EDF projects.

### Whistleblowers

On 8 November 2016, the French Parliament definitively passed the bill on transparency, the fight against corruption and the modernisation of economic life, and the proposed constitutional bylaw on the authority of the Defender of Rights over the guidance and protection of whistleblowers.

Law no. 2016-1691 of 9 December 2016 includes rules to protect whistleblowers, who are defined as individuals who reveal or report, for no ends of their own and in good faith, a felony or a crime, a serious and blatant breach of an obligation provided for by the law or a regulation, or a serious threat or harm to the public interest. The provisions introduced by the law aim to protect whistleblowers from potential criminal or disciplinary proceedings, and provide for a set of rules on internal whistleblowing to be used in companies.

This framework is completed by the provisions of Decree no. 2017-564 of 19 April 2017, which provides for a common reporting procedure for all companies in the same group and guarantees the confidentiality of the procedure.

On 17 April 2018 the EU Commission published a proposal for a Directive on the protection of persons reporting on breaches of Union law without setting a timetable for debating and adopting the text.

### Environmental class action

Law no. 2016-1547 of 18 November 2016 on the Modernisation of Justice in the twenty-first century created a general right to class action and includes an environmental class action, as provided for in Article L. 142-3-1 of the French Environment Code.

This right enables groups of individuals who are placed in a similar situation and who suffer harm to file a class action before the courts of judiciary in order to cause a breach to cease and obtain compensation for "*bodily injury and damage to property that result from harm caused to the environment*". Environmental class actions may be brought *via* environmental protection associations that have been accredited in accordance with Article L. 141-1 of the French Environment Code, or by associations that have been accredited under the conditions defined by a decree issued following consultation of the Council of State (Decree no. 2017-888 of 6 May 2017), the purpose of which, according to their by-laws, includes the defence of victims of bodily injuries or the defence of the economic interests of their members.

On 11 April 2018 the EU Commission published a proposal for a Directive on representative actions for the protection of the collective interests of consumers, and repealing Directive 2009/22/EC. The text has not yet been debated within European institutions.

### Social and environmental reporting obligation for businesses (RSE)

Articles L. 225-102-1 and R. 225-104 of the French Commercial Code provide for the disclosure in EDF's management report of information on how the EDF group takes into account the social and environmental consequences of its activity as well as its societal commitments in relation to sustainable development (CSR reporting see chapter 3).

Under Directive no. 2014/95/EU of 22 October 2014, transposed into French law by the Order of 19 July 2017 and its Application Decree of 9 August 2017, as of the 2018 fiscal year the aforementioned CSR reporting is replaced by the publication in the management report of a non-financial performance report, covering, where appropriate, all of the companies included in the scope of consolidation.

In addition, the Law of 27 March 2017 on the Duty of Care of Parent Companies and Ordering Companies provides for the establishment and implementation of a vigilance plan with reasonable due diligence measures to identify and prevent risks to human rights, fundamental freedoms, serious bodily injury or environmental damage as well as the health risks resulting from their activities, those of their subsidiaries, subcontractors and suppliers, whether they are located in France or abroad (see section 3.8.1 "Vigilance Plan").

### PCBs and PCTs

The Group is subject to regulations on polychlorobiphenyls (PCBs) and polychloroterphenyls (PCTs) in the various countries where it operates, particularly in Europe.

European Directive no. 96/59/EC of 16 September 1996 required that an inventory of equipment containing PCBs and PCTs at levels of more than 500ppm be drawn up, together with a national plan for decontamination and the gradual disposal of these substances, which are mainly found in certain electricity transformers and condensers. Decontamination of equipment containing these substances was to be completed by 31 December 2010 at the latest. EDF had a special disposal plan and has achieved this objective.

Pursuant to Decree no. 2013-301 of 10 April 2013, EDF must clean up and decontaminate equipment with pollution levels of between 50 and 500ppm, with the possibility, as the holder of more than 150 pieces of equipment, of benefiting from a "specific plan" that is approved by order of the Minister for the Environment. This plan must, as a minimum, provide for the decontamination or destruction of one-half of the equipment before 1 January 2020 and all equipment before 31 December 2025. The contents of the application for the specific plan were defined by an Order of 28 October 2013. RTE's and Enedis' specific decontamination plans were approved by two orders of 14 April, and 3 July 2014.

The Decree of 10 April 2013 also specified the new obligations in terms of identifying, labelling, declaring and using equipment with fluid containing PCBs with a volume of more than 5dm<sup>3</sup>. The rules for conforming to these obligations were stipulated in detail by two orders of 7 January, and 14 January 2014.

## Greenhouse gases (GHG)

### Allowance trading scheme

Some of the EDF group's activities fall within the scope of application of Directive no. 2003/87/EC of 13 October 2003, as amended by Directive no. 2009/29/EU of 23 April 2009, which established a European scheme for greenhouse gas (GHG) emission allowance trading, using the project mechanisms set forth in the Kyoto Protocol (the Emissions Trading System (ETS) Directive).

In France, this Directive was transposed and integrated into Articles L. 229-5, R. 229-5 *et seq.* of the French Environment Code. The Group has an annual obligation to surrender allowances equal to the level of CO<sub>2</sub> emitted by its facilities. In order to comply with this obligation, under certain conditions, the Group may use credits issued under projects eligible for the project mechanisms provided for under Articles 6 and 12 of the Kyoto Protocol (joint implementation and clean development mechanism).

Under the ETS Directive, the third period for the greenhouse gas (GHG) emission allowance trading scheme started on 1 January 2013. The provisions of the French Environment Code on this scheme were amended accordingly by Order no. 2012-827 of 28 June 2012 (ratified by Law no. 2013-619 of 16 July 2013), Law no. 2015-992 of 17 August 2015, Law no. 2015-1567 of 2 December 2015, as well as by Decree no. 2012-1343 of 3 December 2012, Decree no. 2014-220 of 25 February 2014, Decree no. 2015-995 of 17 August 2015 and Decree no. 1016-849 of 28 June 2016. Since 1 January 2013, the rule for the electricity sector is the auctioning of quotas, in accordance with the rules defined by regulation (EU) no. 1031/2010/EC of 12 November 2010. Since that date, EDF has to purchase 100% of its allowances.

In order to support the price of GHG allowances on the European market, in Decision (EU) no. 2015/1814 of 6 October 2015, the European Parliament and the Council decided to create a market "stability reserve" that makes it possible to remove surplus allowances from the market. This mechanism will enter into force on 1 January 2019. In addition, a structural reform of the mechanism is currently under way at the European level for the period after 2020.

### GHG reporting

Pursuant to Articles L. 229-25 and R. 229-46 *et seq.* of the French Environment Code (respectively amended by Order no. 2015-1737, Law no. 2016-1087 of 8 August 2016 and Decree no. 2015-1738 of 24 December 2015), companies with over 500 employees must provide an annual report on their greenhouse gas emissions and a summary of the actions they plan to take to reduce such emissions. Article R. 229-46, as amended by the aforementioned Decree of 24 December 2015, specifies that "the groups defined in Article L. 2331-1 of the French Labour Code may draw up a consolidated report on greenhouse gas emissions for all their companies that have the same level 2 nomenclature code for French activities" and that employ more than 500 persons. The information disclosed is made public and must be updated every four years.

## Energy efficiency

### Energy Efficiency Directive

On 25 October 2012, the European Union adopted a Directive on energy efficiency (no. 2012/27/EU). The purpose of this Directive, for which the transposition deadline was 5 June 2014, is to enable the European Union to reach its energy savings target of 20% by 2020. With this aim in mind, the Directive enhances the provisions of European legislation on energy efficiency services (no. 2006/32/EC) and cogeneration (no. 2004/8/EC).

The Directive of 25 October 2012 contains several provisions that are liable to impact the activities of the EDF group, first and foremost of which is the obligation for Member States to reach an energy savings target each year that is equivalent to an aggregate annual reduction in energy sales of 1.5% over the period 2014-2020, which can take the form of an obligation for energy distributors and/or suppliers to reduce sales. The Directive also contains provisions on providing customers with information on their consumption, the promotion of energy services, taking into account energy efficiency in heat and cold production, and in the transmission and distribution of energy.

Published in the Official Journal of the European Union on 19 June 2018, Directive (EU) 2018/844 of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency strengthens current provisions and simplifies some of their aspects under the EU Commission's "Clean Energy Package". The Directive must be transposed by member states no later than 10 March 2020.

## Energy audits

Articles L. 233-1 *et seq.* of the French Energy Code (derived from Law no. 2013-619 of 16 July 2013, which transposed Article 8-4 of the Directive into French law), require large companies to conduct an energy audit on their business activities in France by 5 December 2015 at the latest, then every four years. The thresholds above which companies are concerned, the scope of the audit and the conditions to be met by the energy auditors are laid down in Articles R. 233-1 and R. 233-2 and D. 233-3 to D. 233-9 of the French Energy Code, completed by the Order of 24 November 2014 on the terms and conditions of application of the energy audit. Undertakings that use a certified energy management system that is ISO 50001 compliant may, under certain conditions, be exempted from this obligation. In accordance with regulations, EDF has sent an audit report to the administration.

## Energy savings certificates

At the national level, the energy savings certificates (CEE) mechanism, which is provided for in Articles L. 221-1 *et seq.* of the French Energy Code, places energy suppliers under the obligation to save energy. This mechanism defines a three-year objective that is shared between persons subject to an obligation to achieve energy savings (the "obligors") based on their sales volumes. At the end of the relevant period and under penalty of sanctions, the obligors must produce energy savings certificates that correspond to the amount of the energy savings they are under the obligation to achieve, which are obtained either by carrying out (directly or indirectly) energy savings actions or by purchasing credits from the other obligors or "eligible" economic players through a National Register of Certificates (the Emmy Register).

The mechanism's third period started on 1 January 2015 and ended on 31 December 2017. The energy savings target for the third period was set at 700TWhp (i.e. 233.4TWhp/year). Decree no. 2014-1668 of 29 December 2014 (now Articles R. 221-1 *et seq.* of the French Energy Code) and several implementing orders that were published in December 2014 determined the conditions and terms for the issuance of CEE for this new period.

The Law of 17 August 2015 on Energy Transition for Green Growth amended the CEE system for the third period, by adding an additional system to the obligation that was already provided for, concerning the energy savings made for the benefit of households that are in a precarious situation in terms of energy. Decree no. 2015-1825 of 30 December 2015 (now Articles R. 221-1 *et seq.* of the French Energy Code) and several ministerial orders of the same date have clarified the rules on meeting the energy savings objectives that are specifically for the benefit of households that are in a precarious situation in terms of energy. The level of this specific obligation for energy suppliers was set at 150TWhp for 2016-2017.

The fourth period started on 1 January 2018 will end on 31 December 2020.

Decree no. 2017-690 of 2 May 2017 on energy savings certificates (codified in Articles R. 221-1 *et seq.* of the French Energy Code) sets forth the implementation methods for energy savings certificates for the fourth period. The text sets the total level of obligations for the 2018-2020 periods at 1,200TWhp of classic shares and an extra 400TWhp to be achieved for households in a situation of energy poverty. It involves a doubling of obligations compared with the third period.

Decree no. 2017-1848 of 29 December 2017 (codified in Articles R. 221-1 *et seq.* of the French Energy Code) sets the ceiling for the assistance programmes at 200 billion kWh of updated combined end use electricity.

## Registered natural sites and classified sites (buried lines)

The EDF group is also subject to regulations on classified and registered sites that are stipulated in Articles L. 341-1 to L. 341-22 and R. 341-1 to R. 341-31 of the French Environment Code.

The aim of these regulations is to preserve natural heritage sites and sites for which the conservation, from a landscape, artistic, historical, scientific, folkloric or scenic standpoint, is in the public interest. "Classification", which is reserved for the most singular sites, provides extensive protection, whereas "registration", for which the framework of rules is less restrictive, is proposed for less sensitive sites.

Under the French Environment Code, new electricity lines on classified sites must be buried. Registration and classification can also have an impact on the day-to-day operation of facilities (if more than one site is visible at the same time; obligation to obtain the opinion of the State architect – *architecte des Bâtiments de France* –, etc.).

## Health, hygiene and safety regulations

### Asbestos

In France, the regulations require, among other things, the identification of materials containing asbestos in buildings and, if necessary, monitoring procedures or asbestos removal work. EDF is also subject to regulatory obligations to inform and protect workers who may be exposed to asbestos dust inhalation.

### Legionella

EDF operates cooling towers, particularly for its electricity generation activities, which are subject to the regulations on facilities classified for environmental protection (ICPE) and basic nuclear facilities (BNF) including Decision no. 2016-DC-0578 of 6 December 2016 of the Nuclear Safety Authority which is dedicated to the prevention of risks resulting from the dispersal of pathogenic microorganisms (Legionella and amoeba). EDF must, among other obligations, carry out a methodical analysis of the risk of proliferation of legionella in its air cooling towers and implement a preventive maintenance plan for cleaning and disinfection. EDF is also required to carry out analyses once or twice a month, depending on the type of facility involved.

### Nanoparticle substances

As from 1 January 2013, Articles L. 523-1 *et seq.* and R. 523-12 *et seq.* of the French Environment Code made it mandatory to report the quantities and uses of nanoparticle substances or nanomaterials produced, distributed or imported in France. Information on these substances must be made available to the public and to inspection authorities. The information to be declared and the rules governing the declaration were specified in an Order of 6 August 2012. EDF is likely to be concerned by these provisions as it uses nanoparticle substances.

### Exposure to Electromagnetic Fields (EMF)

Pursuant to the *Grenelle 2* Law, Decree no. 2011-1697 of 1 December 2011 requires managers of public electricity transmission networks to perform regular verifications of the EMF caused by electric lines that transmit electricity.

Law no. 2015-136 of 9 February 2015 on Simplicity, Transparency, Information and Consultation Regarding Wave Exposure introduced an obligation to provide information for persons who install equipment that emits electromagnetic fields on residential premises. In due course, this obligation may concern some entities of the EDF group.

### Chemical products

Regulation (EC) no. 1907/2006 on the Registration, Evaluation and Authorisation of Chemicals, known as "REACH", which came into force on 1 June 2007, applies to EDF as a user, but also as a manufacturer and importer of chemical products. EDF has complied with its obligation to register substances that it manufactures or imports in quantities of more than 1,000 tonnes per year with the European Chemicals Agency. In May 2013, EDF registered the monochloramine that is manufactured in situ at certain nuclear plants.

In addition, the Biocides Regulation (EU) no. 528/2012 of 22 May 2012 provides for a new procedure, with an extended scope of application, of authorisations for placing of biocide products on the market that are generated in situ. In this new regulatory environment, EDF could be concerned as a manufacturer and user of monochloramine and sodium hypochlorite. Applications for authorisation will be prepared and filed within the framework of this Biocides Regulation.

### Waste

The EU Commission's Circular Economy Package, first presented in December 2015, was adopted. It is made up of four Directives: (i) Directive (EU) 2018/849 of the European Parliament and of the Council of 30 May 2018 amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment; (ii) Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste; (iii) Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste; (iv) Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste. The Circular Economy Package strengthens and consolidates rules on waste management and aims to take the entire lifecycle of a product into account. It must be transposed by member states no later than 5 July 2020.

## Health and the environment

Law no. 2013-316 of 16 April 2013 on the Independence of Expertise in the Area of Health, the Environment and the Protection of Whistleblowers confirmed the recognition of an alert procedure in the area of public health and the environment within businesses and laid down the rules for using this procedure. This Law also organises a system to protect whistleblowers and set up the National Commission for Ethics and Public Health and Environment Alerts (CNDASE). Several decrees have specified the rules for the implementation of this system (Decree no. 2014-324 of 11 March 2014, Decree no. 2014-1629 and Decree no. 2014-1628 of 26 December 2014).

### 1.5.6.2 Regulations applicable to EDF installations and Group activities

#### 1.5.6.2.1 Regulations applicable to facilities classified for the protection of the environment (ICPEs)

##### Facilities concerned and main obligations

Certain facilities operated in France by the EDF group, in particular fossil fuel-fired power plants, are subject to legislation on facilities that are classified for the protection of the environment (ICPEs), which is organised in the French Environment Code. These facilities are subject to a prior declaration, simplified authorisation (known as "registration") or to an authorisation depending on the magnitude of danger or adverse effects they may cause to the environment or public health.

The ICPE Regulation requires that the site be restored when a facility is taken out of service, depending on the expected future use of the land. Under Article L. 516-1 of the French Environment Code, lodging financial guarantees is also required for certain ICPEs that are subject to authorisation (including Seveso facilities) and registration. The basis and amount of the financial guarantees vary depending on the facility. These financial guarantees are designed to provide collateral for the financing of the measures that must be adopted in the event of an accident before or after closure, as well as the surveillance, safety works and restoration operations after closure. These guarantees do not cover compensation owed by the operator to third parties who may suffer loss or harm in connection with the activity carried out.

The list of the ICPEs concerned by the obligation to lodge these guarantees and the rules for calculating and lodging the financial guarantees are stipulated by the Order of 31 May 2012 (that was amended by an Order of 12 February 2015) and the Order of 31 July 2012. An Order of 5 February 2014 provides the framework for lodging guarantees via the intermediary of a private guarantee fund. The EDF group operates facilities that are concerned by these new requirements. Decree no. 2015-1250 of 7 October 2015 increased the threshold above which guarantees are required from €75,000 to €100,000 (Article R. 516-1 of the French Environment Code). It also provides for additional financial guarantees to be lodged with the *Caisse des dépôts*, as well as the amendment of the rules governing how guarantees are triggered, in particular by allowing them to be implemented as soon as court-ordered liquidation proceedings are initiated.

Under the conditions laid down in Order no. 2017-80 and by Decree no. 2017-81 and 2017-82 of 26 January 2017, the reform of the environmental authorisation entered into force on 1 March 2017. As of this date, for projects subject to authorisation under ICPE or facilities, structures, works and activities (IOTA) subject to water legislation, the two procedures have been merged into the environmental authorisation. This new scheme incorporates, within book I of the French Environment Code, a new chapter VIII entitled "Administrative Procedures" comprising a separate section entitled "Environmental Authorisation" and is composed of Articles L. 181-1 to L. 181-31 and R. 181-1 to R. 181-56.

##### Seveso facilities

Since 1 June 2015, "Seveso" ICPEs have been governed by the provisions of the Seveso 3 Directive (2012/18 of 4 July 2012), which replaced the Seveso 2 Directive (96/82/EC). The entry into force of the Seveso 3 Directive resulted in the use of dangerous products (under the CLP Regulation of 16 December 2008) that were not covered by the Seveso 2 Directive being incorporated into the scope of the Seveso regulations.

The Seveso 3 Directive also contains stricter provisions concerning access by the public to information related to safety, public participation in the decision-making process and access to justice, as well as improvements in the way information is collected, managed, made available and shared. The Seveso 3 Directive also introduced stricter standards for facility inspections. Law no. 2013-619 of 16 July 2013 transposed the legislative portion of the Directive into French law by



inserting into the Environment Code (Articles L. 515-15 *et seq.*) a section that is specific to Seveso facilities. These provisions, completed by Decree no. 2014-285 and no. 2014-284 of 3 March 2014 and by an order of 26 May 2014, entered into force on 1 June 2015.

Decree no. 2015-1250 of 7 October 2015 amended the rules governing how the financial guarantees that are applicable to "Seveso" ICPEs are lodged, in particular by allowing operators of multiple facilities to pool these guarantees. The Order of 24 September 2018 "*determining the rules for calculating and conditions for lodging the financial guarantees provided for in Article R. 516-2-I of the French Environment Code*" sets out the terms for lodging financial guarantees and the methodology for calculating pooled guarantees from 1 January 2019.

### Facilities that are subject to the "IED"

Directive no. 2010/75/EU of 24 November 2010 on industrial emissions (known as the "IED" Directive) revised and recast several existing Directives into a single piece of legislation, including the IPPC, LCP, Waste Incineration and VOC Directives, among others.

Chapter 3 of this Directive affects EDF as it regulates the combustion plants that are found in fossil fuel-fired plants, in particular. The applicable requirement levels depend on the rated thermal input of the combustion plants concerned and on the fuel used. This Directive, which was partially transposed into French law *via* Order no. -2012-7 of 5 January 2012 (and incorporated into the French Environment Code in Articles L. 515-28 to L. 515-31), has the effect of broadening the application of the IPPC Directive to include new activities, enhancing the scope of the best available techniques (BAT) on which the fixed emission limit values will be based, causing a periodic reconsideration of operating conditions in order to take into account changes in BAT and, in certain cases, requiring a "baseline report" on the state of soil.

Decree no. 2013-5 of 2 January 2013 partially transposed the provisions of the IED Directive on the state of soil. Article 1 of the Decree, which is now Article R. 512-4 of the French Environment Code, states that interim analysis of the soil will now be required in the event of a substantive change of the facility and, if pollution occurs, the operator must propose measures. Another Decree no. 2013-374 of 2 May 2013 completed this transposition by introducing provisions into Articles R. 515-58 to R. 515-84 of the French Environment Code that are specific to facilities that are covered by the IED Directive. These provisions apply to fossil fuel-fired plants, under the conditions laid down, in particular, by the Order of 26 August 2013 on combustion plants with power of 20MW or more, applicable until 20 December 2018. From that date, type 2781-1, 2910, 2931 & 3110 combustion plants will fall under the relevant stipulations set by the five Orders of 3 August 2018. Finally, Decree no. 2017-849 of 9 May 2017 amending the regulatory provisions of the French Environment Code on facilities mentioned in Annex I of Directive 2010/75/EU of the European Parliament and Council of 24 November 2010 on industrial emissions has streamlined administrative procedures (including the content of the review file) and made the implementation of the IED Directive more operational.

#### 1.5.6.2.2 Specific regulations applicable to basic nuclear facilities

In France, EDF and Framatome are subject, in particular, to Law no. 2006-686 of 13 June 2006 on Transparency and Safety in the Nuclear Field (the "TSN Law"), integrated into the French Environment Code, and to the provisions for its implementation, in particular Decree no. 2007-1557 of 2 November 2007 amended by Decree no. 2016-846 of 28 June 2016 on the modification, final shutdown and decommissioning of basic nuclear facilities as well as subcontracting, and to the amended Order of 7 February 2012 laying down the general rules for basic nuclear facilities (the "BNF Order"). These texts specify the amended legal regime applicable to basic nuclear facilities (BNF). The Law was amended by Order no. 2016-128 of 10 February 2016 that contains various provisions on nuclear matters and which, in particular, transposed into French law Council Directive no. 2014/87/Euratom of 8 July 2014 amending Directives no. 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations and Directive no. 2011/70 of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste. It will also concern the NSA's powers of sanction.

The TSN Law created the Nuclear Safety Authority (NSA), an independent government agency, with the Minister for Nuclear Safety retaining authority to issue the main authorisations and draft general regulations.

The construction of a BNF is authorised, following a public debate and a public enquiry, by a decree that is issued after consulting the NSA and on the basis of a

report by the Minister for Nuclear Safety. The decree that authorises the construction must state the identity of the operator, the nature of the facility, its maximum capacity and its perimeter. The application for authorisation to construct a BNF must include, in particular, a preliminary safety report (PSR), a study of the impact of the facility on the environment and health, a decommissioning plan and a risk management study (RMS). The decree that authorises the construction of the BNF sets a time limit to commission the facility and the frequency of safety inspections if they are not scheduled every 10 years and, moreover, lays down basic requirements. The authorisation to commission a BNF is issued by the NSA after a public consultation. In this respect, the operator provides the updated safety rule set and an internal emergency plan (IEP) that specifies the organisational measures and requisite resources that must be implemented by the operator in the event of an emergency. A periodic safety inspection assesses the compliance of the facility with the applicable regulations and updates the assessment of the risks that the facility poses to the interests mentioned above.

Pursuant to the decree that authorises the facility to be set up, the conditions applicable to pumping water, discharging liquid and gaseous wastes – whether radioactive or not – as well as the related limits placed on these activities are set by an NSA decision; decisions that set the limits for discharges by facilities into the environment require a ministerial approval.

The NSA also issues regulations pursuant to the decree that authorises the facility to be set up, in order to prevent or limit the effects of any accidents or incidents, to define measures to protect residents on an individual and collective basis, limit noise pollution and manage the waste generated by and stored at the facilities.

### Rules on nuclear safety and the inspection of basic nuclear facilities

The nuclear facilities operated by EDF are subject to the general regulations on basic nuclear facilities derived from the French Environment Code. Priority must be given to the protection of the interests mentioned by the law (public safety, health and sanitation, nature and the environment) via the prevention of accidents and the limitation of their consequences in respect of nuclear safety, as specified by the BNF Order. In this respect, nuclear safety is defined as a set of technical provisions and organisational measures concerning the design, the construction, the operation, the shutdown and the decommissioning of BNF, as well as the transportation of radioactive substances, which are adopted with a view to preventing accidents or limiting the effects thereof.

The ASN also has the authority to issue regulatory decisions of a technical nature to complete the terms and conditions for application of the decrees and orders issued in the field of nuclear safety and radiation protection, with the exception of those related to occupational healthcare. These decisions are subject to the approval of the relevant ministers. Since the aforementioned BNF Order was published, out of the thirty or so decisions that are being prepared, more than twenty decisions have already been published and approved; others are being prepared.

The Decree of June 2016 overhauled the regulations for making amendments to BNFs by distinguishing substantial alterations that require a decree from significant alterations that according to criteria set by the ASN require an application and approval. In its decision of 30 November 2017, the ASN added to the rules governing significant alterations (criteria, conditions, internal controls) and ended the internal approval systems. The new regulations will come into effect no later than 1 July 2019.

The provisions of the French Environment Code concerning BNF have also introduced mechanisms for informing the authorities. In this respect, all accidents and incidents that occur as a result of the operation of a BNF and that could potentially cause significant harm to the health of the population or to the environment, must be declared as soon as possible by the operator to the ASN and to the administrative authority. Moreover, the methods used to inform the public have been improved, with, for example, the creation of a High Committee for Transparency and Information on Nuclear Safety (HCTINS) and the possibility now given to any member of the public to ask the operator directly for information on the risks involved in exposure to ionising radiation and on the safety and radiation protection measures adopted to prevent or reduce these risks or exposure.

Moreover, criminal law penalties have been established to punish BNF operators who do not comply with their legal and regulatory obligations, such as a three-year prison sentence and a €150,000 fine if a BNF is operated without authorisation, or a one-year prison sentence and a €30,000 fine if radioactive substances are transported without authorisation or approval.



It should also be noted that in July 2014, the Council of Ministers of the European Union adopted Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear facilities.

The legal framework described above for nuclear safety and inspection was completed by certain provisions of the Law of 17 August 2015 on Energy Transition for Green Growth and Order no. 2016-128 of 10 February 2016 that contains various provisions on nuclear matters.

In particular, the role of local information commissions (CLI) was reinforced: they can review all matters that fall within the scope of their remits of their own motion, they must be consulted if the specific intervention plan is amended and can inspect BNF at the request of the chair of the CLI in case of an event greater than or equal to 1 on the INES scale, etc. In addition, the ASN's administrative sanctioning power has been strengthened, notably with the creation, within the ASN, of a Sanctions Committee composed of State Councillors and advisers to the French Court of Cassation, which will be able to impose administrative fines of up to €10 million.

### Decommissioning of nuclear facilities

The decommissioning of a BNF is prescribed by a Prime Minister's decree that is issued after a public enquiry and an opinion by the NSA. This decree specifies the stages of the decommissioning, how long it will last and the intended final status. Once the decommissioning has been completed, the operator must send the NSA a declassification request, which, following an approval decision by the NSA, makes it possible to end the BNF status of the facility. The Law of 17 August 2015 on Energy Transition for Green Growth, in particular its provision that is now Article L. 593-25 of the French Environment Code, gave legislative value to the principle implemented since the early 2000s by EDF according to which decommissioning must take place within a timeframe that is "as short as possible" after final shutdown, under conditions that are economically acceptable and in compliance with the principles set forth in Article L. 1333-2 of the French Public Health Code and section II of Article L. 110-1 of the French Environment Code. Moreover, the aforementioned Law introduced an additional administrative stage which consists of the operator having a duty, at least two years before the scheduled shutdown date, to make a declaration that its facility will be shut down.

Decree no. 2016-846 of 28 June 2016 on the modification, final shutdown and decommissioning of basic nuclear facilities, and sub-contracting, amended the Decree of 2 November 2007, known as the "Procedures Decree", by implementing the provisions derived from the Law on Energy Transition for Green Growth, in particular the content of the shutdown declaration and decommissioning application files.

### Radioactive waste

EDF's business is subject to French regulations on the sustainable management of radioactive waste. EDF bears liability for the radioactive waste resulting from its operations. In France, radioactive waste is managed by the National Agency for Radioactive Waste Management (ANDRA), a public institution of industrial and commercial nature created by Law no. 91-1381 of 30 December 1991 on research into the management of radioactive waste.

The method used to manage radioactive waste in France depends on the level of radioactivity and on the radioactivity lifespan of the waste (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"). The Law of 28 June 2006, which is now Articles L. 542-1 *et seq.* of the French Environment Code, defines the organisation and the financing of radioactive waste management, along with the terms for a framework to evaluate and cover the costs of decommissioning BNF, as well as managing spent fuels and radioactive waste, is incorporated into Articles L. 594-1 *et seq.* of the French Environment Code. In particular, the assets allocated to cover provisions cannot be used for any other purpose by the operator, and separate accounting procedures for these assets must be used. The implementation of these provisions is controlled by the administrative authority, i.e. the Minister for Energy, which is itself overseen by a National Assessment Commission for the financing of decommissioning costs for BNFs and the management of spent fuels and radioactive waste.

Decree no. 2007-243 of 23 February 2007 on securing the financing of costs in the nuclear industry sets forth the terms and conditions for implementing the Law of June 2006.

A report is filed with the administrative authorities and the NSA every three years and a copy sent to the Statutory Auditors. This report includes, in particular, a valuation of the costs, the methods used for the calculation of provisions, and the composition of the assets. The administrative authorities may require any additional supporting documents, have an outside organisation conduct a study, or require an expert valuation of the assets at the operator's expense.

Directive no. 2011/70/Euratom, which was transposed by Order no. 2016-128 of 10 February 2016 containing various provisions on nuclear matters, forms a common set of fundamental rules for the management of spent fuel and radioactive waste for a certain number of European Union Member States, and clarifies several concepts. This text presents, in particular, deep geological disposal as the safest and most sustainable option to manage Long-Lived, High-Level Waste and considers the possibility of creating disposal facilities shared between several Member States, on a voluntary basis.

### The financing of decommissioning and radioactive waste management activities

The Law of 28 June 2006, which is now Articles L. 542-1 *et seq.* of the French Environment Code, defines the organisation and the financing of radioactive waste management, along with the terms for a framework to evaluate and cover the costs of decommissioning BNF, as well as managing spent fuels and radioactive waste, such terms being incorporated into Articles L. 594-1 *et seq.* In particular, the assets allocated to cover provisions cannot be used for any other purpose by the operator, and separate accounting procedures for these assets must be used. The implementation of these provisions is controlled by the administrative authority, i.e. the Minister for Energy, which is itself overseen by a National Assessment Commission for the financing of decommissioning costs for BNFs and the management of spent fuels and radioactive waste.

Decree no. 2007-243 of 23 February 2007 on securing the financing of costs in the nuclear industry sets forth the terms and conditions for implementing the Law of June 2006.

A report is filed with the administrative authorities and the NSA every three years and a copy sent to the Statutory Auditors. This report includes, in particular, a valuation of the costs, the methods used for the calculation of provisions, and the composition of the assets. The administrative authorities may require any additional supporting documents, have an outside organisation conduct a study, or require an expert valuation of the assets at the operator's expense.

### Regulations on radiation protection

In France, nuclear activities that present a risk of exposing persons to ionising radiation are regulated by two separate sets of rules, depending on the category of persons to be protected. Regulations on the basic protection of the population against such radiation, which are governed by the French Public Health Code, are primarily based on all nuclear activities being subject to a declaration, registration or authorisation. Authorisations granted to establish a Basic Nuclear Facility serve as the authorisation required under the French Public Health Code. Article R. 1333-11 of the French Public Health Code sets the maximum exposure level of the general public at 1mSv per year.

French regulations on the protection of workers against the dangers of ionising radiation, which are governed by the French Labour Code, lay down various obligations for employers of workers who are likely to be exposed and, in particular, set a limit on exposure of workers to ionising radiation at 20mSv over a period of twelve consecutive months.

The French Health Code contains the provisions applicable to controlling high-level sealed radioactive sources and orphan sources.

Directive no. 2013/59/Euratom of 5 December 2013, which laid down “basic safety standards”, repealed Directive no. 96/29 of 13 May 1996. It was transposed into French law by the above-mentioned Order no. 2016-128 of 10 February 2016, by Decree no. 2018-434 of 4 June 2018 amending the regulatory sections of the French Public Health Code, French Environment Code and French Defence Code and by Decree no. 2018-437 of the same date doing likewise for the French Labour Code. Implementation orders will specify the provisions.

### Civil liability of nuclear facility operators

Several international conventions govern the civil liability of nuclear facility operators, in particular the Paris Convention of 29 July 1960 on Third-Party Liability in the Field of Nuclear Energy and the Brussels Convention of 31 January 1963, which supplements the Paris Convention. These two conventions are applicable in the signatory countries that have ratified them, including France and the United Kingdom (see also section 2.5.6 “Specific insurance for nuclear facility operations”).

The Paris Convention established a special liability derogation system, with specific characteristics. Liability for nuclear damage to persons and property is strict (even in the absence of a fault), limited in terms of the amount and duration, and is exclusively focused on the operator of the nuclear facility.

In France, the operator’s liability was limited to €91.5 million per nuclear accident at a facility and to €22.9 million per nuclear accident during transport. These amounts were respectively increased to €700 million and €70 million on 18 February 2016 when Article 130 of the Law of 17 August 2015 on Energy Transition for Green Growth mentioned below entered into force.

Over and above the maximum amount for which the operator is liable, the State in which the incident occurred is responsible for compensating victims up to a maximum of €201.4 million (provided that said State is a Contracting State of the Brussels Convention); over and above this amount, Member States that have ratified the Brussels Convention (including France) contribute collectively to compensation up to a limit of €345.3 million.

The Convention also provides that the operator has an obligation to take out insurance or lodge a financial guarantee for the liability amounts established in order to guarantee the availability of funds. The Minister for the Economy monitors French operators’ compliance with this obligation. EDF complies with the current coverage requirements (see section 2.5 “Insurance”).

Protocols to amend the Paris and Brussels Conventions were signed on 12 February 2004 but have still not entered into force. They require significantly higher amounts of compensation than the original conventions, in order to cover a greater number of victims and types of damage that are eligible for indemnification. The operator’s liability will thus be at least €700 million per nuclear incident in a facility and €70 million per nuclear incident during transport. The State, in which the nuclear facility of the operator that is liable for causing the damage is located, is liable for amounts above the €700 million for which the operator is liable, up to €1.2 billion (provided that said State is a Contracting State of the Brussels Convention). Over and above this amount, the Contracting States of the Brussels Convention are liable up to a maximum amount of €1.5 billion. In addition, for personal injury only, the time limit to claim compensation has changed from 10 years to 30 years from the date of the incident. Another important change is the introduction of a detailed definition of “nuclear damage”, which includes economic losses, the cost of protective measures, the cost of measures to rehabilitate damaged environments, and certain other losses resulting from damage to the environment. These new provisions will, however, only be applicable as of the date when the protocol that amends the Paris Convention comes into force, i.e. when at least two-thirds of the sixteen Contracting States have ratified it. France has adopted a law permitting ratification of both protocols (Law no. 2006-786 of 5 July 2006), but has not yet filed the corresponding ratification instruments.

Moreover, on 30 April 2014, France filed its ratification instrument for the joint protocol relating to the application of the Vienna Convention and the Paris Convention, which thus entered into force for France on 30 July 2014. This joint protocol establishes a link between the Paris Convention, which covers countries in Western Europe, and the Vienna Convention of 21 May 1963 on Civil Liability for Nuclear Damage, which covers (among others) countries in Eastern Europe. It enables the parties to one of these two conventions (Paris or Vienna) who adhere to the protocol to benefit from the coverage provided by the other convention.

### Protection of facilities that house nuclear materials

The purpose of the regulations on the protection and control of nuclear material governed by Article L. 1333-1 of the French Defence Code is to detect and prevent the loss, theft or misappropriation of nuclear material that is stored at facilities or being transported, or any attempts to alter, damage or disperse such material.

These regulations were completely recast by Decree no. 2009-1120 of 17 September 2009 on the protection and control of nuclear material, its facilities and its transportation, as set forth in the French Defence Code. The main purpose of this Decree was to extend the protection of nuclear material to the facilities where it is stored. Several orders published in 2011 detail operators’ obligations.

For nuclear power plants, the Order of 10 June 2011 on the physical protection of facilities that house nuclear materials, which can only be held with an authorisation, is based on in-depth defence of targets, namely the nuclear material, equipment or functions, which, in the event of default or damage by a malicious act, are liable to have radiological consequences. Accordingly, the operator must set up several lines of protection in the form of six zones (e.g. access control areas, a vital area, an internal area, etc.). Following an amendment by an Order of 15 September 2015, the Order of 10 June 2011 now makes it possible to set up safety devices in dangerous areas if the assessment of the contents of the safety study provided for in Article R. 1333-4 of the French Defence Code reveal that the means implemented to meet the safety objectives appear to be insufficient.

The Order of 9 June 2011 organises the system for physically monitoring nuclear material, as well as the accounting conditions for nuclear material and operator obligations. Accordingly, operators must ensure that the physical monitoring and accounting are protected against the malicious actions identified when the authorisation is issued.

Law no. 2015-588 of 2 June 2015 on the Improvement of the Protection of Civilian Facilities That House Nuclear Materials, which is now incorporated into the French Defence Code, created a specific criminal misdemeanour of trespassing in these facilities. For the implementation of these rules, Decree no. 2015-1255 of 8 October 2015 created restricted access nuclear areas (ZNAR) that must be delineated within each facility. Trespassing in a ZNAR constitutes a criminal misdemeanour that carries a one-year prison sentence and a €15,000 fine. These penalties are increased in the event of aggravating circumstances (to a three-year prison sentence and a €45,000 fine, in particular when the offence is committed in a group, and to a seven-year prison sentence and a €100,000 fine, in particular if the offence is committed with the use or threat of a weapon). All of the orders that define the ZNAR for each nuclear power plant have been published.

### Brexit's impact on the Euratom Treaty

The UK is scheduled to leave the European Union on 29 March 2019 after which it will no longer be a party to the Euratom Treaty. The consequences of this situation and the measures taken to deal with it are described in section 1.4.5.1.1 “United Kingdom – Strategy”.

#### 1.5.6.2.3 Regulations applicable to fossil fuel-fired energy generation

The EDF group’s fossil fuel-fired energy generation business is subject in France to the regulations that are applicable to ICPEs (see section 1.5.6.2.1 “Regulations applicable to facilities classified for the protection of the environment (ICPEs)”). EDF’s fossil fuel-fired facilities must also comply with specific regulations on air quality, adopted mainly as a result of European Directive no. 2001/81/EC of 23 October 2001 on National Emission Ceilings for Certain Atmospheric Pollutants (the NEC Directive), and Directive no. 2001/80/EC of 23 October 2001 on the Limitation of Emissions of Certain Pollutants into the Air from Large Combustion Plants (the LCP Directive), which, since 1 January 2016, has been repealed and replaced by Directive no. 2010/75/EU of 24 November 2010 on Industrial Emissions (the IED Directive). These Directives were transposed into French law by several orders, in particular the Order of 30 July 2003 on boilers that are present in existing combustion facilities with a power rating of more than 20MWth, which on 1 January 2016 was repealed and replaced by the Order of 26 August 2013 (itself repealed on 20 December 2018) on combustion facilities with a power rating of 20MW or more, which as type 2910 and 2931 plants must be approved. Decree no. 2018-704 of 3 August 2018 amended the designations of type 2910 (Combustion) and 2770 & 2771 (Incineration) plants and lowered the approval and application thresholds from 2MW to 1MW. It modifies the application requirements for combustion facilities. From 20 December 2018, type 2781-1, 2910, 2931 & 3110 combustion plants will fall under the relevant stipulations set by the five Orders of 3 August 2018.

Exemptions from obligations concerning emissions into the air were possible until 31 December 2015. As of that time, the ceilings and the exemptions originating from the IED Directive mentioned above will apply, with, in particular, specific issues concerning production facilities in the overseas departments and emergency systems, for which the pollution levels require negotiating adapted provisions. Fossil fuel-fired energy production is also subject to the provisions of the Seveso 3 Directive and to the obligation to lodge financial guarantees (see section 1.5.6.2.1 "Regulations applicable to facilities classified for the protection of the environment (ICPEs)").

Directive no. 2015/2193/EU of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants that was to be transposed into French law by 19 December 2017 was transposed by Decree no. 2018-704 of 3 August 2018 amending the classification of categorised facilities and some provisions of the French Environment Code. The Directive lays down rules designed to limit the air pollution caused by sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and dust from medium combustion plants, and to reduce the airborne emissions and their potential risks for human and environmental health. The facilities concerned are combustion plants with a rated thermal input of 1MW or more and less than 50MW, regardless of the type of fuel they use. Five orders amending the regulations applicable to combustion facilities falling under environmental protection regulations governing categorised facilities in order to transpose Directive 2015/2193/EU were adopted on 3 August 2018.

#### 1.5.6.2.4 Regulations applicable to hydropower facilities

In France, hydropower facilities are subject to the provisions contained in Articles L. 511-1 *et seq.* of the French Energy Code. They require concession agreements granted by the State (for facilities generating over 4.5MW), or an authorisation from the Prefecture (for facilities under 4.5MW), (see section 1.4.1.5.1.4 "Hydropower generation issues") concerning hydropower concessions.

EDF's hydropower generation business is subject to the substantive provisions of water regulations. Such regulations cover in particular control over variations in water levels and flow rates, the safety of areas in the vicinity and downstream of hydropower facilities and, in general, maintaining balanced management of water resources (see section 1.5.6.1 "General regulations that are applicable to the environment, health, hygiene and safety").

#### Competitive tendering for hydropower concession Contracts

Until 1 April 2016, the competitive tendering procedure for hydropower concession contracts was still governed by Decree no. 94-894 of 13 October 1994, which has now been incorporated into Book V of the regulatory section of the French Energy Code (see Decree no. 2015-1823 of 30 December 2015 on the organisation of the regulatory section of the French Energy Code). This Decree, as amended by Decree no. 2008-1009 of 26 September 2008, places concessions within the legal framework for public service delegation contracts defined by Law no. 93-122 of 29 January 1993, known as the "Sapin Law", it being specified that the former preferential right of the outgoing operator was eliminated by the Water Act (Law no. 2006-1772 of 30 December 2006) as it was incompatible with European law.

For all procedures initiated as from 1 April 2016, the award of hydropower concession contracts is now governed by Order no. 2016-65 of 29 January 2016 and by its Application Decree no. 2016-86 of 1 February 2016 on concession contracts. This legislation has repealed the aforementioned provisions of the *Sapin* law, in order to modernise them and align them with European law (Directive no. 2014/23/EU of 26 February 2014 on the award of concession contracts).

The Law of 17 August 2015 on Energy Transition for Green Growth has completed the legal framework for hydropower concession contracts by giving the State the possibility:

- of combining concession contracts that form a "series of facilities that are hydraulically linked", by setting a new deadline for all the concession contracts concerned (Articles L. 521-16-1 and L. 521-16-2 of the French Energy Code);
- of creating semi-public hydroelectric companies (SEM) made up of private-sector operators and a public Division (State, local authorities, etc.), each of which holds at least 34% of the shares (Articles L. 521-18 *et seq.* of the French Energy Code);
- of extending certain concession contracts in return for investments by operators where these investments are necessary in order to reach national energy policy targets (Article L. 521-16-3 of the French Energy Code).

The purpose of the Decree of 27 April 2016 on hydropower concession contracts is to implement the provisions of the aforementioned Law of 17 August 2015 and to modernise the regulatory framework for hydropower concession contracts (in particular by clarifying certain aspects of the procedure for awarding hydropower concession contracts by approving a new model for general terms and conditions).

A collection of texts complete this framework and concern the execution of the hydropower energy concession agreement: one can quote, in particular, Order no. 2016-518 of 28 April 2016 making various modifications to Book V of the French Energy Code, which aims to strengthen the administrative control of hydroelectric installations and to clarify certain rules with regards to the renewal of their operating rights, the Decree of 27 May 2016 relating to the purchase obligation and additional remuneration, which may concern certain hydroelectric facilities, the Orders of 3 August 2016 relating to the environmental assessment of public information and participation projects and procedures, or the Law of 7 October 2016 for a digital republic.

#### Annual concession fee

In accordance with Article L. 523-2 of the French Energy Code, when a hydropower concession contract is renewed or extended under the conditions provided for by Articles L. 521-16-2 or L. 521-16-3 of the French Energy Code, an annual concession fee that is proportional to the revenues generated by the concession contract is levied, which is paid in part to the French State and in part to the French départements and municipalities through which the waterways used flow. A limit is set by the contracting authority on a case-by-case basis for each new or renewed concession contract. Article 69 of Law no. 2015-1785 of 29 December 2015 (the Budget Act for 2016) expressly confirmed that this type of concession fee excludes the application of the concession fees provided for by Article L. 523-1 of said Code, which apply to concession contracts that were renewed before 2006. Moreover, Law no. 2018-1317 of 28 December 2018 (the Budget Act for 2019) levies a fee on any "rolling delay" concession extended in accordance with Article L. 521-16 of the French Energy Code, starting on 1 January 2019. The amount of this concession fee will be set by decree by the Council of State in view of the nature of the concession.

#### Safety and security of facilities

Articles R. 214-112 *et seq.* of the French Environment Code contains provisions that are applicable to the safety and security of hydropower facilities that are authorised and operated under concession contracts. Dams are divided into three classes (A, B and C) according to their characteristics, in particular their height and the volume of the floodwaters. According to this classification and the legal rules applicable to the facility, the regulations require the operator or concession contract holder to fulfil a certain number of obligations in order to guarantee the safety and security thereof (in particular by carrying out and updating hazard studies – see section 1.4.1.5.1.2 "Hydropower safety"). The aforementioned Decree of 27 April 2016 on hydropower energy concession contracts contains provisions that are designed to unify the regulations, regardless of the legal rules that are applicable to the facility. The decree of 6 August 2018 setting the technical requirements for dam safety applicable to facilities approved for construction and to those in operation lays down basic safety requirements applicable to dams. The provisions will gradually come into force for existing dams between 31 December 2025 and 31 December 2035 depending on the type of dam.

#### 1.5.6.2.5 Regulations applicable to renewable energy generation

The “Climate Package” (known as the “2020 Energy-Climate Package”) is the source of a set of measures aimed at ensuring that, by 2020, the EU will achieve the objectives of a 20% reduction of greenhouse gas (GHG) emissions, a 20% improvement in energy efficiency and a 20% portion of renewable energy (REN) in energy consumption. The “2030 Energy-Climate Package”, which was adopted on 24 October 2014, set new targets for 2030: a 40% reduction in GHG emissions compared to 1990, 27% of renewable energies in the energy mix and a 27% improvement in energy savings.

One of the five instruments that make up the 2020 Energy-Climate Package is Directive no. 2009/28/EC of 23 April 2009 on the Promotion of the Use of Energy from Renewable Sources, known as the “REN” Directive. It allocates the effort to reach the target of 20% of renewable energies in final EU energy consumption by 2020 among Member States, taking into account, among other aspects, the national energy mix, the potential of each State and its GDP, and requires Member States to adopt national renewable energy action plans.

According to Article 4 of the aforementioned REN Directive, France adopted its National Action Plan in favour of renewable energies (2009-2020). This plan, in accordance with the REN Directive, sets a national target of a 23% share of energy from renewable sources in the gross final consumption of energy by 2020. The Law of 17 August 2015 on Energy Transition for Green Growth also provides for a target of 32% of renewable energies in energy consumption by 2030. Moreover, the same Law provides that the National Plan will be replaced by the part of the PPE that concerns the development of renewable energies and energy recovery.

In order to achieve the objectives of the REN Directive, the *Grenelle 2* Law created new land planning instruments with a view to enabling balanced development between the various renewable energy sectors. These include:

- regional climate, air and energy schemes (SRCAEs), for which the legal framework is laid down in Articles L. 222-1 to L. 222-3 and R. 222-1 to R. 222-7 of the French Environment Code. As of 1 May 2014, all regions had adopted their SRCAE;
- regional schemes for connection to renewable energy networks (S3RERs), of which Articles D. 321-10 to D. 321-21 and D. 342-22 to D. 342-25 of the French Energy Code specify the content, approval rules, host capacity management and financial conditions for the connection of electricity producers.

Under Article 15 of the REN Directive, an Order of 14 September 2011 (ratified by Law no. 2013-619 of 16 July 2013) amended the legal rules on the guarantees of origin of the electricity produced using renewable sources or by cogeneration, laid down in Articles L. 314-14 *et seq.* of the French Energy Code. The terms and conditions to implement this new scheme and the rules for appointing the organisation in charge of managing guarantees of origin (issuing, transfer, cancellation) are stipulated in Articles R. 314-24 to R. 314-41 of the French Energy Code. As producer and mandatory purchaser of electricity produced using renewable energy sources, the EDF group is concerned by these provisions. The Law of 17 August 2015 on Energy Transition for Green Growth has empowered the Government to take Order no. 2016-1059 of 3 August 2016 relating to the electricity generation from renewable energies, which has amended the provisions applicable to facilities generating electricity from renewable sources in order to ensure their better integration into the electricity market and to provide the technical provisions necessary for better integration into the electricity system of connected electricity generation facilities to a public distribution network, particularly facilities generating electricity from renewable sources.

The *Grenelle 2* Law also contains exceptional provisions designed to encourage the development of sea-based energies, which were enhanced by the Law of 17 August 2015 on Energy Transition for Green Growth.

In addition, Article 18 of Law no. 2014-1545 of 20 December 2014 on the simplification of corporate life empowers the Government to set up a dedicated, comprehensive authorisation system for sea-based facilities that produce renewable energy and that are located in the maritime public domain, and for the connection structures for these facilities. Moreover, Decree no. 2016-9 of 8 January 2016 simplified the legal procedures that are applicable to sea-based renewable energy projects that win competitive tendering procedures.

Furthermore, the Law of 17 August 2015 on Energy Transition for Green Growth provides an exceptional appeal timeframe for the benefit of “facilities that produce

energy from renewable sources” of four months in which to contest an authorisation, as from, respectively, either the publication of the authorisation, or its notification.

#### 1.5.6.2.6 Regulations applicable to wind power generation

Pursuant to Articles R. 421-1 and R. 421-2 of the French Urban Planning Code, a building permit must be obtained for land-based wind farms with a height equal to or greater than 12 metres. However, the environmental authorisation granted for the completion of an onshore wind farm project is exempted from the requirement for a building permit, in accordance with Article R. 425-29-2 of the French Urban Planning Code. For its part, the construction of wind farms on the public maritime domain is exempted from the requirement for a building permit, in accordance with Article R. 421-8-1 of the French Urban Planning Code.

In addition, the *Grenelle 2* Law provides that onshore wind farms are now subject to the nomenclature applicable to ICPEs with the legal system of authorisation or declaration (see section 1.5.6.2.1 “Regulations applicable to facilities classified for the protection of the environment (ICPEs)”) under section 2980 “*Terrestrial facilities for the generation of electricity using mechanical wind energy with one or more wind-power generators*”. In connection with the application for a building permit, an impact study must be performed for wind farms that are subject to authorisation and submitted with the building permit file.

The Law of 17 August 2015 on Energy Transition for Green Growth amended the rules on the distance required between wind farms and housing: the minimum distance of 500 metres is maintained, but may be increased in light of the impact study, which is part of the authorisation application. It also inserted provisions into Article L. 146-4.1 of the French Urban Planning Code that are designed to facilitate the location of land-based wind farms in municipalities concerned by the “Coastline” Law. A decree is also expected to clarify the rules on wind farm location with regard to military facilities and sectors, weather monitoring equipment and air navigation equipment.

The operator of a wind farm, or in the event of default, the parent company, is responsible for decommissioning the farm and site restoration, as soon as operation is terminated for any reason (Articles L. 553-3 and R. 553-1 of the French Environment Code). For this purpose, the operator is required to lodge financial guarantees as of the start-up of generation and for subsequent accounting periods.

The authorisations relating to the generation and transmission works necessary for the development of offshore wind farm projects are subject to a specific litigation framework, laid down by Decree No. 2016-9 of 8 January 2016.

#### 1.5.6.2.7 Regulations applicable to public procurements

Directive no. 2014/24/EU on Public Procurement and Directive no. 2014/25/EU on Procurement by Entities Operating in the Water, Energy, Transport and Postal Services Sectors, to which EDF is subject as a purchaser, have been transposed into French domestic law by:

- order no. 2015-899 of 23 July 2015 on public procurement contracts, which unified the various competitive tendering procedures that previously existed in the French Public Procurement Code and Order no. 2005-649 of 6 June 2005;
- decree no. 2016-260 of 25 March 2016 that implemented the Order of 23 July 2015.

These texts entered into force on 1 April 2016

### 1.5.7 REGULATIONS ON WHOLESALE ENERGY MARKETS

Inspired by the rules contained in Directive no. 2003/6/EC on Market Abuse applicable to financial markets (see section 4.1 “Corporate Governance Code”), regulation (EU) no. 1227/2011, known as the “REMIT” regulation, on wholesale energy market integrity and transparency came into force on 28 December 2011. This regulation is aimed at preventing market abuse and manipulation on wholesale energy markets and strengthening the confidence of market participants and consumers.



Strengthening wholesale energy market integrity and transparency must foster open and fair competition on these markets, in particular so that prices set on these markets reflect a fair and competitive interplay between supply and demand. The regulation prohibits insider trading and market manipulation, and establishes an obligation to publish inside information as defined in the REMIT.

The European Agency for the Cooperation of Energy Regulators (ACER) is primarily responsible for monitoring wholesale trades in energy products, in order to detect and prevent transactions based on inside information and market manipulations.

ACER also collects the data needed to assess and monitor markets. The regulation provides that market participants, or a person authorised to do so on their behalf, provide ACER with a detailed statement of the transactions in the wholesale energy market.

Lastly, market participants that perform transactions for which a declaration to ACER is mandatory must register with the national regulatory authority of the Member State in which they are established (the CRE in France) or, if they are not established in the European Union, that of a Member State in which they do business.

## 1.6 RESEARCH & DEVELOPMENT, PATENTS AND LICENCES

The main missions of the EDF group's Research and Development Division (R&D) are firstly, to support the Group's Divisions and subsidiaries on a day to day basis, by providing them with its top-level expertise and high performance practices, and secondly, to contribute to build the Group's future by anticipating the developments and major challenges with which it is confronted.

In particular, these challenges include the following:

- the complementarity between nuclear generation and generation from intermittent renewable energies in order to support the energy transition and reduce CO<sub>2</sub> emissions;
- water use and environmental management;
- the rapid development of emerging countries and the resulting shift in consumption areas;
- the significant development of information technology applied to energy, offering new opportunities for the electricity business, the changing behaviours of clients;
- consumers and local authorities who are also becoming producers, and seeking to consume more effectively, living in buildings, neighbourhoods and cities that have greater energy autonomy.

In this context, R&D's role is crucial when it comes to finding solutions to all of these challenges. Its avenues of research are structured around three broad priorities:

- developing and experimenting with new energy services for clients, enabling demand-side management that is both flexible and low-carbon, thanks to improvements in knowledge of demand, the development by clients of energy efficiency, the promotion of new, effective uses of electricity, often in combination with renewable energies (heat pumps, electric mobility, etc.), the development of technical and economic modelling to engineer buildings, industry and sustainable cities, and the development of uses and consumption being integrated into the electricity system itself through the use of smart grids and appropriate pricing;
- preparing the electricity systems of the future, by: optimising the lifespan of network infrastructures and accompanying adaptation of the electricity system by improving network asset management; implementing optimisation models and economic scenarios for new infrastructure projects relating to energy transport; inserting intermittent energies; and developing smart grids;
- consolidating and developing competitive low-carbon production mixes: One of the major challenges of the transition is to ensure the efficient co-existence of traditional means of generation, notably by further improving the security and performance of the existing nuclear plant as well as its operating lifespan, with the development of new renewable energies by improving their performance and integration into the energy systems.

In 2018 the R&D Division updated the list of disruptive initiatives it is leading to prepare for the Group's future: Five new disruptive initiatives were identified:

- a decarbonised economy powered by clean electricity – to combat climate change and encourage growth, the world's major economies must reduce their carbon footprint. Electricity will be one of the key drivers of low-carbon growth. R&D is investing its technical resources to rise to the challenge;
- distributed storage and generation – more efficient and cheaper storage, solar power and distributed generation solutions (e.g. standalone solar power systems, micro-cogeneration) are causing electricity companies to make major changes to their business models, currently based on balancing demand and supply at all times and mitigating network incidents. To help reach EDF's goal of developing 10GW of energy storage across the world by 2035, R&D is pouring resources into batteries, standalone power systems, distributed generation and carbon-free hydrogen;
- smart buildings & smart cities – future buildings must do their bit to lower greenhouse gas emissions while tomorrow's cities must be such that one can sleep with the window open on account of the clean air, low noise, safe neighbourhood and eco-friendly atmosphere. To make this happen, EDF R&D will design methods and tools to manage and optimise combined power systems;
- nuclear innovation – to bring about the nuclear plant of tomorrow, EDF has identified 18 technological building blocks for cutting edge innovation in digital technology (e.g. digital twins), manufacturing (e.g. 3D printing), materials (e.g. innovative fuels) and optimisation (e.g. renewables-nuclear energy mix);
- flexible, forward-looking R&D – the EDF group is adapting its R&D model to create value for its various entities and enable it to meet intensifying technological and competitive challenges head on.

### 1.6.1 R&D ORGANISATION AND KEY FIGURES

EDF's R&D is both integrated and cross-disciplinary, in order to facilitate synergies and method transfers between the different Divisions within the Group.

Adding EDF's R&D budget of €510 million to that of some of its subsidiaries, including Framatome, the Group's total R&D allowance in 2018 came to €711 million. This is one of the largest R&D budgets of any major electricity company. Approximately two-thirds of this budget is devoted to programmes put together on a yearly basis under contractual agreements with EDF's operational Divisions and subsidiaries. The remaining third goes to medium and long-term anticipation initiatives that fall within Group R&D priority areas.



In 2018, approximately 20% of this budget was devoted to protecting the environment. In particular, expenditures covered research into energy efficiency, uses of electricity as a substitute for fossil fuels, renewable energies and their insertion into the grid, energy storage, carbon-free hydrogen and its applications for decarbonising the economy, sustainable cities, the local impacts of climate change and other environmental issues such as biodiversity, water quality, and the mitigation of disturbances.

At end 2018 EDF's R&D employed 1,900 people in France representing 29 nationalities. Managers made up 84% of staff and women 31.6%. R&D is home to 117 Ph.D. students and 77 students on work-study programmes. Around 160 researchers teach in universities and major engineering schools. The Division also has 225 employees spread out across the world of which 27 are French expatriates. In late October 2018 EDF's R&D hired 45 people. It channels its employees towards other entities of the EDF group. In late October 2018 the result of this mobility was a net reduction in headcount of 55.

The R&D Division is made up of 13 technical departments. Their skills cover all the Group's field of activities: renewable energies and storage, networks, nuclear generation, thermal, hydropower, energy management, trade and services, IT systems, environment. They are specific to particular disciplines, business lines and projects, and also come together for work on major systems.

EDF's R&D Division manages an internal training body, the Technology Transfer Institute (*Institut de Transfert de Technologie, ITech*), whose purpose is to disseminate EDF's R&D know-how and innovations to the rest of the EDF group. ITech has a catalogue of training courses which is updated each year. In 2018, out of the 114 courses on offer, 56 were available to professionals from outside the Group. Its courses are part of the syllabi of the Vocational Academies (see section 3.4.1.3 "Skill development: preparing for the future"). In 2018 ITech added a new programme on creating value in innovative projects.

At present, the R&D Division is organised on a multi-site basis. Three are located in France in the greater Paris area and six worldwide: Germany, United Kingdom, China, United States, Singapore and Italy. The Chatou and Les Renardières (near Fontainebleau) centres have workforces of 423 and 540 people respectively.

EDF's main R&D centre is located in Palaiseau on the Paris-Saclay campus where it opened in 2016. A total of 1,054 Group researchers, doctoral students, interns and EDF partners work at the facilities.

The Saclay centre sets fresh ambitions for EDF's R&D and places scientific and industrial innovation and research at the heart of the Group's priorities.

EDF's R&D training programme and its training centre, which opened in September 2016, position the Group as a leading player on the Paris-Saclay campus where it is ideally placed to benefit from more dynamic collaboration with the higher education establishments and public and private-sector research centres located nearby.

In addition, a number of partnership agreements have been concluded with other institutions of the Paris-Saclay University:

- SEIDO, a joint EDF-Telecom Paris Tech laboratory dedicated to the Internet of Things and cyber security for electricity systems. Its mission is to prepare and facilitate the deployment of energy demand management and energy efficiency services, making use of interoperable, communicating energy-related objects (heating, air conditioning, white and brown goods, electric vehicles, etc.), thereby helping to provide coherence for the system as a whole, as well as safety (security, confidentiality, and so on);
- the shared Rise Grid laboratory, devoted to the modelling and simulation of smart grids, in association with the Supélec engineering school;
- the SEISM Institute for modelling the effects of seismic activity from fault lines through to structures, which was founded by EDF, the French Atomic Energy Commission, CentraleSupélec, the École normale supérieure Paris-Saclay, the French Geological Survey (BRGM) and the National Centre for Scientific Research (CNRS);
- PGM0, the Gaspard Monge Programme for optimisation and operational research, housed by the Jacques Hadamard Mathematics Foundation, and established with the patronage of EDF's R&D Division;

■ IMSIA, the Institute of Mechanical Sciences and Industrial Applications, which since June 2015 has brought together ENSTA, CNRS, and CEA Saclay alongside EDF;

■ the Energy Finance and Markets laboratory, shared with Dauphine University, ENSAE and École polytechnique;

■ the Île-de-France Photovoltaic Institute SAS (IPVF), which is an institute for energy transition (ITE) dedicated to developing ground breaking technologies in the photovoltaic field, brings together EDF, Total, Air Liquide, Riber, Jobin Yvon, the CNRS and École polytechnique in a partnership which is supported by the French State within the framework of ITE funding by the Commissariat-General for Investment (CGI).

The INSTN, the training & education arm of the CEA, with which three courses on neutron transport will be shared. Further shared courses with the INSTN on materials science are in the works.

The R&D sites house two joint research units with the CNRS: the Institute for Mechanical Science and Industrial Applications (formerly Laboratory for the Mechanics of Ageing Industrial Structures, LaMSID) and the Materials Ageing Institute (MAI), an international R&D centre.

To carry out its research, EDF continues to invest in powerful and recognised means of digital simulation. It is developing cutting-edge computing code and resources that are among the best in industry. Currently it has a capacity of 4 petaflops.

In addition, the Group benefits from unique experimental resources; these include specific analytical loops to study (chemicals/corrosion, failure, aero-acoustics, etc.) loops focusing on components and processes; resources for on site test interventions; and resources dedicated to the characterisation of materials and their ageing. Two recent flagship installations are noted below:

- Concept Grid: a scaled-down electricity grid for the purpose of trialling and testing the insertion of the innovative hardware and "intelligent" systems that together make up a smart grid, prior to them being installed on the grid itself. Concept Grid is designed to prepare future developments of the grid by studying the integration of new components and equipment from the world of information and communication technology to facilitate demand-side management. It is also intended to facilitate the integration of decentralised production, by studying the behaviour of production resources on the electricity system, and electricity storage applications. Concept Grid provides the missing link between a conventional research laboratory, in which innovations are tested in conditions that are not entirely representative of reality, and the actual grid, where quality of service considerations restrict experimentation;
- VeRCors: construction of a model reactor building to 1/3 scale in order to study how double containment buildings age. This model was completed in 2016 and the initial tests have been conducted. Due to its reduced thickness, it enables the Group's researchers to analyse then predict the effects of ageing of the concrete enclosures of reactor buildings and to check the solidity of this type of structure over time. It is used in conjunction with several digital models, which make it possible to model concrete ageing phenomena.

In terms of innovation, the R&D plays a leading role in guiding and supporting the Group in the innovation dynamic, established in the context of its "CAP 2030" strategy.

To that end, through its Innovation Hub, R&D develops services supporting innovation and explores new avenues of business development. The two ultimate objectives of this Innovation Hub are as follows:

- support, boost and enhance the value of innovation within the Group: 'innovate now'; this involves supporting the Divisions and R&D in the implementation of innovation processes, growth and entrepreneurship;
- help to anticipate and explore 'venture forth' disruptive models. These new models may tomorrow constitute new business lines for the Group, whether they are new services or new technological solutions.

These initiatives rely heavily on open and collaborative innovation, notably through the animation of a network of external partners and connections with French and international eco-systems. This network (start-up, incubator, major groups) is harnessed in an effort to face the challenges of the Group.

In 2018, the actions were based around the following priorities:

- consolidating processes of valorisation and protection of internal innovation and boosting the 'time to business' through actions aiming to accelerate/promote the industrialisation phase; for EDF is to detect, assess and propose high value external innovations to the Group's Divisions;
  - R&D validated more than fifty demonstration projects this year. development of collaborative innovation notably through SME partners and start-ups proposing value added solutions for the Group's Divisions. The objective for EDF is to detect, assess and propose high value external innovations to the Group's Divisions. R&D validated more than fifty demonstration projects this year.
- More broadly, the innovation dynamic relies on a network of partners. Partnerships have been entered into with incubators/accelerators like Paris&Co, Numa and EDF is a member of the Scientipôle and Incuballiance associations. Framework agreements with junior entrepreneurs (HEC, ESSEC, ESCP, etc.) have been launched, to carry out market studies. Agreements are being negotiated with networks of international experts to assess our technologies;
- internal and external optimisation and dissemination of innovation. R&D contributes directly to creating value for innovation, externally through its contributions within the framework of the EDF Pulse competition, events such as Vivapolis.

R&D also contributes to the development of new business, notably through entrepreneurship in conjunction with "EDF Pulse Expansion" Department (see section 1.4.6.1.3 "EDF Pulse Expansion").

EDF also has a stake in the Amorce Technologique Investissement fund (ATI) managed by CEA Investissement. This is directed at new French companies working in technological innovation for energy, the environment, micro-technologies and nanotechnologies.

Lastly, six stakes held by EDF Pulse Expansion in venture capital funds in France, North America and China provide access to a global pool of startups and innovation:

- Robolution Capital, a fund focusing on robotics, launched in March 2014;
- Chrysalix, a Canadian fund dedicated to cleantech venture capital, in December 2011;
- Tsing capital, the first Chinese fund to be devoted to cleantech venture capital, in December 2011;
- DBL Investors in the USA, a fund set up in 2008;
- Mc Rock, a Canadian venture capital firm that specialises in the Industrial Internet of Things (IIoT), in 2015;
- Partech, a transatlantic venture capital firm specialising in information and communication technologies, in 2017.

## 1.6.2 R&D PRIORITIES

EDF R&D's work serves all the Group's Divisions (except for recently consolidated Framatome which still has its own R&D Division). For each of them, it offers technological solutions or innovative business and economic models designed to improve their performance, and prepare the Group's future in the longer term by means of medium and long-term anticipation initiatives. It is one of the factors in EDF becoming a global industrial group providing low-carbon electricity systems.

EDF's R&D performs work for Enedis on the networks under a services agreement, which defines obligations that guarantee the protection of commercially sensitive information and compliance with the principle of the independent management of the distributor.

As the energy sector undergoes profound change, the goal of EDF R&D may be defined in terms of three strategic avenues: developing and experimenting with new energy services for clients, preparing the electricity systems of the future and, moreover, consolidating and developing competitive, low-carbon production mixes.

R&D also engages in research into information technology to support these three strategic avenues. This research is in turn structured around five major areas: complex systems, the management and the processing of large volumes of data, the Internet of Things, cyber security and the simulation of physical problems.

Research in this field has a twofold purpose:

- improving Divisional performance through advanced simulation technologies;
- facilitating the emergence of new opportunities for business lines through innovative uses of new information and communications technologies.

### 1.6.2.1 Developing and experimenting with new energy services for clients

The development of energy efficiency and distributed renewable energies, regulatory and technological changes (digitisation) as well as market deregulation, have all led to profound changes in the relationship between energy firms and their clients. They allow customers to be actively involved in their consumption and production of energy, on an individual or regional scale.

Shifts in European and French legislation and regulation, exemplified by the EU's Clean Energy Package and France's National Low-Carbon Strategy (SNBC) and multiyear energy programme (PPE), as well as various tax incentives to replace fossil fuels with clean electricity (batteries vs combustion engines, heat pumps vs oil-fired boilers) are shaping the future energy landscape.

In this context, the challenges for the EDF group's marketers and specialised subsidiaries are many, and its CAP 2030 goals aim high in terms of energy services:

- the development of price categories in order to adapt them to conditions of intensified competition;
- the desire to develop electricity use in building and transport, built on a low carbon mix to preserve market share threatened by the emergence of a new environmental regulation for 2020, to succeed the 2012 Thermal Regulation (RT);
- demand-side management: Green deal in the United Kingdom, energy savings certificates in France, suppliers must fulfil their increasing obligations;
- the development of smart technologies: the deployment of smart metres, easier access to client consumption data and the emergence of connected objects will open, for the public, access to new services permitted by new smart technologies (remote operating, increasingly customised offers, etc.);
- changes in client relations, which are becoming increasingly digital, with more demanding client expectations accompanied by changing behaviours. However, the modernisation of this relationship should not obscure the accompanying increase in clients' energy vulnerability, which calls for an appropriate response from the Company;
- the increased power wielded by local territories within the framework of the Energy Transition Law and the NOTRe Law: the regional authorities, already active in the fields of urban planning and public energy distribution, can increasingly take responsibility for their future energy strategies. The notion of sustainable territories, which combines aspects of planning (eco-districts) and mobility (electric vehicles), is becoming a key structural component in local policies. New potential areas of service are emerging at the intersection of the development of smart technologies and the shift in power to local territories;
- the emergence of demand among customers to become stakeholders in their own electricity generation through private energy generation and consumption;
- the development of the performance of our specialised subsidiaries in their respective areas of activity.

For instance, research has been conducted into new uses for electricity, such as electric mobility, heat pumps and more economic buildings. R&D helped EDF Luminus integrate its PACO industrial high-temperature heat pump prototype into a heating network in Belgium, raising its share of renewable energy generated by cogeneration. A co-development initiative has been launched with equipment manufacturers, which will ultimately lead to a reduction in the cost of heat pumps for the tertiary, commercial and residential sectors. Lastly, innovations relating to smart energy management for electricity used for heating have been developed, in particular for residential heat pumps and the modernisation of storage tanks in order to make them compatible with innovative control modes such as managing daytime and nighttime off-peak consumption.

Under EDF's smart factory initiative, work has intensified on the operating safety of industrial electrical networks and a range of Software as a Service for industrial customers is being developed. This work is a component of a broader project destined to produce a range of offers of the EDF group for the "Smart Factory", in line with the objectives outlined in the Factory of the Future initiative launched by the government.

As for client relations, to allow residential clients to be aware of their electricity use and its budgetary impact between two bills, EDF has designed and developed a prototype range of features compatible with smart meters, including an application for smart phones and PCs that allows consumers to estimate their bill, taking into account their own particular characteristics, seasonal variations in their electricity consumption, and their past consumption history. EDF's R&D is also studying ways to combat energy poverty. In 2018 the "Don d'énergie" [gift of energy] initiative was launched with the Abbé Pierre Foundation to enable people to give to energy poor households via their smartphones. R&D continued to develop a new offering of energy services this time combining electricity supply, control of electric heating by connected thermostat and the digital customer interface for a new EDF subsidiary.

That same year also saw the launch of new customer interfaces, using techniques linked to artificial intelligence, in particular chatbots and augmented reality.

In sustainable territories, to address the needs of cities that are seeking to optimise infrastructures and their management (e.g. for transport, waste treatment, buildings, energy production, and networks) and aspiring to become sustainable, "smart cities", R&D is developing urban engineering resources for EDF sales staff in France, such as the study performed for the Nice urban district. R&D particularly supported work organised around the Local Energy Pilot concept. R&D renewed its partnership with the city of Singapore to develop decision-support tools for town planning.

With these tools, collaboration with the Singaporean authorities covers the following areas: energy efficiency of buildings and their air-conditioning systems as well as household waste collection. It also includes the possibility of addressing issues such as the incorporation of photovoltaics into buildings, green roofs, and local water recycling. This modelling is coupled with innovative 3D visualisation tools at the level of individual buildings or a neighbourhood, allowing the impacts of planning decisions, for instance on greenhouse gas emissions, to be studied. The experience gained resulted in a service which is being tested with a property developer in Moscow.

Electric mobility is an important dimension of sustainable cities: electric transport opens up the prospect of a fundamental transformation of modes of travel. Battery storage is the key technology for electric transport. R&D research in this respect consists, firstly, in characterising battery safety and performance in the lab, and secondly, in innovating in the realm of breakthrough technologies with the potential to deliver significant improvements in battery life and/or cost. R&D is also studying non mobile applications for the reuse of batteries that were originally used in electric vehicles (combining them with renewable energies, system services, etc.). In the longer term, R&D will adopt a similar approach for the hydrogen (H<sub>2</sub>) technologies that are used for mobility, including electrolyzers and charging stations, as well as fuel cells for heavy transport and light vehicles.

More generally, the goals of R&D activities in the field of electric vehicles (EVs) and rechargeable hybrid vehicles (RHVs) are as follows:

- supporting the development of this new use (monitoring initial experimentation; standardisation; innovations with the potential to remove technological barriers such as wireless charging);
- managing integration with the electricity system (smart charging, dimensioning and location of charging stations);
- developing mobility service resources (fleet supervision platform, charging station operation software, smart charging stations for residential customers and resources to advise local authorities on mobility);
- preparing the integration of electric vehicles into local energy systems, with the study of vehicle to grid (V2G) and vehicle to home (V2H) models. In particular, through partnerships with leading car manufacturers;
- developing alternative mobility solutions, such as batteries and fuel cells, for heavy road and water transport that tailor batteries to vehicle types and uses and that encompass modes of charging electric and hydrogen vehicles;
- developing Mobility as a Service by preparing the way for self-driving cars.

### 1.6.2.2 Preparing the electricity systems of the future

Energy transition towards a low-carbon economy in Europe primarily involves reducing the carbon footprint of electricity systems. This involves addressing new challenges for electrical systems:

- managing the intermittence of production sources that use renewable energies and pushing back the limits of their inclusion in electrical systems;
- integrating new uses of electricity by optimising the production mix and grid requirements;
- developing network transmission infrastructures and optimising electricity traffic in Europe;
- optimising decentralised energy systems (demand-side management, decentralised generation and storage, etc.) by integrating them into larger scale energy management systems;
- adapting the coordination of electricity systems in order to address a reduction in inertia in a context of increasing use of power electronics in order to factor in patterns of use and new production sources;
- and, more generally, optimising investments in production and storage facilities, in network infrastructures and energy efficiency and green energy solutions, having regard to the interest of the public and the competitiveness of electricity, without there being any significant increase in bills for customers, while also maintaining the quality and reliability of the electricity system.

The trend towards more intelligent electricity systems, also known as smart grids, is one of the pivotal points in transitioning towards a low carbon energy economy in Europe. It raises not only technical, economic and regulatory issues, but over and above the integration of renewable energies and new uses, issues relating to the management of information for the various users of the grid and the need to control costs.

R&D's work can be divided into three main categories.

The first category of work aims to anticipate the impacts of energy transitions and the emergence of decentralised energy systems on the development and management of electricity systems:

- energy transitions: this work involves developing an overview of changes in the fundamental aspects of demand for power and new electricity uses, potential disruptions in supply, energy mix choices and the conditions for implementing energy transition scenarios (financing, technologies and infrastructures) with a view to reaching carbon neutrality by 2050. In 2018 R&D undertook market research with the Provence-Alpes-Côte d'Azur region in France to identify ways to encourage the emergence of a low-carbon, resilient and thriving local economy enjoying competitive power prices;
- market design and the emergence of local energy markets: this work involves contributing to the definition of the future ground rules for the electricity and gas markets in the context of intermittent energy sources such as wind and solar, electric mobility and distributed energy systems.

The second category of work aims to improve the performance of electricity grids:

- R&D is working to improve the management of distribution network assets. Studies are being carried out into the lifespan of materials. Predictive maintenance techniques are also being tested. These combine detailed knowledge of the behaviour of components and data and image processing techniques, with the aim of optimising maintenance cycles and detecting early signs of equipment failure;
- in 2018, R&D continued testing a new generation of software to connect, manage and administer instrumentation & control systems, network management systems and distributed energy resources. The tools are based on recent standards developed by the International Electrotechnical Commission (IEC) for high interoperability between machines and components. The first versions of the embedded software used to manage distributed energy resources and substations will be delivered in early 2019 to be integrated into the industrial systems of the Group's entities and subsidiaries. Advanced cybersecurity tools for terminal equipment and central administration and management systems are also under development;

- another focus of R&D work is the impact of developing direct current for the incorporation of renewable energies in terms of hybridisation of large alternative synchronous electricity systems, recognising that this development may profoundly change the fundamental technical and economic dynamics of electricity systems with the increased use of intermittent renewable energies.

The third category of work aims to manage the transition of the electricity system to smart grids through the integration of intermittent renewable energies and new distributed resources such as energy storage and electric vehicle charging infrastructure:

- R&D work forms part of the joint European H2020 research programmes aimed at developing solutions to integrate a high proportion of intermittent renewable energies in the European interconnected system. EDF's R&D is involved in the EU-SysFlex project aiming to build a flexibility roadmap for Europe together with EirGrid and 32 other European partners; the Plan4Res project aiming to develop an integrated modelling of the European energy system to produce an end-to-end planning and operational tool; and the TDX-ASSIST project aiming to facilitate data exchange between transmission and distribution system operators in the European electricity market. R&D is working on and taking part in demonstrations of new distribution network management functionalities in a distributed generation model. This innovative coordination method makes it possible to maintain voltage on the high-voltage grid within its contractual range, on the basis of a grid status estimate, even when decentralised production resources are used;
- R&D is developing advanced tools to forecast intermittent renewable energy consumption and production on various territorial scales. It is working in partnership with weather forecasting organisations in order to develop meteorological benchmarks for the management of electricity systems;
- R&D is pursuing work on the development of predictive network management tools in the presence of intermittent renewable energy generation. Predictive management enables power flow arbitrations, generation injected by renewable energy installations and the unavailability of installations on the grids to be predicted. The functions developed for HVA grids are currently being extended to low-voltage grids;
- R&D is accelerating development of its entire range of solutions to make it easier to make electric mobility part of the grid. This involves analysing the impact of electric vehicles at their connection points with the distribution network, namely the impact of the load profile on the power drawn and the impact on the stability and safety of the electrical current. Other areas of research include modelling mobility across time and space so as to estimate the impact on the grid. R&D is also working on new technology, materials, software and modes of communication to facilitate the seamless integration of charging stations into the grid;
- R&D provides technical support for some of the certification tests carried out on metering equipment (including Linky meters) and helps to develop grid equipment;
- R&D is also experimenting with electricity use coordination systems based on the Linky infrastructure. In particular, these experiments are making it possible to demonstrate the feasibility of load management and the new types of flexibility offered by the electric vehicle, distributed storage facilities and self-consumption solutions;
- R&D is also working towards the optimal integration of decentralised renewable resources in small-scale grids with the objective of facilitating a transition to a local low-carbon electricity mix. Microgrid prototypes worked successfully in a variety of applications, such as the integration by EDF SEI of renewable energy generation and storage into island network microgrids on the island of Sein and at Mafate on the island of Réunion, and the functional contribution of microgrids to the interconnected Nice Grid resulting in improved grid resilience and support. In October 2018 EDF R&D successfully brought a microgrid prototype into service in Singapore, proving its ability to provide competitively-priced electricity to parts of Southeast Asia through low-carbon, reliable and replicable systems of this type;
- moreover, R&D is working on innovative solutions for the management of production and consumption portfolios, and the associated risks. This involves anticipating the consequences of the development of new means of production and/or new decentralised uses for the management of energy systems and developing tools to aggregate the local flexibilities of distributed energy systems.

The activities in the second and third categories for the benefit of Enedis are performed under a services agreement entered into by the R&D Divisions of EDF and Enedis.

Research into electricity systems uses extensive test facilities:

- laboratories for high-voltage electrical testing enabling a very wide range of qualification and investigation tests for all types of electrical equipment to be carried out: high power, mechanical and climatic endurance, dielectric materials, "high power" long term and aging; the high power testing laboratory benefited from a major renovation program in 2017 and 2018;
- system management test facilities, communicating devices and systems, metering equipment, power-line communication and electric vehicle smart charging;
- Concept Grid testing facility: Concept Grid is a scaled-down electricity network for the purpose of trialling and testing the installation of the innovative hardware and "intelligent" systems that together make up a smart grid, prior to them being installed on the grid itself.

### 1.6.2.3 Consolidating and developing competitive low-carbon production mixes

In the field of nuclear, hydro and fossil-fired power generation, EDF R&D is developing tools and methods to improve the safety of production resources, optimise their operational lifespan, and increase their performance in terms of output and environmental impact. There are three key priority goals: ensuring the Group maintains its advantage in terms of nuclear power over the long term, developing renewable energies while reducing their cost and increasing the extent to which they are used in electricity systems, while improving the environmental acceptability of our generation facilities.

To secure the Group's advantage in nuclear power generation in the long term, R&D is working to protect EDF's assets through actions in line with its policy to improve the safety of facilities, particularly with regard to enhanced performance and extended operating lifespan. In 2018, for example, R&D carried out further tests on the VeRcors concrete containment model located in the Renardières R&D centre. This VeRcors model is a one-third scale, double-walled concrete containment structure representative of a 1,300MW reactor building. The results of the containment test carried out in March 2018 are being used to strengthen the digital twin of this containment building which serves to predict the ageing phenomena of the concrete and therefore the building's operating lifespan. A containment test is programmed every year, and thus after 5 tests (given that the thickness of the VeRcors wall is one third weaker than for an actual containment building), the digital twin will be able to predict with a reasonable level of confidence the ageing of the building beyond a 40-year lifespan.

More broadly, the EDF group (EDF and Framatome) works on R&D with the CEA as part of the Institut Tripartite (which also includes AREVA). In 2017 the three partners launched the Nuclear Plan of Tomorrow Initiative comprising technological building blocks for existing plants and nuclear new build. The aim of several of these technological building blocks is to gain actionable knowledge of the ageing mechanisms of components having an impact on the operating lifespan of the EDF group's nuclear units. This knowledge is used to help reduce common interruptions and optimise the maintenance, upgrade or replacement of equipment and structures to ensure safety and availability. More immediately, it contributes to making units more efficient.

Moreover, initiatives in the field of nuclear power also concern issues relating to the fuel cycle. They include the design of new power plants, in particular fourth-generation plants and Small Modular Reactors (SMR).

Furthermore, R&D actions contribute to improved knowledge and better control of the impact of facilities on the environment, and, at the same time, to ensuring that greater attention is paid to the environmental risks for industrial facilities. For instance, R&D is studying how water resource availability may change in the future as a result of changes in climate and physical geography. R&D research also contributes to understanding the possible risks and consequences for the power generation plants (availability of a heat sink, scope for modulation and location optimisation).

To support these programmes, R&D is developing digital simulation tools and experimental test resources, as well as tools that are capable of handling the fresh challenges raised by the increase in large sets of digital data, IT security, and new information and communication technologies. In 2017, EDF launched ConnexLab in



Saclay to test new concepts of operation and maintenance. ConnexLab is part of the nuclear sector's digital transition initiative bringing together EDF and its subsidiary Framatome), the CEA, equipment manufacturers, maintenance companies and digital model suppliers.

In association with other European leaders in the nuclear sector, in 2012 EDF R&D set up NUGENIA, an international non-profit organisation whose purpose is to develop a single cooperative framework for R&D in Europe for second- and third-generation nuclear systems, as part of the European Sustainable Nuclear Energy Technology Platform (SNETP). The organisation has 101 members from 25 countries representing the manufacturing, research and safety regulation sectors among others. Chaired by EDF, it will facilitate the creation of synergies and joint projects between members or with national R&D programmes in the following fields: safety and risk analysis, serious accidents, safety and risk analysis; serious accidents; reactor cores and performance; component integrity and ageing; fuel, waste and decommissioning; "Innovative Generation III Design"; as well as into cross-functional issues such as the harmonisation of practices (mainly in the safety field) and non-destructive controls and tests.

The second priority is support for the development of renewable energies. These are playing a growing role in the energy landscape both within Europe and worldwide; EDF is already a major player here, and is seeking to expand its role in the field still further. The Group has set itself ambitious goals under its CAP 2030 plan, and in late 2017 and 2018 launched a solar power plan and a storage plan.

For renewable energies, storage and hydrogen, the goal of R&D is to identify technological breakthroughs that offer a significant competitive advantage, and to help the most promising technologies emerge industrially, working in partnership with academia, industry and startups. EDF is investigating a wide range of renewable energies and storage solutions: hydropower, photovoltaics, onshore and offshore wind power, solar thermodynamic power, biomass, marine energies, geothermal power, electrochemical batteries, flywheels, flow cells, electrolyzers, fuel cells (hydrogen) and thermal energy storage (heat and ice).

R&D is also working to develop tools and methods to enhance operational performance and optimise the cost of the EDF group's electricity generation system projects that are based on renewable energies and storage, with a number of aims in mind:

- contributing to the success of fixed-foundation and floating offshore wind farm projects, of EDF Renewables in France and in the United Kingdom by reducing investment risks: EDF R&D, for example, provides its expertise in the Group's offshore wind farm projects, in particular in terms of turbine system and foundation design, turbine certification, production assessment methods, by limiting uncertainties. As an example of how it supports offshore wind power development, EDF's R&D analysed feedback from the Blyth wind farm in the UK and with a British partner built a dedicated diagnostic bench to test the main rotation of the Haliade turbine. R&D is also preparing the future by studying floating offshore windfarm technologies. As such, R&D assessed the floating structures of EDF's Provence Grand Large offshore floating wind farm using in-house modelling tools;
- increasing the competitiveness of the EDF group's PV and wind farm projects, through enhanced performance (predictive maintenance) and through the extended lifespan of PV and wind farm facilities, performance qualification brought by innovations, notably through demonstration projects with large-scale wind turbines, and also to show the potential reductions for tidal energy. EDF R&D designed and assembled a tool to measure the potential output of a solar park fitted with bifacial solar panels as well as a hybrid model (comprising a physical model and big data) to predict the long-term wear and tear of solar modules;
- helping the EDF group gain access to new markets, in particular, to be a benchmark in thermodynamic solar power and succeed in the deployment of the "*Mon soleil et moi*" self-consumption offering without grid feeding. EDF's R&D drew on EDF Renewables' experience in Morocco in order to limit technical risks

and promote innovative hybrid solutions combining CSP with thermal storage and to more accurately estimate falling intensity of sunshine. R&D also developed new algorithms for EDF ENRS that maximise solar power self-consumption;

- enhancing operational performance, whereby R&D is participating, for example, in the development of an onshore wind farm performance analysis tool and is testing solutions for increasing the return of a wind farm in an electricity market through an efficient control system jointly integrating several dimensions (production optimisation, maintenance, lifespan, system services) to enhance EDF Renewables' operational performance. EDF R&D also assesses and tests the contribution of new business sectors to improve business performance (virtual and augmented reality, 3D printers, stealth blades, etc.). In 2018 R&D helped define data infrastructure and lent assistance to EDF Renewables in building its DataLake;
  - controlling the technical and economic impact on the electricity system, and managing the electricity system balance as renewable energies are incorporated. The work concerns the definition of procedures for renewable energies to be inserted into electricity grids. This involves analysing the different solutions allowing the integration of intermittent renewable energies and the evaluation of constraints and the cost of their integration into large systems: storage, super grids, smart grids, demand-side management, etc.;
  - devising services and offerings that EDF might offer its customers in the area of stationary storage and design better storage/renewable energies/converter products according to planned use in order to optimise investment and running costs;
  - anticipating and contributing to the emergence of forthcoming major breakthroughs in the areas of renewable energies and storage (technological or business model) and assessing them;
  - boosting deployment of internal and external innovations to the Divisions.
- The third priority is to improve the environmental acceptability of our production facilities. Climate change, the marked decline in biodiversity and Earth's limited resources make EDF a legitimate choice for a low carbon energy mix. The aim of the R&D Division's initiatives is:
- through its scientific and technical expertise, to contribute to the way in which the regulatory environment is implemented and evolves, in a way that is proportionate to the key issues;
  - to provide justification for our production facilities being on par with the best available techniques, at an economically acceptable cost, and to leverage these best available techniques in new projects;
  - to acknowledge and manage our impact on terrestrial and aquatic environments, enhance the value of our improvement initiatives, limit and enhance the value of our sub-products;
  - to know how to anticipate and address new developments in climate change, for example by becoming more familiar with the robustness of the heat sinks for power plants in light of future climate change;
  - to contribute to leveraging our positive actions with regard to local stakeholders.

### 1.6.3 INTERNATIONAL BUSINESS AND PARTNERSHIPS

To conduct its research and development programmes, EDF R&D develops a large number of partnerships worldwide, the purpose of which is to maintain its expertise at the highest global level in the disciplines central to EDF's concerns, and to supplement its internal reservoir of skills.

R&D's partnership policy is embodied in a variety of ways, both nationally and internationally.

1.



In France, over the past few years R&D has set up about fifteen laboratories on a joint basis with academic partners and technical or industrial centres. With them, it is participating in collaborative research projects funded by several national desks. Each shared laboratory offers an opportunity to establish a combined team in order to focus on a common scientific and technical problem, with a view to creating value, expertise and knowledge for all partners; this constitutes a major asset when taking part in cooperative projects. R&D also supports a few specially targeted teaching and research chairs.

In the field of nuclear R&D, a three-way agreement between CEA, EDF and AREVA was agreed upon at the beginning of 2014 and was renewed in 2017 (Framatome replacing AREVA). This new "Institute" agreement is designed to increase R&D programme coordination between partners and to make available programmes defined with reference to detailed goals, particularly industrial goals. In practical terms, this entails the following:

- formation of a Three-Party Programme Team (*équipe programme tripartite*, EPT), responsible for programme supervision and coordination. This team consists of four members per partner, for a total of 12 members;
- detailing of these programmes in the form of projects monitored by the EPT;
- implementation of these programmes in existing shared laboratories.

At the same time, the three-party agreement on R&D between CEA, IRSN and EDF was also the subject of negotiations in 2014, this has led to the signature of a four-party agreement including AREVA NP (now Framatome), allowing enhanced coordination with the "Institute" policy.

R&D is also present within the Energy Transition Institutes (*Instituts de la transition énergétique*, ITE) which were set up as part of France's "Investments for the Future" initiative:

- the Île-de-France Photovoltaic Institute (IPVF): EDF is one of the founding members of this Institute, which seeks technological breakthroughs in photovoltaic energy that is competitive in the market. Ultimately, the Institute will bring together some 150 researchers seconded from the different partners to work with state of the art equipment located at Saclay. The new building designed to house the IPVF was completed in autumn 2017 and EDF and IPVF staff moved there from EDF's R&D facilities in Chatou. This building complex with a floor area of around 8,000 square metres and combines tertiary space and laboratories is located on the Paris Saclay Campus in close proximity to EDF Lab.;
- France Énergies Marines, a non-profit organisation devoted to marine energies and offshore wind farms;
- SuperGrid, focusing on major transport networks to connect remote renewable energy production sites;
- Vedecom, devoted to electric mobility;
- efficacy, working on energy efficiency and sustainable cities;
- INEF 4 working in the field of building rehabilitation and sustainable construction.

EDF is also the driving force behind ConnexITy, an R&D programme aimed at connecting, through digital technology, players in the nuclear sector in order to simplify power plant operation, site preparation and design. To respond to this a new laboratory was opened in November 2017, ConnexLab at EDF Lab Paris-Saclay.

EDF is also a founding member of several European associations recognised at the EU level, such as NUGENIA for nuclear power and EASE for storage.

Since the early 2000s, EDF has had a research centre in Germany, EIFER, in collaboration with the Karlsruhe Institute of Technology (KIT). This centre is chiefly devoted to decentralised production (fuel cells, hydrogen), sustainable cities and territories, geothermal energy, and biofuels. This centre was recently reorganised to increase the focus on hydrogen issues and also on innovations in technologies and business models being developed in Germany within the framework of EnergieWende. In 2018 EIFER enhanced its hydrogen expertise as one of the main

contributors to the research initiatives conducted under the Group's Storage Plan. That same year the Japanese research foundation CRIEPI, EIFER and Edison's R&D centre stepped up their cooperation begun in 2017 with common working groups meeting in Japan and Europe. The EIFER centre also supports the commercial subsidiary EDF Deutschland in its sales and marketing development projects in the German market through the integration of innovative solutions in its range of offers. Following on from the contracts signed in Singapore, EIFER sealed a business agreement in Russia to implement the EDF City Platform in a new planned development near Moscow.

Since 2010, research activity has increased internationally around several centres: in the United Kingdom, China, Singapore, the United States and Italy.

The United Kingdom centre consolidates the Group's positions in the British research eco-system, particularly through Strathclyde University in the field of renewables, as well as with Manchester University, Imperial College, the National Nuclear Laboratory (NNL) and the University of Bristol in the field of nuclear energy. In 2012, this research centre became an independent legal entity, EDF Energy R&D UK Centre Ltd, a subsidiary of EDF Energy. This new status has raised EDF's profile and research capability in the United Kingdom, in line with the Group's development strategy. The centre thus provides direct support to the activities of EDF Energy business units whether in the existing nuclear field (extension of AGR reactor lifespans, decommissioning), or in new projects with the installation of an antenna in Bristol to support the HPC project and help solve its environmental problems. The centre is also fully mobilised, in *digital* solutions for clients and offshore wind farm projects for which it is the reference centre for all the Group's projects in France and abroad.

The Beijing centre is an asset in terms of participating in large-scale Chinese smart grid demonstration projects for smart grids, or nuclear facilities (see section 1.4.5.3.6.1 "Activities in China"). The centre was reorganised in 2017 to provide direct support to EDF China's business units in line with EDF China's "Go 2020" strategic plan. It thus supports sustainable cities and more broadly local multi-energy projects combining electricity, heating and cooling networks. It also provides support to the new renewable energy development entity established in China, and the centre increased its cooperation with several Chinese public and private partners on CSP. China's massive investment in electric vehicles make the centre a key vantage point from which to monitor the technology and business models arising there.

Lastly, the centre has developed an extensive partnership with the China Electric Power Research Institute (CEPRI) of the network operator, State Grid, in the field of networks and notably on the issue of integrating renewable energies in the grids.

In support of Edison's business development goals, the R&D centre has developed programmes in the field of digital customer solutions and the "Connected Home" in partnership with the French and UK R&D teams whose business units are facing the same challenges in terms of developing new customer services in competition-oriented markets. This work relies on the joint Edison and the University of Turin laboratory established to deal with these issues in 2015. As noted above, the Edison R&D centre is actively involved in research work in the hydrogen field. It also invested heavily in its data analysis capabilities.

The United States R&D and innovation sector is one of the largest and most buoyant in the world. EDF has had an R&D and Innovation team in Silicon Valley for several years, which supports EDF's development in the USA and contributes to innovation in the Group. EDF Innovation Lab's areas of activity include, in particular, analysis of technological, digital and regulatory trends and the assessment of new business models for the Group in the USA, in connection with distributed energy resources and micro-grids. EDF Innovation Lab has thus supported EDF's International Management which markets an 'off-grid' access to electricity offerings in certain African countries with the Californian company OGE. Since 2017 EDF Lab has participated in several innovative electric mobility and micro-grid demonstration projects with top-notch partners such as Stanford University. EDF Innovation Lab has also contributed to the long-standing partnerships developed by EDF with elite establishments such as EPRI, MIT and UC Berkeley.

EDF Lab Singapore was set up in early 2014 primarily to support the promotion and implementation of the Group's know-how concerning sustainable cities and to market the various solutions described above to Singapore's urban planning agencies. Within the framework of the new City of the Future contract signed in November 2017 between EDF and Singapore's Housing Development Board, the city's main property developer, EDF has continued to increment its innovative 3D urban modelling tool with new modules integrating quality of life (e.g. noise, heat islands, mobility). In 2018 the first microgrid prototype, competitively-priced and running on renewable energy sources, was brought into service on Semakau Island south of Singapore in just one year. The prototype makes possible the mass manufacture of an affordable, reliable and environmentally-friendly solution for insular or unconnected regions of Southeast Asia powered today by diesel generators. It reinforces the agreement signed in mid-October 2017 with Nanyang Technological University.

## 1.6.4 INTELLECTUAL PROPERTY

Intellectual property plays a major role in protecting the EDF group's technologies and know-how from competition, and in leveraging these assets through licensing agreements.

EDF is keen to strengthen its industrial property portfolio in order to make the most of its capacity for innovation and technological expertise. The portfolio is comprised of patents, registered software and formalised expertise.

## Patents

At the end of 2018, EDF's portfolio comprised 615 patented innovations, protected by 1,906 property titles in France and abroad.

The strengthening of the patent portfolio is a priority. It aims to facilitate R&D cooperation, protect the development of EDF's activities, to contribute to the Group's external image, to boost researcher motivation and to further enhance the value of inventions.

In 2018, EDF filed 59 patent applications <sup>(1)</sup> (64 in 2017).

## Trademarks

"EDF" is a registered trademark in over 90 countries. The Group's name is an essential part of its image and heritage: the EDF brand, Internet domain names and logos are therefore constantly monitored, in order to protect them against any unauthorised use likely to jeopardise the Group's image. Moreover, following the work to increase the status of the "EDF" brand, the Company has entered into brand licensing agreements with those of its subsidiaries that use the "EDF" brand.

The Group has also registered a large number of other trademarks, in particular those relating to the business of its various subsidiaries.

At the end of 2018, the EDF group's brand portfolio comprised some 497 names, protected by over 1,325 property titles.

# 1.7 COMMERCIAL PROPERTIES

## 1.7.1 SERVICE-SECTOR REAL ESTATE ASSETS – EDF AND ENEDIS IN FRANCE

EDF's Real Estate Division, comprised of the Group's Real Estate Department and its real estate subsidiaries, operates in France as the real estate service provider for EDF and Enedis's entities by managing and optimising a real estate portfolio of nearly 4.9 million square metres of offices and commercial premises, of which approximately 49% are fully owned by the Group and 51% are leased from third parties (leases and concessions). In 2018, approximately 247 of these assets were disposed of, representing 0.5 million square metres or so in usable floor area. Among these 247 real estate assets, a portfolio of 199 assets was sold by Sofilo. To get the most out of its real estate assets, the Group sought to trim its premises and floor area, especially in Greater Paris. Consequently, in 2019 certain leases in La Défense and Levallois-Perret in Paris will be terminated and the staff affected will be relocated to the Smart Side campus in Saint Ouen.

The Real Estate Division is in charge of real estate asset management, lease management, the technical operation of building as well as the operation-maintenance of the facilities and the services provided to occupants, by offering areas through a sub-lease system for Group entities and units. By taking leases from third parties, the Real Estate Executive Management made lease commitments for EDF amounting to €862 million for the period from 2019 to 2033.

## 1.7.2 EMPLOYER PARTICIPATION IN THE CONSTRUCTION EFFORT

Each year, EDF is subject to an obligation to participate in the French construction effort program up to 0.45% of its total payroll, which represented approximately €18.5 million for 2018 (€18.7 million for 2017).

In return for this funding, EDF employees benefit from subsidies and services aimed at facilitating their residential mobility: assistance with renting, assistance with home purchasing, assistance with mobility, advice on financing.

## 1.7.3 SUBSIDISED LOANS FOR HOME OWNERSHIP

As part of its social policy, EDF helps its employees purchase their main home, thanks to a partnership concluded with a banking institution (SOCRIF). This institution produces, finances and manages loans granted to the Company's employees. EDF compensates this institution for the difference between the preferential rate at which SOCRIF grants loans to EDF employees and the rate resulting from the bank survey on the basis of which this institution was chosen.

As of 31 December 2018, the residual non securitised balance for personal residence mortgages amounted to €1.7 million on EDF's balance sheet (€2.1 million as of 31 December 2017).

(1) Enedis filed four patent applications.



## 2. RISK FACTORS AND CONTROL FRAMEWORK

<b>2.1 RISKS TO WHICH THE GROUP IS EXPOSED</b>	<b>112</b>
2.1.1 Risks associated with the regulation of energy markets	114
2.1.2 Risks related to the competitive and general context	116
2.1.3 Risks related to the transformation of the Group	118
2.1.4 Risks related to the Group's operational performance	119
2.1.5 Specific risks related to the Group's nuclear activities	122
<b>2.2 CONTROL OF GROUP RISKS AND ACTIVITIES</b>	<b>128</b>
2.2.1 Control environment	128
2.2.2 Implementation of systems for the control of risks and activities	132
<b>2.3 DEPENDENCY FACTORS</b>	<b>136</b>
2.3.1 Nuclear fuel cycle	136
2.3.2 Power plant development and maintenance	136
<b>2.4 LEGAL PROCEEDINGS AND ARBITRATION</b>	<b>138</b>
2.4.1 Legal proceedings involving EDF	138
2.4.2 Legal proceedings concerning EDF's subsidiaries and holdings	143
2.4.3 Litigation arising after the closing of the 2018 financial year	145
<b>2.5 INSURANCE</b>	<b>145</b>
2.5.1 Insurance organisation and policy	145
2.5.2 Use of captive insurance companies and mutual insurance companies	145
2.5.3 Civil liability insurance (not including nuclear civil liability)	146
2.5.4 Civil liability insurance for corporate officers and directors	146
2.5.5 Damage insurance (excluding nuclear assets)	146
2.5.6 Specific insurance for nuclear facility operations	146
2.5.7 Premiums	147



## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Risks to which the Group is exposed

The main risks to which the Group considers itself exposed, and taking into account its specific nature, are described in section 2.1 "Specific risks to which the Group is exposed".

The measures taken by the Group to control activities and the risks to which it is exposed are described in section 2.2 "Control of Group risks and activities".

The dependency factors on its customers and suppliers are specified in section 2.3 "Dependency factors".

In general, the Group faces legal risks in all of its activities and in its various markets. The main legal, administrative and arbitration proceedings in which the Group is involved are described in Section 2.4 "Legal proceedings and arbitration".

Chapter 2.5 "Insurance" describes the EDF group's insurance programme.

## 2.1 RISKS TO WHICH THE GROUP IS EXPOSED

The Group operates in an environment that is experiencing profound change, generating numerous risks, some of which are external and may depend on regulations as well as on the economic or general environment. These risks are in addition to the internal risks inherent in the activities of the Group's divisions.

The issues associated with the risks to which the Group is exposed are multi-criteria. They may be strategic or operational and may have financial consequences, in particular on its financial position or real estate property value.

The Group describes hereinafter the specific risks to which it considers itself exposed. The principle of specificity leads us to describe in this section only those risks for which the specificity of the EDF group is a key factor. For risks that are not specific to the Group, the absence of a risk description in this section does not exclude the Group from taking the risk into account. The risks related to ongoing legal proceedings and arbitration are described in Section 2.4 "Legal proceedings and arbitration".

Specific risks are divided into five categories, described in sections 2.1.1 to 2.1.5 respectively.

The first two categories concern factors outside the Group (in blue in the graph below).

Section 2.1.1 "Risks associated with the regulation of energy markets" describes the risks associated with the regulation of energy markets, in particular those for electricity, with consideration of:

- competition rules, especially in Europe and France, where most of the Group's activities are conducted;

- public policies in the field of energy.

Section 2.1.2 "Risks related to the competitive and general context" describes the risks caused by exposure to the energy markets in which the Group operates, as well as the risks caused by changes to competition and new societal expectations, economic or general circumstances, and elements of public policy or general regulation in the various countries and territories where the Group exercises its activities.

The following three categories cover factors that are internal to the Group (in orange in the graph below).

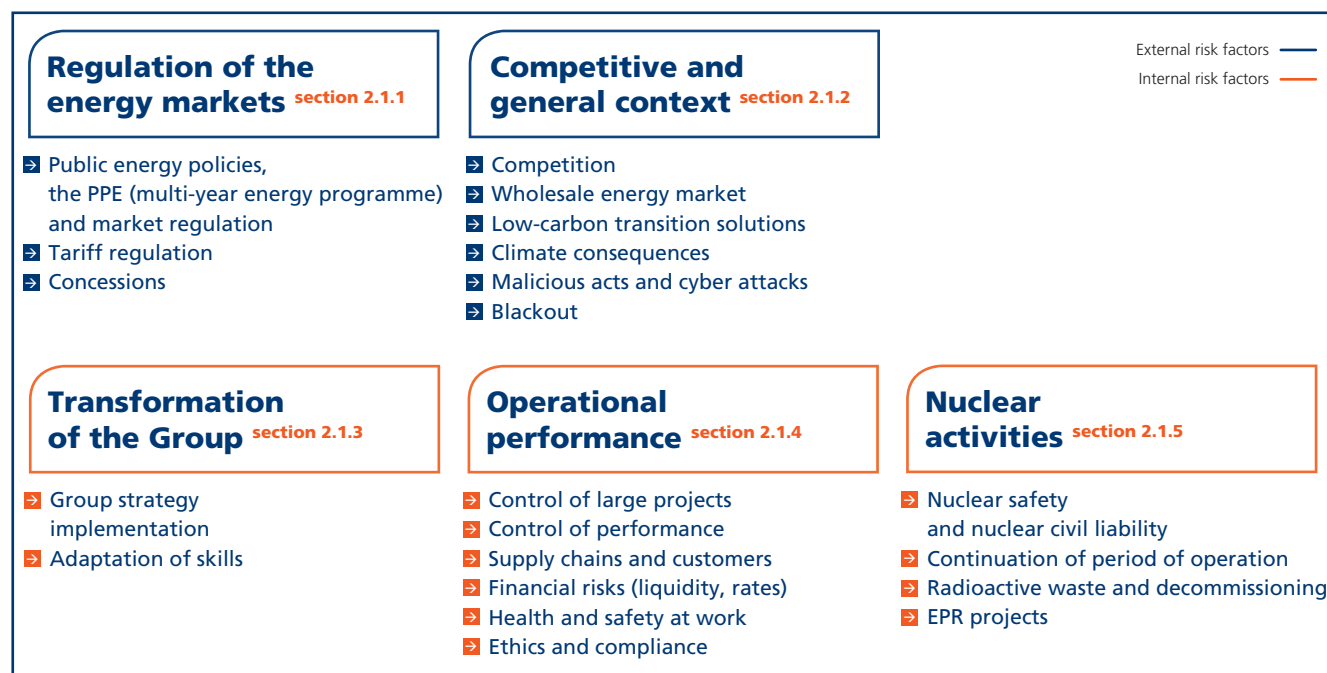
Section 2.1.3 "Risks related to the transformation of the Group" describes the risks associated with the implementation of its strategy, the evolution of the EDF group's portfolio and business model, and its transformation in its industrial, service and sales activities with the associated change management.

Section 2.1.4 "Risks related to the Groups' operational performance" describes the risks associated with the control of its operational activities in its various industrial, services and sales activities.

Section 2.1.5 "Specific risks related to the Group's nuclear activities" describes the specific risks related to the Group's nuclear activities, which involves additional risk factors and specific measures, notably with regard to the overriding requirements of nuclear safety and the long-term capital-intensive nature of the nuclear activities.



## THE EDF GROUP'S MAIN SPECIFIC RISKS ARE GROUPED INTO FIVE CATEGORIES



2.

The risks specific to the Group are classified into 5 categories and described in detail in each of the sections concerned for their respective category. They are numbered to facilitate the link between the following table and the detailed descriptions. Risks were grouped by importance in a qualitative approach that takes into account both the potential impact on the Group and the probability of occurrence. Thus, the most important risks (marked with a + sign in the below table) are identified in each category, without assuming the relative importance of the risks between them or the relative importance between categories.

As a general rule, the scope of exposure is France, Europe and international. Where the scope of exposure is more restrictive, it is specified in the table and in the risk description.

Exposure to risk may vary according to duration. The potential impact of these risks may produce effects at very different time horizons, ranging from very short term (less than a year), to medium term (up to a few years) to very long term (up to

several decades or more, given the nature of the relevant industrial activities which may span centuries). This time horizon is indicated in the risk description when it is considered relevant.

Estimates of the order of magnitude of the financial consequences caused by the occurrence of certain risks taken in isolation are mentioned for information purposes only in the body of this section 2.1 "Specific risks to which the Group is exposed".

The measures taken by the Group to control the activities and risks to which it is exposed, and to implement appropriate control, prevention and mitigation actions, are described in section 2.2 "Control of Group risks and activities". Additional measures addressing occupational health and safety risks are described in section 3.2.2.1 "A standard-setter in terms of health and safety: the well-being of the women and men in our company, and that of our contractors, is an absolute priority" and those relating to the risks of breach of ethics and compliance are described in section 3.5.1 "Ethics and compliance".

## 2. RISK FACTORS AND CONTROL FRAMEWORK

Risks to which the Group is exposed

Risk categories	Summary of the main risks specific to the Group	Importance
<b>Regulation of the energy markets, section 2.1.1</b>	<ul style="list-style-type: none"> <li>1A - Evolution of public energy policies and market regulation, including the Multiannual Energy Programme (<i>PPE or programmation pluriannuelle de l'énergie</i>) in France</li> <li>1B - Evolution of the regulatory framework and tariff regulation</li> <li>1C - Evolution of the regulatory framework for concessions (hydropower field or public distribution) ***</li> <li>1D - Insufficient compensation for missions of general interest*</li> <li>1E - Increased cost caused by energy savings certificates*</li> </ul>	<ul style="list-style-type: none"> <li>+</li> <li>+</li> <li>+</li> <li></li> <li></li> </ul>
<b>Competitive and general context, section 2.1.2</b>	<ul style="list-style-type: none"> <li>2A - Increased competition in energy markets</li> <li>2B - Exposure to wholesale energy and capacity market prices</li> <li>2C - Environment unfavourable to the Group's low-carbon transition solutions</li> <li>2D - Exposure to the physical effects of climate change</li> <li>2E - Increased risks of malicious attack, including cyber attacks</li> <li>2F - Blackout risk</li> <li>2G - Major crisis</li> <li>2H - Impact of Brexit</li> </ul>	<ul style="list-style-type: none"> <li>+</li> <li>+</li> <li>+</li> <li>+</li> <li>+</li> <li>+</li> <li></li> <li></li> </ul>
<b>Transformation of the Group, section 2.1.3</b>	<ul style="list-style-type: none"> <li>3A - Group strategy implementation in line with the defined objectives</li> <li>3B - Adaptation and development of skills according to the Group's evolution, division requirements and new working methods</li> <li>3C - Ability to ensure the Group's long-term social and financial commitments (pensions and other employee benefits)</li> </ul>	<ul style="list-style-type: none"> <li>+</li> <li>+</li> <li></li> </ul>
<b>Operational performance of the Group, section 2.1.4</b>	<ul style="list-style-type: none"> <li>4A - Management of large and complex industrial projects (including nuclear)</li> <li>4B - Control of operational and financial performance</li> <li>4C - Operational continuity of supply chains and contractual relationships with customers and suppliers</li> <li>4D - Exposure to financial risks (liquidity, exchange rates, interest rates, discount rates)</li> <li>4E - Occupational safety or health violations</li> <li>4F - Ethics or Compliance Violations</li> <li>4G - Industrial safety and impact on environmental heritage including biodiversity</li> </ul>	<ul style="list-style-type: none"> <li>+</li> <li>+</li> <li>+</li> <li>+</li> <li>+</li> <li>+</li> <li></li> </ul>
<b>Nuclear activities of the Group, section 2.1.5</b>	<ul style="list-style-type: none"> <li>5A - Nuclear safety in operation, exercise of nuclear civil liability**</li> <li>5B - Safely extending operating life while controlling costs and deadlines** (<i>Grand Carénage</i> in France*)</li> <li>5C - Management of the final processing of radioactive waste, the decommissioning of reactors and the ability to fulfil the corresponding commitments**</li> <li>5D - In addition to factor 4-A, additional regulatory, industrial and financial factors are taken into account for EPR projects</li> <li>5E - In addition to factor 4-B, consideration of fuel cycle management**</li> </ul>	<ul style="list-style-type: none"> <li>+</li> <li>+</li> <li>+</li> <li>+</li> <li></li> </ul>

Main scope of exposure, France, Europe and International, with specific notes

\* France

\*\* France and United Kingdom

\*\*\*France and Italy

### 2.1.1 RISKS ASSOCIATED WITH THE REGULATION OF ENERGY MARKETS

**Description 1A: The evolution of public energy policies and market regulation in the countries where the Group operates, including the multi-year energy programme (PPE) in France, is likely to lead to profound transformations in the Group's governance or business portfolio. These could hinder the Group's development in relation to its competitors or undermine its ability to meet its commitment to climate protection.**

On 25 January 2019, the French Government presented a draft multi-year energy programme (PPE) which sets out the trajectory for the next 10 years in terms of energy policy, and therefore ecological transition (see section 1.5.2 "Public service in France"):

- to fully implement the PPE guidelines, the Government asked EDF's management to propose Group developments that would enable it to meet the challenges

facing the Company in the nuclear, renewable energy, energy services and networks sectors. The proposed developments must preserve the Group's integrated nature and make it possible to dedicate adequate resources and financing for each activity;

- the French Government has confirmed the objective of diversifying the electricity mix and reducing nuclear power to 50% of electricity generation in France by 2035: to reduce nuclear power to 50% of the energy mix, 14 reactors could be shut down by 2035 (including the two in Fessenheim). This would represent a quarter of the reactors currently operating in France. The final version of the multi-year energy programme will identify the sites on which these reactors should be closed;
- accordingly, the early closure of one or more reactors in the EDF fleet might be decided upon, not because of an industrial choice but rather because of a legal decision. Such decisions must lead to EDF being compensated for the harm suffered, as reiterated by the French Constitutional Council in a decision of 13 August 2015. In this respect, with regard to the Fessenheim nuclear power plant, discussions remain ongoing with the State with a view to signing a protocol defining the principles of compensation, which may not cover the entire loss of revenue.

At the same time, the competent authorities or certain States could, in order to preserve or promote competition on certain energy markets, take decisions that are contrary to the Group's economic or financial interests or that impact its integrated operator model.

The European legal framework organising the liberalisation of the energy sector is relatively recent. It is likely to change in the future ("Climate Energy and Clean Energy Packages") and may adversely affect the Group, in particular resulting in additional costs, be at odds with the Group's development model, modify the competitive context in which the Group operates, modify European regulations on regulated tariffs or affect the profitability of current or future generating units or of other Group activities.

In terms of the governance or delimitation of its scope of activity that may be enforced, EDF could be affected by a limitation or loss of control of certain strategic and operational decisions that could have a negative impact on the outlook and profitability of its various activities (see section 1.5 "Legislative and regulatory environment"). At the same time, EDF may continue, in its capacity as shareholder, to bear certain risks, potential liabilities towards third parties and factors that may affect the profitability of assets.

Although EDF complies and will continue to comply with applicable laws and rules in terms of competition and non-discrimination, competitors have initiated or may initiate litigation for non-compliance with these rules, which could be decided in a way that is detrimental to the Group's interests (see Section 2.4 "Legal proceedings and arbitration").

In the new energies field, EDF relies primarily on its EDF Renewables subsidiary (see section 1.4.1.5.3 "EDF Renewables"), which does business in numerous countries. The profitability of these developments is often dependent on the support policies adopted in the various countries. The Group cannot guarantee that the support programmes will not change in some of these countries and adversely impact the profitability of investments made.

Finally, changes in the legislative and regulatory environment in the energy sector in the various countries where the Group operates may constitute an obstacle in terms of the Group's ability to achieve its no. 1 corporate responsibility goal: "Committed to climate action" (see section 3.2.1.1 "EDF group's ambition (CSRG no. 1)").

**Description 1B: A significant portion of the Group's revenues comes from activities subject to regulated purchase or sales tariffs, for which changes in tariff regulations could have an impact on the Group's results. Changes in the regulation of carbon dioxide emissions, including the price of CO<sub>2</sub> emission allowances, are likely to affect the Group's profitability and its objectives for low-carbon energy solutions for climate protection.**

In France, a significant portion of the EDF group's revenues is based on regulated tariffs set by public authorities or regulatory authorities (Regulated Sales Tariff, Tariffs for Using the Public Transmission and Distribution Networks (TURPE)). In France, the law on the New Organisation of the Electricity Market (NOME law or *Nouvelle Organisation du Marché de l'Électricité*) has also introduced the Regulated Access to Electricity from the Existing Nuclear Fleet (ARENH), for the benefit of EDF's competing electricity suppliers. (See section 1.5 "Legislative and regulatory environment").

In this context, the risks are as follows:

- risk of limiting or even blocking rate increases for the same quality of service;
- risk of stakeholders challenging tariff decisions;
- many options in favour of alternative suppliers that give them arbitrage opportunities on the markets to the detriment of EDF, which therefore exposes EDF symmetrically to major uncertainties that adversely impact the effectiveness of its energy market risk management (see section 2.2.2.2.1 "Control of energy market risks").

More generally, in France as in other countries, the Group cannot guarantee that regulated sale or purchase tariffs will always be set at a level enabling it to preserve its short-, medium- and long-term investment capacity and its property interests, by ensuring a fair return on capital invested by the Group in its generation, service, transmission and distribution assets.

There is a risk, potentially caused by inadequate regulation, that CO<sub>2</sub> prices remain low hindering sufficient development of low-carbon energy solutions, to the detriment of both an effective transition to combat the global greenhouse effect and

the Group's consideration of climate change. This may represent a loss of opportunity to promote the Group's low-carbon energy solutions and call into question the Group's ability to achieve corporate responsibility goal no. 1, committed to climate action (see section 3.2.1.1 "EDF group's ambition (CSRG no. 1)").

**Description 1C: At times, the Group operates its generation, transmission, distribution or supply businesses pursuant to public service concession arrangements and it is not always the owner of the assets it operates. Changes in the regulatory framework, in concession specifications and implementation conditions could have an impact on the Group's results.**

The Group does not always own the assets that it uses for its activities and, in such case, frequently operates them pursuant to a public service concession arrangement.

In France, for example, Enedis does not own all distribution network assets: it operates them under concession agreements negotiated with local authorities (see section 1.4.4.2.2 "Distribution activities"), which grant it the exclusive right to engage in expansion actions and operate the public electricity distribution network. These public electricity distribution concession agreements, generally concluded for a period of between 20 and 30 years, are tripartite contracts between the licensing authority, the distribution system operator and the supplier at the regulated rates. Under the law, only Enedis and Local Distribution Companies (LDC) in their service areas (and EDF for areas not connected to the continental metropolitan network) may be appointed to operate the public energy distribution networks and only EDF and LDCs in their service areas may be appointed to provide the supply at the regulated rates. Therefore, at this time, when a concession agreement is renewed, Enedis and EDF do not compete with other operators. However, the Group cannot guarantee that such provisions will not be amended by law in the future (see section 1.5.5 "Public electricity distribution concessions in France"). Furthermore, the Group may not obtain the renewal of these contracts under the same financial terms and conditions.

In France, hydropower generation facilities are operated under concessions awarded by the French State for structures of 4.5MW or more and within the framework of prefectural authorisations for structures of less than 4.5MW (see section 1.5.6.2.4 "Regulations applicable to hydropower facilities"). The challenges associated with the renewal of hydraulic concessions in France are specified in section 1.4.1.5.1.4 "Hydropower generation issues".

The EDF group cannot guarantee that each of the concessions that it currently operates will be renewed, or that any concession will be renewed under the same financial terms and conditions as the initial concession. Furthermore, the Group cannot guarantee that the compensation paid by the government in the event of early termination of a concession's operation will fully compensate the Group's consequent loss of revenue, or that future regulations regarding the limitation of fees will not change in a way that could negatively affect the Group. These factors could have an adverse impact on its activities and financial position.

The Group also operates under electricity distribution or generation concessions in other countries where it does business, particularly in Italy in the field of hydropower generation. Depending on the conditions in each country, the transmission, distribution or generation concessions may not be continued or may not be renewed in its favour with changes to the financial terms and conditions of the concession specifications, which would have an adverse impact on the Group's activities and financial position.

**Description 1D: EDF has certain obligations, in particular public service obligations, that are remunerated by mechanisms that may not provide complete compensation for additional costs incurred in connection with such obligations, or that are subject to change.**

The public service contract entered into by the French government and EDF on 24 October 2005 specifies the objectives and terms for performing the public service obligations that EDF is appointed to perform under law (in particular Articles L. 121-1 *et seq.* of the French Energy Code), and also sets out the mechanisms under which EDF is compensated for the performance of these obligations (see section 1.5.2 "Public service in France" and section 1.5.3.2 "French legislation: Energy Code - Contribution to the Public Electricity Service (CSPE)"). The estimated amount of public service energy costs to be offset in France in 2019 for EDF amounts to €7,206.1 million (decision of the Energy Regulation Commission of 12 July 2018 on the assessment of public service energy costs for 2019).

## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Risks to which the Group is exposed

The development of renewable energies connected directly to the distribution network may, in certain regions, saturate the reception capacities of the source substations and networks. This situation may possibly generate local imbalances, or disputes if Enedis must disconnect certain producers or connect them with significant delays. New investments may be required in these regions, with the risk that the costs associated therewith may not be taken into account.

More generally, EDF cannot be certain that the compensation mechanisms provided in the laws and regulations applicable to it for performing these public service obligations will fully compensate additional costs incurred to perform such obligations. Furthermore, EDF cannot guarantee that these compensation mechanisms will never be subject to change or that existing mechanisms will fully cover potential additional costs that may be incurred in relation with new duties imposed on EDF in connection with its public service obligations, in particular when a new public service contract is negotiated.

The occurrence of any of these events may have an adverse impact on EDF's activities and financial position. Such situations could also call into question the Group's ability to achieve its corporate responsibility goal no. 3 in its commitment to supporting fragile populations (see section 3.2.3.1 "EDF's commitment: providing 100% of vulnerable populations with information and support solutions in terms of energy consumption and access to rights (CSRG no. 3)").

**Description 1E: Changes to regulations concerning energy savings certificates (ESC) could impose additional obligations on EDF and generate costs in relation thereto.**

In France, the energy savings certificates (ESC) measure, which is set out in Articles L. 221-1 *et seq.* of the French Energy Code, imposes energy savings obligations on energy sellers. It sets a three-year energy savings target in terms of volumes for those bound by the obligations and financial penalties in case of failure to meet the targets. The Energy Transition for Green Growth Act of 17 August 2015 amended the ESC scheme for the third period of the scheme by adding to the original obligation a supplementary scheme for energy savings for households in situations of fuel poverty. Decree No. 2017-690 of 2 May 2017 set the overall level of obligations for the 2018-2020 period, with a doubling of objectives compared to the third period (see section 1.5.6.1 "General regulations applicable to the environment, health, hygiene and safety").

An increase in competition between energy suppliers, the economic crisis or a reduction in the main sources of energy savings could cause an additional difficulty in reaching this three-year objective. The Group cannot guarantee that the commercial costs incurred in meeting the three-year target will be fully passed on in energy prices, which would be detrimental to the Group's financial position. Such situations would also call into question corporate responsibility goal no. 1 in its commitment to climate and corporate responsibility goal no. 4 in its commitment to helping each customer consume better (CSRG 1 and CSRG 4, see section 3.2.1.1 "EDF group's ambition (CSRG no. 1)" and section 3.2.4.1 "Innovate so that all customers can consume better (CSRG no. 4)").

### 2.1.2 RISKS RELATED TO THE COMPETITIVE AND GENERAL CONTEXT

**Description 2A: The Group faces stiff competition in the European energy markets and, especially, in the French electricity market, which constitutes its main market.**

In France, the electricity market has been totally open to competition since 1 July 2007. All EDF customers can select their electricity supplier and therefore choose any of EDF's competitors (see section 1.4.2.1 "Presentation of the market in France"). In a context of escalating competitive intensity (new customer expectations, new regulations, emergence of new players, mergers between existing operators, changes in market prices, etc.), these changes, at constant consumption and price levels, have had and may have in the future a negative impact on the Group's sales in France. EDF must therefore adjust its marketing expenses; insufficient adjustment could have a negative impact on its profitability.

Elsewhere in Europe, the Group faces different situations, depending on the local competitive conditions (totally or partially open markets, position of competitors, regulations, etc.). The type of competition faced by the Group, the evolution over time of such competition and its effect on the Group's activities and results vary from one country to another. These factors depend in particular on the level of market depth and its regulations in the country in question and on other factors over which the Group has no control.

In this context, particularly following the development of low-carbon electricity uses and energy services and energy efficiency, the Group may not be able to defend its market share or gain market shares as expected, or it may see its margins decrease, which would have an adverse effect on its activities, its strategy and its financial position.

**Description 2B: In order to sell its output, the Group is exposed, directly or indirectly, to the prices of the European wholesale energy markets and capacity markets in the course of deployment, the levels of which might impact its financial position.**

In conducting its production and marketing activities, the Group does business in energy markets, primarily in Europe. Therefore, the Group is exposed to price fluctuations in the wholesale energy markets (electricity, gas, coal, petroleum products). These fluctuations are particularly significant in the current context of wholesale energy prices in Europe (see section 5.1.2 "Economic environment").

In France, since the end of regulated tariffs for companies, the Group has been exposed to market prices. The degree of exposure depends on the level of subscription to the ARENH mechanism, which is itself dependent on the level of market prices: market exposure in France is thus at a maximum when no ARENH volume is subscribed and it is then estimated at about 80% of the EDF production in France.

Low electricity price levels create strong uncertainty regarding sales, the expected margin and the results. If they persist, they may also affect the profitability of the Group's generating units and, more broadly, the value of assets, mainly in Europe, and the conditions under which they are maintained or even renewed.

Various factors affect these price levels in wholesale energy markets: commodity prices in world markets, the balance between supply and demand, but also tariff, fiscal or subsidy policies allocated to certain means of generation. Therefore, the Group cannot guarantee that it will be able to avoid adverse impacts on the development of its activities, the valuation of its assets and its financial position.

The Group manages its exposure to these risks primarily through purchases and sales on wholesale markets. With the exception of petroleum products markets, these are recent markets that are still under development. Therefore, a lack of liquidity may limit the Group's ability to hedge its exposure to risks in the energy market. Moreover, certain of these markets continue to be partially partitioned by country due to, in particular, a lack of interconnections. Furthermore, these markets may experience significant price increases or decreases that are difficult to foresee, as well as liquidity crises.

Energy market risks are managed in accordance with the "Energy market risks" policy adopted by the Group (see section 2.2.2.2.1 "Control of energy market risks"). The Group hedges its positions on these markets through derivatives, such as futures, forwards, swaps and options traded on organised markets or over the counter. However, the Group cannot guarantee that it is totally protected, in particular against liquidity risks and significant price fluctuations, which could have an adverse impact on its financial position and the valuation of its assets (see note 40 "Management of market and counterparty risks" in the notes to the consolidated financial statements for the year ended 31 December 2018).

In addition, the context of wholesale energy market prices in Europe may impact the profitability of certain generating tools, particularly those that are potentially useful for food security, and this applies to all European producers. Capacity markets are currently being set up in several European countries, but with different approaches. In addition, the judgement handed down by the European Court of Justice on 15 November 2018 suspending the capacity market in place in Great Britain, poses a risk to its sustainability and the corresponding revenues for EDF Energy. The Group's exposure to these various evolving capacity markets may affect its financial position.

**Description 2C: The societal, technological and economic context may not be favourable to the Group's low-carbon solutions for the transition to address climate change challenges.**

The Group has made a commitment to significantly reduce its carbon dioxide emissions released directly into the atmosphere, with a target of 30 million tonnes in 2030 instead of 51 million tonnes in 2017. The achievement of this objective, which contributes directly to corporate responsibility goal no. 1 with regard to climate commitment (see CSRG 1 section 3), is primarily determined by the continued societal acceptance of nuclear energy, the successful closure or conversion of fossil fuel-fired power plants and the accelerated development of renewable means of generation in addition to nuclear and hydropower generation. The Group has been particularly active in the development of solar energy in France, electric storage and low-carbon electric mobility, which will make it possible to develop and promote the Group's low-carbon energy solutions, particularly for the transport sector, which still emits a very high level of carbon dioxide in France and Europe.

The external, societal, competitive, social, economic or industrial context could constitute a barrier to these developments. New low-carbon energy solutions can lead to new societal questions (new intrusive technologies, land tenure, new usage conflicts in the use of scarce resources, etc.). Nuclear energy may not be recognised at the societal level as a key factor in enabling the low-carbon transition.

The Group may encounter difficulties in achieving these transformations and may not achieve the desired objectives. It may also have to deal with the emergence of new technologies or disruptive solutions in response to the need for transition.

These situations are likely to directly or indirectly affect the Group's business volumes, margins, the value of its assets, its financial position, its reputation or its outlook, and the achievement of the first corporate responsibility goal and compliance with its climate commitment (see section 3.2.1.1 "EDF group's ambition (CSRG no. 1)").

The time-frame of this risk factor is short/medium term.

**Description 2D: The Group is exposed to physical effects of climate change that could have consequences on its own industrial and tertiary facilities and more generally on the Group's financial position.**

The Group's industrial and tertiary facilities may not be designed to cope with extreme weather events caused by climate change in the context of their expected operating life, notably despite periodic reviews of nuclear and hydropower facilities. The EDF group's industrial, logistics and tertiary activities are likely to be significantly affected by the possible physical effects of climate change. These effects are difficult to predict and could have an adverse effect on the continued operation of the Group's activities, its operating results, cash flows and overall operating performance. New legislative or regulatory developments caused by climate change may also have a negative impact on EDF's activities.

Such situations may jeopardise the Group's commitment to meeting the challenges of climate change as expressed in its Sustainable Development Policy and may have consequences on its financial position and reputation.

The time-frame of this risk factor is medium/long term.

**Description 2E: The Group is exposed to an increase in the risk of malicious attacks, particularly on its information system.**

The facilities or assets operated by the Group or its employees may be the target of external attacks or malicious acts of any kind. An attack or malicious act committed on these facilities could have consequences such as injury to persons and damage to property, the Group being held liable on the grounds of measures judged to be inadequate and interruptions to operations. In addition, the Group cannot guarantee that laws and regulations regarding the protection of sensitive sites and critical infrastructure will not become more restrictive, which could generate additional investments or costs for the Group.

The Group operates multiple, interconnected and highly complex information systems (databases, servers, networks, applications, etc.) that are essential to the conduct of its commercial and industrial activity, the preservation of its human, industrial and commercial assets, and the protection of personal data (of customers and employees alike), the control of its industrial processes, particularly hydropower and nuclear, which must adapt to a rapidly changing context (digital transition, development of teleworking, new ways to share work in extended companies with suppliers, changes in regulations, etc.).

The frequency and sophistication of information system hacking and data corruption incidents are increasing worldwide.

A malicious attack may have a negative impact on the Group's operational activity, its financial, legal or property position or its reputation.

**Description 2F: Repeated customer power supply interruptions, or a black out, or a widespread power grid incident, in a territory served by the Group could have consequences for the Group's activities, financial position and reputation, particularly if they were partly attributable to the Group.**

The Group may be faced with repeated power outages or even a black-out, a widespread network incident of considerable scale, or be involved in it, even if the triggering incident occurred on a network not operated by EDF or was attributable to another player.

The causes of power outages can be diverse: local or regional imbalance between electricity generation and consumption, accidental power supply or transmission failure, cascade failures, interconnection problems, delays in investment and the necessary network conversions to meet the needs of energy and ecological transition, difficulty in coordinating players, particularly in a market with insufficient or evolving regulation.

The initial impact of such power failures could be repair costs incurred to re-establish power or restore the network. Power failures may also generate capital expenditures if it were decided, for example, to install additional generation or network capacity. This could also cause a decline in the Group's turnover. Finally, they could have a negative impact on the Group's financial position or reputation with its customers and all its stakeholders, particularly if the power outage were to be partly attributable to it.

**Description 2G: Any major event or crisis of unpredictable scale, whether involving the Group or outside the Group, could have a significant negative impact on the Group's financial position.**

As was the case with storms Klaus (2009) and Xynthia (2010) in France, and Irma (2017) in the Antilles, natural disasters (floods, landslides, earthquakes, etc.), other significant weather changes (droughts, etc.), or any other event on a scale that is difficult to predict (large-scale epidemics, a major industrial accident in the world, etc.) may affect the Group's activities. The national and international feedback from each of these types of events may lead to provisions to strengthen the robustness of the Group's facilities, particularly industrial facilities, and to limit the impact and consequences of such major events.

In the event of an exceptional incident, the measures adopted may generate costs beyond those of repairing the damage caused by the disaster and the loss of earnings from the interruption of the supply and services provided by the Group.



## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Risks to which the Group is exposed

As part of the renewal of the storm insurance coverage, Enedis has signed with Swiss Re a parametric insurance policy covering its aerial distribution network against the consequences of high-intensity storms (see section 2.5.5.3 "Storm cover"). Island Energy Systems aerial distribution networks are not covered for property damage. Damage to these networks could have an adverse impact on the Group's financial position in the absence of insurance cover or if cover is inadequate. In addition, renewing or taking out these specific covers may be difficult or costlier due to the impact, frequency and magnitude of natural disasters experienced in recent years by the alternative risk transfer markets.

In the event of a wide-spread health epidemic, depending on the intensity of the crisis, the continuity of electricity supply and the safety of the facilities may no longer be fully guaranteed.

Despite the implementation of a crisis management system taking account of the Group's territorial presence and the economic importance of the Group's energy activities, the Group cannot guarantee that the occurrence of a natural disaster, or any other event of a scale that is inherently difficult to predict, will not have a significant negative effect on its business, assets, financial position and reputation.

**Description 2H: The United Kingdom's exit from the European Union is likely to have an adverse effect on overall economic conditions, the financial markets and EDF's activities.**

In June 2016, a majority of UK citizens voted in favour of withdrawing from the European Union in a national referendum. The consequences of this referendum, and the procedures for the withdrawal of the United Kingdom, are the subject of negotiations within the withdrawal procedure specified by Article 50 of the Treaty on the European Union. Many of the United Kingdom's policies are likely to evolve (monetary, tax, economy, energy, etc.). The impact of these evolutions on the economic and financial environment (notably in terms of growth, exchange rates and inflation) and on the Group may exist from the transition phase or once the course of events is stabilised. These consequences will depend on the content of the negotiations, not only between the United Kingdom and the European Union, but also with other parties involved, such as the Commonwealth, the United States and China.

The referendum created significant uncertainty about future relations between the United Kingdom and the European Union, including in terms of which laws and regulations of European origin the United Kingdom will decide to replace or replicate. Furthermore, the United Kingdom's withdrawal from the European Union may lead to changes in energy policy both within the European Union and the United Kingdom along with changes to laws relating to nuclear activity.

The draft law empowering the British Prime Minister to implement the right of withdrawal in accordance with Article 50 of the Treaty on European Union, which was approved by the House of Commons on 1 February 2017, provides for the joint exit from the European Atomic Energy Community established by the "Euratom" treaty, of which the United Kingdom became a member on 1 January 1973 at the same time as it became a member of the European Economic Community. Specific agreements have been negotiated accordingly in order to allow for continued cooperation in the nuclear field and operational continuity, with the United Kingdom remaining a member of the International Atomic Energy Agency. However, delays in setting up or deploying the new provisions could disrupt the implementation of ongoing or future projects and more generally, the operation of the existing nuclear fleet.

The impact of all these developments on the activity of the Group in the United Kingdom remains limited in the short term. See section 1.4.5.1.1. "Strategy". It may however result in the worsening of the economic conditions leading to a restriction of the energy market. Changes in the monetary and economic environment, the deflationary or inflationary context, potential future exchange rate fluctuations, possible new legislation, regulations, tax or customs charges, both for trade in services and products and for the movement of people, new shifts instigated by economic players, may lead to new risks for the Group in the UK market.

This new environment may lead to changes in the conditions of project profitability (see in particular section 1.4.5.1.2.4 "New Nuclear Build Business") and to re-assessment or even removal of investors associated with the Group's future projects in the United Kingdom or Europe. Changes in exchange rates and customs duties may have an impact on the Hinkley Point C (HPC) project, in particular (see section 2.1.5 description of the 5D factor below)

These developments, the uncertainty that they create, as well as the belief that any of them might occur, are likely to weaken European economic activity, threaten the stability of its regulatory environment and cause significant fluctuations in exchange rates (see the risk factor "exchange rate risk" below). This could have a significant adverse effect on global economic conditions, and in particular on the Group's activities, financial position and operating results, particularly in the United Kingdom.

### 2.1.3 RISKS RELATED TO THE TRANSFORMATION OF THE GROUP

**Description 3A: The Group's development strategy, changes in the scope of activities and synergies within the integrated Group may not be implemented in accordance with the objectives defined by the Group, at the service of customers, Group stakeholders and climate protection.**

The Group, in line with corporate responsibility goal no. 1 to protect the climate (see section 3.2.1.1 "EDF group's ambition (CSRG no. 1)"), and goal no. 4, (see section 3.2.4.1 "Innovate so that all customers can consume better (CSRG no. 4)") intends to pursue its development as a high-performance and responsible electricity producer, champion of low-carbon growth in France, in its core countries in Europe (United Kingdom, Italy, Belgium) and internationally in accordance with the CAP2030 strategy. This strategy combines the search for growth drivers with the promotion of existing assets. The strategy and drivers of the Group's transformation are described in section 1.3 "Group Strategy". Weak synergy in the deployment of the Group's integrated model, particularly upstream/downstream or in the enhancement of the complementarity of the divisions and the diversity of the solutions deployed by the Group, (see section 1.4 "Description of the Group's activities"), could lead to an increase in risks related to physical and market contingencies, and to a loss of gross margin, to the detriment of customers, subsidiaries and the Group's performance. The lack of added value of geographical diversification, or of the diversification and complementarity of the low-carbon industrial solutions proposed by the Group, or the reduction of cross-functional synergies deployed within the integrated Group, could lead to a decrease in the Group's ability to cope with the seasonal nature of the electricity generation and sales activity, the diversity of local expectations and the proximity of its customers and stakeholders, and the efficiency and, therefore, the competitiveness of the low-carbon industrial solutions used to meet them.

In order to provide itself with the resources for its strategy, the Group implements development, conversion, reorganisation and performance plans (see risk factor 4B below entitled "The Group is exposed to the risk of non-control of operational performance and its continuous improvement"). These programmes may be complemented by a strategic analysis of assets which may itself lead to a requirement for additional financial agility, giving rise to disposals or acquisitions.

Focused primarily on its customers and stakeholders, the Group intends to develop and consolidate its offer of integrated service solutions, in particular energy efficiency services, its offer of low-carbon and decentralised power generation solutions, and its offer of diffuse storage solutions, in a sustainable development approach and in close proximity to customers and local communities.

The Solar Plan, the Electric Storage Plan and the Electric Mobility Plan are three major levers for developing and expanding the range of low-carbon energy solutions offered by the Group in addition to the industrial solutions already widely available within the Group, particularly wind, hydro and nuclear power.

Even in the event of protective contractual arrangements, the Group cannot guarantee that these various projects relating to its offer or to the various low-carbon industrial solutions deployed to meet them can be implemented according to the forecast schedules and under satisfactory economic, financial, regulatory, partnership or legal conditions or that they will ensure a long-term response to the needs expressed by our customers and stakeholders and the expected profitability at the outset, which could have a negative impact on the Group's financial position, its commitment to the fight against climate change, and its reputation.

**Description 3B: Skill conversion and development may be insufficient in view of the Group's transformation, business line requirements and new organisational and working methods.**

People development is the corporate responsibility goal no.2 (see section 3.2.2 "Committing to people development"). The Group's scope of activity is evolving in a rapidly changing environment and context of energy and digital transition and, consequently, many new business lines are emerging and new working methods are being adopted (extended company, project platform operation, teleworking, etc.). The historical business lines are themselves undergoing dramatic change yet retaining their very high level of technicality, with a similarly high requirement for a culture of safety and security, particularly in the hydropower and nuclear power sectors as well as for electricity networks. The human and socio-organisational dimension is a key factor in the Group's performance. The anticipation of emerging needs and requirements related to new business lines, the necessary functional and geographical adjustments required to facilitate the evolution of the scope of activity, elicits adaptation and constant development of skills and organisations. (See section 3.4.1 "Professional excellence, employment and skills development" and section 3.4.2 "Providing the conditions for well-being: organisation and quality of working life"). Obtaining qualifications or authorisations may require several years and sufficient coverage for the transfer of knowledge and experience. The rapid evolution of technology and, therefore, of the business lines, requires flexibility and an increased ability to adapt on both an individual and organisational level, as well as in terms of working methods and acquiring and transmitting individual and collective skills.

The EDF Group considers the dynamic matching of skills to needs over time to be a major challenge and therefore implements the appropriate measures to facilitate change. However, it cannot guarantee that the measures taken will always be sufficient, timely or on satisfactory terms, which could have an impact on its business, financial position and reputation as an employer.

**Description 3C: The Group may be required to meet significant commitments related to pensions and other employee benefits.**

The pension plans applicable in the various countries in which the Group operates involve long-term commitments to pay benefits to the Group's employees (see note 31 to the consolidated financial statements for the financial year ended 31 December 2018). In France, in addition to these pension commitments, the Group also owes obligations for post-employment benefits and long-term benefits for employees currently in service. The ongoing pension reform in France may have an impact on the Group's commitments.

To cover these commitments, the Group has set up outsourced funds or pension funds. At the end of 2018, depending on the case, assets only partially covered these commitments, although, for the Group, the maturity dates of the obligations are relatively smoothed over time. At 31 December 2018, the average duration of employee benefits commitments was 18.8 years in France and 19.5 years in the United Kingdom.

The amounts of these commitments, the provisions booked, the outsourced funds or pension funds set up and the additional contributions required to make up insufficient funding are calculated based on certain actuarial assumptions, including a discount rate subject to adjustment depending on market conditions and, in the event of any employee-related commitments in France, on the rules governing retirement benefits paid out by the general retirement scheme, and amounts owed by the Group. These assumptions and rules may be adjusted in the future, which could increase the Group's current commitments for pensions and other employee benefits and, therefore, require a corresponding increase in provisions.

Furthermore, if the value of outsourced funds or pension funds proves insufficient to meet the corresponding commitments, in particular in the United Kingdom or France, primarily due to calculation assumptions or developments in the financial markets, (see risk factor above, "The Group is exposed to risks related to financial markets"), the Group may be obliged to make additional contributions to the relevant funds, which may have an adverse impact on its financial position.

## 2.1.4 RISKS RELATED TO THE GROUP'S OPERATIONAL PERFORMANCE

**Description 4A: The Group is exposed to risks related to the management of major projects, both nuclear and otherwise.**

As part of its activity and in its capacity as project owner or prime contractor, the Group is called upon to carry out projects that are inherently complex, require significant investments and lengthy procedures for construction and regulatory approvals. A very large number of stakeholders can be involved. Projects may need to be connected to local development projects or may encounter difficulties with respect to local approval. The control of these projects is part of the corporate responsibility goal no. 5 to organise a process of open dialogue and consultation for every new project around the world. (See section 3.2.5.1 "EDF's commitment to organise a worldwide dialogue and consultation process around our projects (CSRG no. 5)").

Such projects may include, but are not limited to, offshore structures for new energies (offshore wind power in France) the installation of new meters throughout a distribution network covering tens of millions of customers in France or the United Kingdom, the implementation of international hydropower projects, or carrying out large-scale nuclear investments over decades, (notably, *Grand Carénage*, EPR projects and decommissioning projects). Technical, administrative, financing or admissibility issues are likely to affect project time lines, associated costs or profitability.

The additional and specific challenges and risks related to nuclear activities and nuclear projects, are specified in section 2.1.5 "Specific risks related to the Group's nuclear activities".

More generally, the implementation of these projects may be subject to numerous technical, industrial, operational, economic, regulatory or environmental risks that could delay or prevent them. Such situations could have a negative impact on the Group's activities, results, asset values, financial position, reputation and prospects.

**Description 4B: The Group is exposed to the risk of non-control of operational performance and its continuous improvement.**

The Group has set up programmes that aim to continuously improve its operational and financial performance and increase its financial flexibility. The objectives set for these programmes may not be achieved.

Energy, and electricity in particular, is an activity that is very closely linked to economic activity in general and requires responsiveness and flexibility in operational performance, notably to respond effectively to changes in the economic environment and the emerging needs of customers and stakeholders.

The Group's operational and financial performance is a key condition for achieving corporate responsibility goal no. 4, to commit and innovate to optimise customer energy consumption. (See section 3.2.4.1 "Innovate so that all customers can consume better (CSRG no. 4)"). It makes it possible to achieve sustainable development performance objectives as expressed in the Group's sustainable development policy and also contributes to the achievement of other corporate responsibility goals, no. 1, committed to climate action, (see section 3.2.1.1 "EDF group's ambition (CSRG no. 1)"), no. 3, committed to supporting fragile populations, (see section 3.2.3.1 "EDF's commitment: providing 100% of vulnerable populations with information and support solutions in terms of energy consumption and access to rights (CSRG no. 3)") and no. 6, committed to biodiversity (see section 3.2.6.1 "EDF's commitment: launch a positive approach to biodiversity, not to limit itself solely to knowledge in the long term, but to have a positive impact on biodiversity (CSRG no. 6)").

The Group's ability to transform depends on the achievement of operating results.

However, the Group cannot guarantee that the performance improvement programmes that it implements will have the anticipated results or that these results will be obtained according to the forecast schedule, nor that they will be sufficient to jointly cope with regulatory and economic developments and with the Group's commitments.

## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Risks to which the Group is exposed

Failure to achieve the expected operating results, and failure to achieve the objectives of improving operational performance, may lead to a direct deterioration in the Group's financial position, reputation and ability to transform.

**Description 4C: The Group is exposed to the operational continuity of supply chains and contractual relationships with customers and suppliers as well as to fluctuations in the price and availability of materials, equipments or services it purchases in the course of its business activities.**

The Group's needs can arise in markets with limited surface area or increasing tensions, in particular due to the structure and evolution of the industrial offer or the increase in competition from new uses (competition that increases in particular between the growing needs of information systems and the needs of energy players). The climate transition can create further tensions in supply chains. The effect of climate change could have consequences for supply chains. In the event of significant and sustained increases in the prices of raw materials, the Group may experience higher procurement costs for certain critical products or services. Such increases may also lead certain suppliers to reduce supply due to reduced profit margins. Furthermore, the Group's results may be affected by fluctuations in the prices of certain raw materials used to structure electricity and energy services prices. Certain materials, equipment or services could also be subject to increased demand relative to the available industrial supply, which could have an impact on their cost and availability and on the Group's supply capacities in terms of costs, volume and contractual flexibility.

The Group currently depends on a limited number of industrial players with specific skills and the required experience. This situation reduces competition in markets where EDF is a buyer and exposes the Group to the default risk of one or more of these specialised suppliers or service providers. This is notably the case for Orano, Westinghouse, GE and Alstom (see section 2.3 "Dependency factors"). Changes to the shareholding or governance of these various providers may also have an impact on the cost, the operational continuity of ongoing contracts and the cost of services provided or delivered products.

The scarcity of raw materials could become critical for the Group in the event of geological, geopolitical, industrial or regulatory constraints. The control of the conditions under which raw or semi-finished materials are extracted, processed or packaged for the Group's needs, may be subject to provisions implementing strong regulatory requirements, increased vigilance, or the search for alternative solutions with R&D actions or the development of new industrial solutions.

Control of these activities can directly affect that of the financial position and, through its relations with its suppliers, the achievement of corporate responsibility goal no. 2 with respect to people development (see section 3.2.2 "Commitment to people development"). Corporate responsibility goal no. 2: adopt industrial groups' best practices in people development: health & safety, gender equality, and social advancement") and section 3.3.3.4 "responsible purchasing".

**Description 4D: The Group is exposed to risks in the financial markets.**

As a result of its activities, the EDF group is exposed to risks in the financial markets:

- **liquidity risk:** the Group must at all times have sufficient financial resources to finance its day-to-day business activities, the investments necessary for its expansion and the appropriations to the dedicated portfolio of assets covering long-term nuclear commitments, as well as to deal with any exceptional events that may arise. The Group's ability to raise new debt, refinance its existing indebtedness or, more generally, raise funds in financial markets, and the conditions that can be negotiated to this effect, depend on numerous factors including the rating of the Group's entities by rating agencies. The Group's debt is periodically rated by independent rating agencies (see section 5.1.6.1.2 "Financial rating"). Any downgrading of EDF's debt rating could increase the cost of refinancing existing loans and have a negative impact on the Group's ability to obtain financing; To meet liquidity needs, the use of hybrid issues could lead to a change in the Group's financial statements, particularly in the event of a change in accounting standards;

- **counterparty risk:** like all economic operators, the Group is exposed to possible default by certain counterparties (partners, subcontractors, service providers, suppliers or customers). A default by these counterparties may impact the Group financially (loss of receivables, additional costs, in particular if EDF is required to find satisfactory alternatives or take over the relevant activities or pay contractual penalties). The risk may be hedged by the use of margin calls. In the event of high market volatility, the Group may have to mobilise cash. (see section 5.1.6.1.1.2 "Liquidity risk management");

- **exchange rate risk:** due to the diversity of its activities and their geographical distribution, the Group is exposed to the risks of fluctuations in foreign exchange rates, which may impact currency translation adjustments, balance sheet items and the Group's financial expenses, equity and financial position. As the Group is involved in long-term contracts, an unfavourable currency fluctuation could have consequences on project profitability. In the absence of hedging, currency fluctuations between the euro and the currencies of the various international markets in which the Group operates can therefore significantly affect the Group's results and make it difficult to compare performance levels from year to year. If the euro appreciates (or depreciates) against another currency, the euro value of the assets, liabilities, income and expenses initially recognised in that other currency will decline (or increase). Moreover, insofar as the Group is likely to incur expenses in a currency other than that in which the corresponding sales are made, fluctuations in exchange rates could result in an increase in expenses, expressed as a percentage of turnover, which could affect the Group's profitability and income (see section 5.1.6.1.3 "Management of foreign exchange risk").

An adverse fluctuation of 10% in exchange rates related to currencies in which the EDF group's debts are denominated (USD, GBP, other currencies) would have an impact amounting to around 2% on the EDF group's indebtedness after hedging instruments;

- **equity risk:** the Group is exposed to equity risk on securities held primarily as dedicated assets constituted to cover the cost of long-term commitments in relation with the nuclear business, in connection with outsourced pension funds and, to a lesser extent, in connection with its cash assets and investments held directly by the Group (see section 5.1.6.1.5 "Management of equity risks" and 5.1.6.1.6 "Management of financial risk on EDF's dedicated asset portfolio");

- **interest rate risk:** the Group is exposed to risks related to changes in interest rates in the various countries in which it operates. These rates depend partly on the decisions of the central banks. Increases in interest rates could affect the Group's ability to obtain financing under optimum conditions or even its ability to refinance itself if the markets are very tight. The Group's exposure to changes in interest rates involves in particular two types of risks: (i) the risk of changes in the value of fixed-rate financial assets and liabilities along with the risk of changes in the Group's discounted liabilities and (ii) the risk of changes in cash flows associated with variable-rate financial assets and liabilities. Downward variations in interest rates could notably affect the value of the Group's long-term commitments in the nuclear field and its commitments in matters of retirement and other specific provisions in favour of the employees, which are discounted with discount rates which depend on interest rates with different time frames. Such changes in provisions could impact the Group's financial position by (i) affecting the financial rating of its debt securities and (ii) generating an obligation to pay for dedicated hedging assets (See risk factor below in section 2.1.5 "Specific risks related to the Group's nuclear activities", in the paragraph "Provisions made by the Group for spent fuel treatment operations, recovery and packaging of waste and for the long-term management of waste may increase significantly if assumptions... are revised") (and see section 5.1.6.1.4 "Management of interest rate risk").

The impact on income before tax of a 0.5% fluctuation in interest rates would be around +€290 million<sup>(1)</sup> (impact on the financial result in relation to the cost of the debt and the accretion expense of the provisions, and on the gross operating surplus in relation to the benefits to the personnel).

As for the financial assets held by the EDF group and classified as floating-rate bonds and negotiable debt securities, the impact on income before tax of a 1% fluctuation in interest rates would be around €22 million.

Besides, the EDF group's exchange rate risk relates, in particular; to the value of the EDF group's long-term nuclear commitments (see note 29 to the consolidated financial statements for the fiscal year ended 31 December 2018) and its commitments for pensions and other specific employee benefits (see note 31 to the consolidated financial statements for the fiscal year ended 31 December 2018), which are discounted to their present value using rates that depend on interest rates at various time horizons, and debt instruments held for the management of the dedicated assets constituted to cover these commitments.

For the specific case of nuclear provisions in France, given the decline in rates over the past few years, the discount rate could be reduced over the next few years by applying the method used by the Group, in accordance with regulation on the ceiling discount rate. The importance of this decline will depend on the future rates evolution. An increase in nuclear provisions due to a decrease of the discount rate may require allocations to the dedicated assets and may result in an adverse effect on the Group's results, cash flow generation and net debt.

With regards to the regulations on the ceiling discount rate, the order dated 29 December 2017 changes the statutory discount rate ceiling. The new formula leads, progressively over a period of ten years, from the regulatory ceiling as of 31 December 2016 (4.3%), to a regulatory ceiling equal, in 2026, to the average over the four previous years of the thirty-year constant maturity rate (TEC 30), increased by 100 basis points.

Given past and expected changes in rates, this new formula, which takes into account progressively the transition from the 4.3% regulatory rate to an average rate calculated over four years, including a 100 basis point spread, should lead to a steadier evolution of the regulatory ceiling rate during the next few years, as opposed to the previous formula.

As the case may be, this increase in provisions, including those covered by dedicated assets, does not mean however a mechanical impact on the amount to be allocated to dedicated assets as of the considered dates, as the former depends on:

- the profitability of dedicated assets and the resulting hedging rate: there is no need to provide dedicated assets once the hedging rate reaches 110%;
- the period within which the allocation is made, as applicable rules provide for the option to set a maximum three-year time period to proceed with the allocation, subject to approval by the supervisory authority.

As a reminder, changes in nuclear provisions estimates resulting from a variation of the discount rate are recorded (see notes 1.3.2.2 and 29.1.5.1 to the consolidated financial statements for the financial year ended 31 December 2018 presented in chapter 6 of this Reference Document):

- as an increase or decrease of the corresponding assets, within the limit of their net book value, when the counterparty to the provision has been initially recorded as an asset;
- as financial income for the period in other cases.

Therefore, any change of the discount rate therefore has a punctual impact on the financial results of the year during which the discount rate change occurred, without equivalence for the following years.

The policy and principles concerning the management of the Group's financial risks are described in section 5.1.6.1 "Management and control of financial risks". The control of financial risks is described in section 2.2.2.2.2 "Control of financial risks".

However, the Group cannot guarantee that it is totally protected, in particular in the event of significant fluctuations in foreign exchange rates, interest rates and the equities markets.

#### Description 4E: The Group is exposed to occupational health and safety risks.

Human resources and their related skills are a major challenge for the Group and its service providers. In a very diverse industrial context, adherence to rules and consideration of the various risks that may affect people working in the Group's industrial facilities are crucial to preserving occupational health and safety.

On 29 May 2018, EDF's Chairman and CEO signed a global agreement at the headquarters of the International Labour Organisation in Geneva, with the General Secretaries of two global trade union federations, *IndustriAll Global Union* and *Rosasa Pavanelli* for Public Services International (PSI), as a responsible employer, covering human and social rights. This agreement encompasses all EDF's industrial and tertiary activities in 24 countries, in accordance with international labour conventions. It is designed to guarantee the development of a common set of standards for the Group's 160,000 employees and to consolidate social dialogue. This agreement promotes human rights, diversity, health and safety, skills development and social protection for employees and subcontractors wherever the Group operates. This commitment is in line with corporate responsibility goal no. 2 (section 3.2.2 "Committed to human development. Corporate responsibility goal no. 2: adopt industrial groups' best practices in people development: health & safety, gender diversity, and social advancement").

Although the Group has for many years taken the steps necessary to comply with the health and safety laws and regulations in the various countries in which it operates, and considers that it has taken the measures required to ensure the health and safety of its employees and that of its subcontractors', the risk of occupational illnesses or accidents cannot be excluded. The occurrence of such events may lead to lawsuits against the Group and may result in the payment of damages, which could be significant.

#### Description 4F: Prohibited and unethical practices carried out by employees or third parties in the conduct of business could, in certain circumstances, adversely affect the Group's reputation and shareholder value. The Group is involved, and could be involved in the future, in litigations or regulatory investigations which may adversely affect the Group's reputation, as well as its relationship with regulatory bodies and results.

The globalisation of the Group's activities and the strengthening of regulatory frameworks repressing unethical practices especially in the conduct of business could expose the Group, its employees, or third parties acting on the Group's behalf to criminal and civil sanctions that could adversely affect EDF's reputation and shareholder value.

In France, Act No 2016-1691 of 9 December 2016 on transparency, the fight against corruption and the modernisation of economic life requires companies to take measures to prevent and identify acts of corruption or trading in influence, under the control of a French Anti-Corruption Agency established under the Act and under penalty of administrative or criminal penalties. This law incorporates a system for protecting whistleblowers from possible criminal or disciplinary prosecution and provides, within a corporate framework, an internal alert reporting system (see section 1.5.6.1 "General regulations that are applicable to the environment, health, hygiene and safety"). These regulations could increase compliance costs. Moreover, any failure to comply in any way with these regulations could lead to prosecutions being brought against EDF, which could have a negative impact on the Group's result and reputation.

Notwithstanding the fact that the Group has taken all necessary measures to ensure the compliance of its practices with the regulations in force, a risk of non-compliance cannot be totally ruled out.

(1) This estimate is only indicative. The completeness of the economic effects of a rate increase for the Group is not presented here.



## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Risks to which the Group is exposed

As a result of its activities, the Group is involved in several litigation and arbitration cases and regulatory investigations, of which material ones are described in section 2.4 "Legal proceedings and arbitration". In the future, the Group may be involved or exposed to such proceedings. The potential adverse outcome of these proceedings may entail the payment of damages, or result in other civil or criminal adverse consequences (including financial consequences) for the Group. The implementation of class actions in France in 2014 and similar developments in other European jurisdictions, as well as recent or future regulatory changes, may increase litigation risks and related costs, which could have a negative impact on the Group's results and reputation.

**Description 4G: The Group operates facilities for which accidents could, in the event of a failure in industrial safety, have serious consequences on the human or natural environment, particularly in terms of biodiversity and environmental capital.**

The Group operates or has operated facilities which, as part of their day-to-day operations, can, may or may have been the cause of industrial accidents or environmental and health impacts. The Group's facilities may be located in industrial areas where other activities subject to similar risks are conducted, which means that the Group's own facilities may be impacted by accidents occurring at neighbouring facilities owned by other operators and not under the Group's control.

Biodiversity issues concern all the Group's facilities and projects, particularly in France where EDF is a landowner and a manager of natural resources of great importance. The Group is committed to biodiversity through its corporate responsibility goal no. 6 (see section 3.2.6.1 "EDF's commitment: to launch a positive approach to biodiversity, not to limit itself solely to knowledge in the long term, but to have a positive impact on biodiversity (CSRG no. 6)").

Measures taken for industrial safety and the control of these risks may not be fully effective, which could have consequences for people, property and business continuity. Protective measures may be taken on similar facilities. The Group may be held liable.

Insurance policies for civil liability and damages taken out by the Group could prove to be significantly inadequate, and the Group cannot guarantee that it will always be able to maintain a level of cover at least equal to current cover levels and at the same cost.

The risks specific to nuclear facilities are the subject of an additional explanation in section 2.1.5 "Specific risks related to the Group's nuclear activities".

The impact of an industrial safety failure may have a negative impact on the Group's operational activity, its financial, legal or property position or its reputation, and may affect the Group's ability to achieve Corporate Responsibility Goal no. 6 with respect to biodiversity.

### 2.1.5 SPECIFIC RISKS RELATED TO THE GROUP'S NUCLEAR ACTIVITIES

The EDF group is the world's leading nuclear operator in terms of the number of reactors in operation (73 reactors for which the EDF group is the nuclear operator, among 453 operating reactors in the world)<sup>(1)</sup>. With 58 reactors in operation in France, nuclear electricity accounted for 47.8% of installed electrical power at the end of 2018, and accounted for 71.6% of total electricity output in France<sup>(2)</sup> during that year. EDF operates 15 nuclear reactors in the United Kingdom, accounting for 19.3% of electricity output in 2017<sup>(3)</sup>.

The Group has basic nuclear fuel cycle facilities and carries out activities in research, equipment manufacture and the supply of services to other nuclear operators, since the integration of the New NP subsidiary, now Framatome, within the scope of the Group in 2018.

In addition, the Group holds minority stakes in nuclear power plants in operation in China, the United States, Belgium and Switzerland, which it does not operate. The Group is investing in new reactor projects in France, the United Kingdom and China and carries out its nuclear industrial activity in other countries, notably India and the United Arab Emirates, countries in which nuclear operators signed agreements with the Group in 2018.

The share of nuclear energy, as a low-carbon form of energy and a part of the Group's electricity mix, thus represents a significant industrial asset for the competitiveness and development of the Group.

Given the low impact of the nuclear industry's fossil carbon dioxide emissions over the entire industrial life cycle, the performance and control of nuclear activities directly contribute to achieving corporate responsibility goals: committed to climate action (see CSRG no. 1); committed to human development (see CSRG no. 2); committed to supporting fragile populations (see CSRG no. 3), particularly in the fight against fuel poverty and access to clean, low-carbon and competitive energy, including for the most disadvantaged; committed to helping each customer consume better (see CSRG no. 4); committed to consultation (see CSRG no. 5); and committed to biodiversity (see CSRG no. 6). (see section 3.2 "EDF's corporate responsibility goals". The control and performance of nuclear activities are at the heart of EDF's sustainable development policy.)

The nuclear activities of EDF are associated with the following issues:

- as with any nuclear operator, the latter's obligations means giving ongoing priority to nuclear safety, based on technical and organisational provisions in order to guard against a nuclear accident and, in the hypothetical event of an accident occurring, to limit the consequences of such an accident. The nuclear business is carried out under the control of nuclear safety authorities in countries where the Group exercises nuclear operator responsibility; failure to take into account the requisite number 1 priority dedicated to nuclear safety could have a significant or even vital impact on the Group;
- the Group's nuclear activity is subject to detailed and demanding regulations with, particularly in France, a system in place that monitors and periodically re-examines basic nuclear facilities, which focuses, firstly on nuclear safety, protection of the environment and public health, but also on security considerations regarding malicious acts. These regulations may be significantly tightened by national or European authorities (see section 1.5.6.2.2 "Specific regulations applicable to basic nuclear facilities"). Furthermore, stricter regulations or possible non-compliance with current or future regulations could result in the temporary or permanent shutdown of one or more of the Group's plants or financial penalties as stated in Article L. 596-4 of the French Environment Code. Cases of non-compliance with regulations or non-compliance with commitments undertaken, may also be used by third parties against EDF and brought before the courts. The increased number of requests emanating from the French Nuclear Safety Authority (NSA) and enhanced controls may increase EDF's compliance costs and risks;
- although the nuclear business can contribute effectively to the security of energy supply and to combating the greenhouse effect, it must also demonstrate its competitiveness and its acceptance over the different time scales in which it operates. Nuclear activity by its very nature requires substantial and long-term investments, sometimes spanning decades. The robustness and efficiency over time of maintenance and upgrading programmes for the operating fleet, new reactor projects, and the respect of very long-term commitments are inevitably subject to extreme vigilance, with industrial cycles that span a century or even beyond;
- the nuclear fuel cycle is part of this long-term industrial outlook. EDF has a specific responsibility to develop a long-term strategy with the various stakeholders;

(1) Source: International Atomic Energy Agency, Power Reactor Information System, <https://www.iaea.org/pris>, indicating that there were 453 nuclear reactors in operation in the world on 23 January, 2019.

(2) Source: RTE, [www.rte-france.com/fr/article/bilans-electriques-nationaux](http://www.rte-france.com/fr/article/bilans-electriques-nationaux)

(3) Source: [www.iaea.org/pris](http://www.iaea.org/pris)



- the nuclear business is an industrial activity that brings together a large number of industrial partners in France, Europe and throughout the world. In France, EDF was assigned the role of lead company in the nuclear sector by the public authorities, with the integration of the Framatome subsidiary, which involves specific risks associated with the exercise of this responsibility and the activities of Framatome.

In light of the fact that EDF is the world's largest nuclear operator, exploiting global feedback and making comparisons with best practices internationally <sup>(1)</sup> represents an ongoing challenge to ensure that the EDF group is well positioned to be able to sustainably manage the risks associated with being the world leader;

**Description 5A: In addition to the risks relating to industrial performance control set out in category 4 above, the exercise of nuclear operator liability, with the number one priority given to nuclear safety, determines the Group's overall performance in its nuclear activities. As a result, the Group is exposed to nuclear civil liability risks.**

The primary responsibility for nuclear safety lies with the nuclear operator throughout the operating cycle of nuclear reactors. The no. 1 priority given to nuclear safety drives the industrial performance of the nuclear activity as a whole. The nuclear operator's consideration of the design is an element of nuclear safety. Failure to control operating safety could have major or even vital consequences on the value of the Group's industrial assets, its financial position and its development outlook or even on the continuation of its industrial activity.

Any serious event related to the Group's nuclear activities, with a potential or proven impact on the population or on a territory, could lead to a significant increase in the operating constraints of the Group's industrial sites, or even the partial or total interruption of the Group's nuclear activities. Such an event could have a significant negative impact on the Group's activities, financial position, strategy and reputation.

The nuclear civil liability scheme that applies to nuclear facility operators of States Parties to the Paris Convention, and the insurance applicable thereto, are described in section 1.5.6.2.2 ("Specific regulations applicable to basic nuclear facilities") and section 2.5.6 ("Specific insurance for nuclear facility operations"). This scheme is based on the principle of the operator's strict liability. Accordingly, if an event occurs that causes nuclear damage, the Group would be automatically liable up to a monetary maximum set by the law applicable in the country, regardless of the source of the event that caused the damage and any safety measures that may have been taken.

The Group cannot guarantee that in countries where it operates nuclear facilities the maximum liability set by law will not be increased or cancelled. For example, the protocols amending the Paris Convention and the Brussels Convention, not yet in force (see section 1.5.6.2.2 "Specific regulations applicable to basic nuclear facilities"), provide for these maximum amounts to be increased and a substantial expansion of the damage to be covered. With regard to the new amounts, Act No. 2015-992 of 17 August 2015 on the energy transition for green growth made them applicable as from 18 February 2016. The operator's liability in France now amounts to €700 million in the event of a nuclear accident in a facility and €70 million in the event of a nuclear accident during transport. The entry into force of the other changes laid out in these protocols is likely to increase yet again the cost of insurance and the Group cannot guarantee that insurance covering this liability will always be available or that it will always be able to maintain such insurance. The insurance cover for the Group's civil liability as a nuclear operator is described in section 2.5.6.1 "Civil liability of nuclear facility operators" and for insurance coverage for transport of nuclear materials in section 2.5.6.2 "Civil liability for transport of nuclear substances".

Property damage to EDF's nuclear facilities is covered by insurance programmes (see section 2.5.6.3 "Damage to nuclear facilities"). Despite this cover, any event that may cause significant damage to a nuclear facility of the Group could have an adverse impact on the Group's business and financial position.

Lastly, the Group cannot guarantee that the insurers that cover both its liability as a nuclear plant operator and property damage to its facilities will always have available capacity or that the costs of cover will not significantly increase, particularly in light of the impacts on the insurance market of events such as the nuclear accident in Japan that occurred in March 2011.

**Description 5B: The Group may not be able to obtain authorisation to continue the operation of its reactors beyond the period currently planned, or it may not even be authorised to exploit them up to the end of this period. In addition to the control of complex projects specified in risk factor 4B described above, the Group may not be able to control the costs and deadlines of its operations to upgrade the fleet in operation (major refit in France).**

The fleet of nuclear reactors that the Group currently operates in France is highly standardised (see section 1.4.1.1.1 "EDF's nuclear fleet in France"). This enables the Group, in particular, to achieve economies of scale, to apply improvements made to its newest reactors to all reactors and, in the event of a reactor malfunction, to anticipate the measures to be taken in other reactors. But this standardisation has a potential parallel risk of the dysfunction being common to several reactors or to a generation or series of reactors (see section 1.4.1.1.2 "Operation and technical performance of the nuclear fleet"). The Group cannot guarantee that it will not be required to make significant or costly repairs or modifications to all or some of its plants, or that events will not occur that may have an impact on the operation of its plants or their output or cause a temporary or permanent shutdown of all or some of its plants.

During the periodic reviews carried out during the ten-yearly inspections and following the Fukushima accident in Japan, the Group drew up a major work programme, called "Large refit", the principle of which was approved by the Board of Directors. The potential risks of the latter include a possible delay in the appraisal of the authorisations required to start operations, in particular as regards the authorisations expected from the French Nuclear Safety Authority (ASN). Such uncertainties may also concern the manufacture and delivery on site of new equipment or work carried out on-site in a situation where a large number of industrial operations are being carried out at the same time.

The ASN decides on the measures taken by the operator and may give additional instructions for each reactor and for each authorisation stage. Solutions are being studied to demonstrate the capacity of non-replaceable equipment such as the containment building and reactor vessels, to ensure their operation up to 60 years. These studies, which are based on data available in France but also internationally <sup>(2)</sup> make it possible to confirm the safety margins available for the operating periods under investigation but may also lead to the need to identify additional protective measures, if necessary, to be taken on the existing fleet, which could have consequences on its performance.

In order to postpone the construction of new units and related investments, and to continue to benefit from low-carbon generation and cash flows from its existing fleet, the Group has been aiming for several years to extend the operating life of its nuclear fleet in France beyond 40 years, a period already exceeded in France for five reactors. The fourth ten-yearly inspection of the 900MWe reactor series (VD4-900), like the previous ones, includes, on the one hand, a verification of the compliance of the facilities with the current reference design and, on the other hand, a safety reassessment. This makes it possible to increase the level of safety by taking into account, on the one hand, international best practices and, on the other hand, the condition of the facilities, the experience acquired during operation and the evolution of the knowledge and rules applicable to similar facilities.

The ASN shall examine the extended operation of each reactor on the basis of a report on the conclusions of the periodic re-examination, taking into account the results of the inspections and re-qualification tests. The first concluding report on the fourth re-examination of the 900 reactor series should be available in February 2020 for Tricastin 1. The president of the ASN confirmed that the generic opinion would be issued in 2020 and that the enforceable and applicable requirements for EDF would be submitted in 2021 by the ASN. The ASN will rely on the following key elements: the Response Note to the Objectives, which was sent to the ASN on 28 February 2018 and which takes stock of the provisions proposed by EDF as part of the fourth periodic re-examination of the 900 reactor series, the result of the public consultation on the generic phase of the re-examination, which was launched in the second half of 2018 under the supervision of the High Committee for Transparency and Information on Nuclear Safety, the conclusions of the standing "reactors" group currently scheduled for 2020 and the first concluding report of the fourth periodic re-examination to be submitted by EDF in February 2020 for the first reactor concerned.

(1) Exploitation of standards and feedback from the International Atomic Energy Agency and the World Association of Nuclear Operators (WANO).

(2) Six reactors in the US are being investigated for an extended operating life of 80 years: the Nuclear Regulatory Commission (NRC) staff has defined subsequent license renewal (SLR) to be the period of extended operation from 60 years to 80 years. <https://www.nrc.gov/reactors/operating/licensing/renewal/subsequent-license-renewal.html>.

## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Risks to which the Group is exposed

In 2016, all the technical, economic and governance conditions necessary for the amortisation period of France's nuclear fleet with the Group's industrial strategy to match were met (see notes 1.3.2 "Group management judgements and estimates" and 3.7.1 "Extension to 50 years of the depreciation period of the 900MW PWR series in France" in the notes to the financial statements as of 31 December 2018). The consolidated financial statements dated 31 December 2018 incorporate the extension from 40 to 50 years of the amortisation period of the 900MW PWR units (except Fessenheim), without prejudice to any decisions which might be made by the French Nuclear Safety Agency following each ten-year inspection regarding authorisations to continue operations, reactor by reactor.

The accounting period of the other series of France's nuclear fleet (1,300MW and 1,450MW), which are more recent, currently remains at 40 years, because the conditions for an extension have not been met. The subsequent extension of these other series remains an industrial objective of the Group that may not be achieved.

In the United Kingdom, in-service inspection and upgrading programmes for reactors in operation, in particular advanced gas reactors (AGR) with specific technology, may result in prolonged downtime.

The current planned operating period for the reactors in EDF Energy's existing nuclear fleet ranges from 41 to 47 years for advanced gas reactors (AGRs) and is 40 years for the pressurised water reactor (PWR). Since EDF Energy acquired them, the operating lifespan of the AGR power plants has been extended by 10 years on average and the objective is to increase the operating life of the PWR power plant by 20 years after the currently planned 40 years (see section 1.4.5.1.2.1 "Nuclear generation"). However, in light of the nuclear safety rules applicable in the United Kingdom, the Group cannot guarantee that EDF Energy will obtain the necessary authorisations at the appropriate time to operate its existing nuclear reactors until the end of their currently projected operating life, or that such authorisations will not be obtained subject to conditions that entail significant expenditures or investments for the Group.

For nuclear reactors where EDF is not in charge of operation but has financial interests (United States, Belgium, Switzerland, China), the Group is financially exposed to the same risks. The Group may be required to contribute up to the amount of its share to costly repairs or modifications to be carried out on these units or to events that may have an impact on their operating lifespan, production or availability. As in France and the United Kingdom, the nuclear safety authorities in these countries may take decisions that require additional works or controls, in particular as regards exploiting feedback from international experience and anticipating potentially precursory events.

Furthermore, despite the quality of operations and the changes made by the Group to its nuclear facilities, it cannot be ruled out that some of these facilities will be subject to special operating conditions to reinforce the operating safety margins at the initiative of the nuclear operator responsible for nuclear safety or at the request of the Nuclear Safety Agency.

Finally, a potential serious nuclear accident not involving the Group but with widespread consequences worldwide could lead the Safety Authorities to require new reactor upgrades applicable to the Group's reactors, and to those in which the Group has a stake.

The Group cannot guarantee that it will receive the expected operating lifespan extension from the competent authorities. Furthermore, such extensions could also be obtained under certain conditions, the financial impact of which, in particular in terms of investments, could affect the Group's strategy with respect to extending the operating life of its reactors or the Group's ability to pursue its global investment strategy. These events could have a significant negative impact on the Group's financial position.

**Description 5C-1: The amount of dedicated assets in France allocated by the Group to cover the costs of its long-term nuclear business commitments (radioactive waste and decommissioning) might need to be revised upwards or require additional expenditures.**

In France, as of 31 December 2018, the market value of EDF's portfolio of dedicated assets was €27.7 billion, compared to €28.1 billion on 31 December 2017 (see sections 1.4.1.1.7 "Assets available to cover long-term nuclear commitments (outside the operating cycle)" and 1.5.6.2.2 "Specific regulations applicable to basic nuclear facilities" and note 45.3 to the consolidated financial statements for the financial year ended 31 December 2018).

In the event of a significant change in the provisions determining the reference base of the dedicated assets, it might prove necessary to make additional allocations to adjust the value of these assets, which could have a material adverse impact on EDF's financial position. Moreover, stricter regulations at the national level (in particular those that impact the base for determining the dedicated assets to be constituted by EDF) or European level may lead to more stringent requirements regarding the constitution of dedicated assets and have a significant impact on EDF's financial position.

Lastly, although these assets are constituted and managed in accordance with strict prudential rules, the Group cannot guarantee that price fluctuations in the financial markets or changes in valuation will not have a material adverse impact on the value of these assets (see section 5.1.6.1.6 "Management of financial risk on EDF's dedicated asset portfolio" for a sensitivity analysis), which could require EDF to allocate additional amounts to restore the value of these assets; such events could have a material adverse effect on the Group's financial position.

In the United Kingdom, funds to finance nuclear commitments are managed by an independent organisation created by the UK government (Nuclear Liabilities Fund – NLF). Operators therefore have no assets to manage for this purpose (see section 1.4.5.1.2.1 "Nuclear generation").

The unavailability or insufficient amount of dedicated assets to hedge the expenditure schedules of the Group's long-term commitments could have a negative impact on the Group's financial position and reputation.

**Description 5C-2: The provisions allocated by the Group for final processing and storage of radioactive waste may be insufficient, particularly for long-lived waste from spent fuel reprocessing and decommissioning.**

The Group's liability may be alleged, in particular as a nuclear power operator or producer of radioactive waste within the meaning of applicable legislation on waste, in the event of an accident or any damage to third parties or the environment from spent fuel or waste, even if they are handled, transported, kept, warehoused or stored by contractors other than the Group (especially, in France, the ORANO group and the French National Agency for the Management of Radioactive Waste (ANDRA)), in particular in the event of a breach by such contractors.

In France, the EDF Group is responsible for all radioactive waste produced during the operation of its nuclear facilities, during the reprocessing of spent fuel from its reactors, and during the decommissioning operations of its nuclear facilities. (See section 1.4.1.1.4 "Nuclear fuel cycle and related issues - Storing conditioned ultimate waste").

The long-term management of radioactive waste has been the subject of various studies under programme laws no. 91-1381 of 30 December 1991 on research on radioactive waste management and no. 2006-739 of 28 June 2006 on the sustainable management of radioactive materials and waste. The Group cannot guarantee that all long-life high- and medium-level waste will constitute "final radioactive waste" within the meaning of Article L. 542-1-1 of the French Environment Code and, therefore, that such waste may be directly stored in deep geological layers, especially as the nuclear order of 10 February 2016 adopted pursuant to Law no. 2015-992 on the Energy Transition for Green Growth empowers the administrative authority to reclassify radioactive material as radioactive waste and radioactive waste as radioactive material. Nor can the Group guarantee the time-frame within which the authorisations allowing such storage will be granted by the public authorities, nor what the technical guidelines will be, which is likely to create uncertainties regarding the fate of waste, liability and the resulting costs for EDF.

EDF has allocated provisions for the long-term management of waste, assessed on the assumption of geological storage, which is the international solution of reference for the ultimate storage of long-lived high-level radioactive waste and on the basis of a reasonable version of the work carried out in 2006 by a working group comprising ANDRA, the public authorities and radioactive waste producers (see Note 29.1.2 of the notes to the consolidated financial statements for the year ended 31 December 2018). Following new calculations of the costs of deep storage under the supervision of the DGE in conjunction with EDF, the Minister of Ecology, Sustainable Development and Energy, in an order of 15 January 2016, set the new reference cost at €25 billion under the economic conditions of 31 December 2011. This cost was taken into account in the Group's financial statements at the end of 2015 (see note 29.1.2 of the notes to the consolidated financial statements for the year ended 31 December 2018). The current estimate is based on the preliminary design assumptions and will be regularly revised based on the progress of the project, as stated in the Ministerial order. Opinion no. 2018-AV-0300 from the French Nuclear Safety Authority dated 11 January 2018 relative to the safety options file presented by Andra for the Cigeo project to store radioactive waste in a deep geological layer specifies that the project has achieved satisfactory overall technological maturity at the stage of the safety options file. The reservations that remain and the supplementary investigation being carried out for Andra to obtain approval for the construction of the geological storage area starting in 2022 could lead to a revision of the provisions for long-term waste management.

The act no. 2006-739 dated 28 June 2006 provided for a dedicated storage centre for Low-Level Long-Life waste (FAVL), such as graphite. ANDRA submitted a progress report in July 2015 under the national plan for the management of radioactive materials and radioactive waste (PNGMDR). This report assesses several storage concepts and allows for the possibility of storage of graphite waste on the Soulaïnes site. A global industrial plan for the management of all FAVL radioactive waste is planned by the PNGMDR before the end of 2019. (See section 1.4.1.1.4 "Nuclear fuel cycle and related issues"). Provisions may have to be adjusted accordingly.

In the United Kingdom, when British Energy was restructured, agreements were entered into with the authorities concerning the management of certain radioactive waste from existing nuclear power plants (see section 1.4.5.1.2.1 "Nuclear generation"). Under the terms of these agreements, the liability and certain costs associated with the management of certain radioactive waste are transferred to the British government. However, EDF Energy Nuclear Generation Ltd. remains financially, technically and legally liable for the management, storage and processing of waste that does not come within the scope of the aforementioned agreements.

For nuclear power plants which EDF does not operate, but in which it has financial interests (United States, Belgium, Switzerland, China), the Group is exposed financially in proportion to its shareholding to contributing to future expenditures related to the management of spent fuel and waste.

In addition to these technical and industrial sensitivity factors, the amount of provisions currently set aside may change in the coming years. Determining the amount of these provisions is sensitive to assumptions made in terms of costs, inflation rate, long-term discount rate and payment schedules. Pursuant to the French Environmental Code, the amount of these provisions may be controlled by the administrative authority formed jointly by the Ministry for the Economy and the Ministry of Energy, which verifies in particular the adequacy of the provisioned expenses and imposes a cap on the discount rate for the provisions. Given these sensitivity factors, changes in certain parameters may require significant adjustments of the provisions booked. In such case, any insufficiency of provisions for long-term nuclear commitments may have a material adverse impact on the Group's financial position (see note 29.1.5 to the consolidated financial statements for the financial year ended 31 December 2018).

Note 29.1.5.2 "Analyses of sensitivity to macro-economic assumptions" of note 29.1 "Nuclear provisions in France" to the notes to the consolidated financial statements as of 31 December 2018 indicates the connection between "costs based on year-end economic conditions", which represent estimated amounts as at 31 December 2018, and "provisions made at present value". Concerning the long-term management of waste and the recovery and packaging of waste, the expenses at year-end economic conditions are evaluated at €32,164 million and the corresponding provision is €10,597 million, as the discounting effect is very significant due to distant waste storage maturities. Note 29.1.5.2 "Analyses of sensitivity to macro-economic assumptions" indicates the analyses of sensitivity of provisions and Group's results to a discount rate change, for the different types of provisions.

Failure to control the costs and time-frames for completion with respect to the solutions for the treatment and ultimate storage of waste for which the Group is liable would have a negative impact on the Group's financial position and reputation.

**Description 5C-3: The provisions allocated by the Group for the decommissioning of nuclear facilities may be insufficient. In particular, in addition to the control of complex projects specified in risk factor 4 - A above, the decommissioning of the existing nuclear fleet could present difficulties that are not currently envisaged or could be significantly more costly than currently provided for.**

Ongoing operations in France (see section 1.4.1.1.6 "Decommissioning of nuclear power plants") concern plants that were built and operated before the current nuclear fleet and the Superphenix plant ("first generation" plants). These operations cover four different reactor technologies: heavy water reactor (Brennilis), sodium-cooled fast reactor (Superphenix at Creys-Malville), graphite-moderated and gas-cooled reactor (UNGG reactors at Chinon, Saint Laurent and Bugey) and the ("PWR" at Chooz). These operations were firsts for EDF and with the exception of the PWR, they concern reactor technologies for which international feedback is low or non-existent. They therefore require the development of new methods and technologies which involve greater risk than technologies for which feedback is already available. The decommissioning of the PWR at Chooz does benefit from some feedback (essentially American and of a limited nature) but it has the innovative specific feature of being located in a cave, which also makes it an unusual operation for which experience is not immediately transferable and which includes specific risks.

The feedback from the PWR at Chooz will enable consolidation, as far as possible, of the studies and estimates on the future costs of decommissioning the nuclear fleet currently in operation (power plants of the "second generation"). Nevertheless, neither EDF, nor any other operator, has yet undertaken a decommissioning programme on a scale comparable to that of the Group's current PWR fleet and the estimates therefore involve risks that are associated in particular with this scale effect.

The time-frame and cost of the work is also dependent on administrative authorisations and the timely availability of radioactive waste storage centres or other facilities required for the conditioning or storage of waste packages.

In addition to these technical and industrial sensitivity factors, the amount of provisions currently set aside may change in the coming years. Determining the amount of these provisions is sensitive to assumptions made in terms of costs, inflation rates, long-term discount rates and payment schedules. The amount of these provisions, in accordance with the French Environment Code, is subject to control by the administrative authority, which verifies in particular the adequacy of the provisioned expenses and imposes a cap on the discount rate for the provisions.

Given these sensitivity factors, changes in certain parameters may require significant adjustments of the provisions booked and, therefore, the Group cannot guarantee that the provisions booked will equal the costs actually incurred at the relevant time, which would have an adverse impact on the Group's financial position (see note 29.1.5 to the consolidated financial statements for the financial year ended 31 December 2018). The Group regularly conducts an update of the key assumptions underlying the provisions (see Note 29.1.3 of the notes to the consolidated financial statements for the financial year ended 31 December 2018).

With regards to the provision for decommissioning the nuclear electricity generation fleet in France, the costs at year-end economic conditions are evaluated at €27,331 million and the corresponding provision is €15,985 million. As for the last core provision, costs based on year-end economic conditions are estimated at €4,346 million and provision at present value amounts are valued €2,526 million, as the discounting effect is very significant due to distant waste storage maturities. Note 29.1.5.2 "Analyses of sensitivity to macro-economic assumptions" to the consolidated financial statements for the fiscal year ended on 31 December 2018 indicates the analyses of sensitivity of provisions and Group's results to a discount rate change, for the different types of provisions.

The provisions of Framatome and SOCODEL in relation to the basic nuclear facilities in France stand respectively at €77.5 million and €45.5 million (see note 30 "other provisions for decommissioning" to the consolidated financial statements for the fiscal year ended 31 December 2018).

In the United Kingdom, under the agreements concluded in connection with the restructuring of British Energy, the costs of decommissioning EDF Energy Nuclear Generation Group Ltd.'s existing nuclear power plants will be paid by the Nuclear

## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Risks to which the Group is exposed

Liabilities Fund. If the assets of this Fund prove insufficient, these costs will be borne by the UK Government (see section 1.4.5.1.2.1 "Nuclear Generation").

For nuclear power plants which EDF does not operate, but has financial interests in (China, United States, Belgium, Switzerland), the Group is exposed financially in proportion to its contribution to future decommissioning costs.

Failure to control the costs, the time-frame for completion and the associated provisions with respect to the decommissioning of nuclear facilities for which the Group is liable would have a negative impact on the Group's financial position and reputation.

**Description 5D: in addition to the risk of controlling complex projects (risk factor 4A described above), the success of EPR projects depends on specific industrial, regulatory and financial factors.**

The success of EPR projects determines the performance and reputation of the nuclear industrial sector, and through it, those of the Group.

The Flamanville 3 project is a major industrial, regulatory and financial challenge for the Group.

On-time completion remains conditional, notably on the implementation of the action plan for the 53 welding operations to be carried out on the pipes of the main secondary circuit of the Flamanville EPR, on the success of the start-up tests still to be carried out, as well as on obtaining the various permits that have yet to be issued by the ASN. Within this framework, EDF has requested the amendment of the construction authorisation decree, as a precautionary measure, with the Ministry of Ecological and Solidarity Transition on 11 March 2019 with a view to extend the deadline for commissioning the reactor until 11 April 2023.

The Group might have to cope with new uncertainties. It might not obtain the expected permits or they might be compromised by judicial decisions.

Furthermore, EDF has proposed a specific process to the ASN justifying ten further welding operations to ensure the high level of safety of the facility throughout its operational lifespan. This number was reduced to eight as two of the welding operations initially concerned have since been found to be compliant.

The ASN is expected to issue an opinion on EDF's strategy for the Flamanville 3 welding operations in May 2019. If the ASN's assessment of this strategy is negative, the completion schedule for delivering the work-site would not be met. Any delay in this schedule would result in an increase in the cost of construction beyond the current target<sup>(1)</sup>. Despite the mobilisation of the teams, the completion schedule remains tight (see section 1.4.1.2.1 "Flamanville 3 EPR Project").

Studies of the EPR 2 Project are continuing in order to establish a competitive reactor for the renewal of the existing nuclear fleet. Failure to meet the competitiveness target, the absence of an appropriate regulatory framework or the failure to obtain the necessary permits to continue the reactor's development could have an impact on the Group's financial position (see section 1.4.1.2 "New Nuclear projects" - "EPR 2").

In China, the Group has a 30% stake in TNPJVC (Taishan Nuclear Power Joint Venture Company Limited) alongside its Chinese partner CGN. Taishan 1 was the first EPR reactor to be coupled to the grid on 29 June 2018. It was commissioned on 13 December 2018. The Taishan 2 reactor is continuing its start-up tests with a view to commissioning in 2019. CGN's work with the competent Chinese authorities to obtain a buyback tariff may fail to result in a buyback tariff that meets the expected profitability objectives (see sections 1.4.1.2.2 "Other "New Nuclear projects" - Taishan EPR" and 1.4.5.3.6.1 "Activities in China").

In the United Kingdom, control of the design and bringing the manufacturing and the major milestones of the construction site under control will determine the profitability of the Hinkley C project and the financing of any future projects in the United Kingdom. The Group has a 66.5% stake in the Hinkley Point C Project,

alongside its Chinese partner CGN with 33.5% (see sections 1.4.1.2.2 "Other "New Nuclear projects" and section 1.4.5.1.2.4 "United Kingdom - Nuclear New Build Business"). The project's completion costs were estimated in July 2017 at £19.6 billion<sup>(2)</sup>. This estimate depends on the success of operational action plans, particularly those in partnership with the suppliers. In addition, the risk of a postponement of commercial commissioning is estimated at 15 months for unit 1 and nine months for unit 2. The additional cost of this potential deferral has been estimated at approximately £0.7 billion<sup>(2)</sup>. The IRR for the project is sensitive to exchange rates and could be reduced if the pound sterling continues to drop in relation to the euro. Furthermore, the conditions for carrying out the project may be affected by the terms and conditions for deploying Brexit (see risk 2H described above), in particular on customs duties, the movement of persons and trade in products and services. Finally, the governance of the project could be affected in the event of misalignment between shareholders. Changes to these different factors could have an impact on the Group's financial position.

EDF has also signed two other agreements with CGN relating to studies on two nuclear construction projects in the United Kingdom: Sizewell C and Bradwell B (see section 1.4.5.1.2.4 "United Kingdom - Nuclear New Build Business"). EDF's ability to make a final investment decision on Sizewell C and to finance this project beyond the development phase could depend on the control of the Hinkley Point C project, the existence of investors and financiers and an appropriate regulatory and financing framework.

On 10 March 2018, the Chairman and Chief Executive Officer of EDF and the Chairman and Chief Executive Officer of NPCIL (Nuclear Power Corporation of India Limited), which already operates 22 reactors in India, signed an Industrial Way Forward Agreement for the construction of six EPR-type reactors at the Jaitapur site in India. Jaitapur is set to be the biggest nuclear project in the world, with a total power capacity of around 10GW. EDF submitted a non-binding offer on 14 December 2018. As part of this offer, EDF, in association with GE and its subsidiary Framatome, will be the engineering contractor for the entire project and supplier of the EPR technology. EDF will undertake all engineering studies and all component procurement activities for the first two reactors. (See section 1.4.1.1.2.2 "Other New Nuclear projects - projects under development" and section 1.4.5.3.6.2 "South-East and South Asia").

A fundamental element for the success of an EPR project and for the operating safety of EPR reactors in which the Group is involved is accounting for the needs of the final operator, who is responsible for operating safety, from the beginning of the design phase and throughout the design and implementation of the EPR project.

Framatome is now a Group subsidiary and as such can expose the Group through its activities for other nuclear operators or customers in France and abroad. Exposure may be financial or involve the Group's reputation. Framatome's industrial performance remains strategic for EDF Nuclear Operator in France and the United Kingdom. The successful completion of an EPR project depends on quality and compliance with contractual clauses in Framatome's production of studies, components or services for each EPR Project.

The success and value creation resulting from Framatome's integration into the EDF Group implies a converging framework for nuclear projects, and the development of resulting synergies. Failure to achieve these objectives could jeopardise the competitiveness of the nuclear sector in France and that of the Group in its international development, and the success of all EPR Projects.

These projects require obtaining administrative authorisations, licences, permits and, in certain cases, setting up additional partnerships, particularly for financing. These are large-scale and long-duration projects involving numerous industrial partners and significant investments, for which the financing and pricing conditions may still be subject to confirmation. Given the economic or institutional climate, obtaining such funding may be delayed.

(1) €10.9 billion in 2015, excluding interim interest.

(2) Excluding interim interest and excluding exchange-rate effects in relation to a reference exchange rate for the project of £1 = €1.23. At 31 December 2018, the exchange rate was €1.12=£1



Failure to comply with the Group's contractual commitments, or the Group's potential exposure in the event of a major incident in the execution of these projects or the operation of these reactors, could have a major impact on the Group's exposure, legal and financial position or the Group's reputation.

Finally, consultation and dialogue with all stakeholders, including institutional, local, national and international, industrial and financial stakeholders, on EPR projects contribute directly to the achievement of corporate responsibility goal no. 5 (see section 3.2.5.1 "EDF's commitment to organise a worldwide dialogue and consultation process around our projects (CSRG no. 5)").

**Description 5E: In addition to the control of industrial performance specified in risk factor 4B of category 4, Operational Performance, set out above, the Group is exposed in its nuclear activities to the requirement to control the nuclear fuel cycle.**

The Group's operating costs include nuclear fuel purchases.

EDF is supplied with uranium, conversion and enrichment services, fuel assembly supplies and spent fuel reprocessing operations for its nuclear fleet in France and the United Kingdom.

Prices and volumes are subject to fluctuations due to factors that are inter alia political and economic and that the Group cannot control (in particular, the profitability outlook of mining investments, imbalances between supply and demand or supply shortages associated with, for example, an operating accident in a uranium mine or a combined cycle plant, delays in commissioning new mines or events leading to institutional instability in a uranium-producing country).

The storage and transport of new or spent nuclear fuel is an industrial activity that requires specific safety and security measures. These requirements could become more stringent, generating additional difficulties and costs for the Group.

In the event of the collapse of this industrial logistics system, the Group could reduce or even interrupt all or part of the electricity generation at the affected sites, either due to the non-delivery of new assemblies or to the saturation of intermediate storage facilities, which could have a negative impact on the Group's financial position (see section 1.4.1.1.4 "Nuclear fuel cycle and related issues").

In France, EDF has booked provisions for spent nuclear fuel management operations (transport, processing, conditioning for recycling) (see note 29.1.1 to the consolidated financial statements for the financial year ended 31 December 2018) based on the price and volume conditions of the master agreement signed with Orano in December 2008 and broken down in the successive implementation agreements. The implementation agreement for the period from 2016-2023 was signed in February 2016 (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"). The amount of provisions currently booked to cover the period not covered by the current agreement should be reassessed if the terms under which this agreement is renewed prove more onerous than those currently applicable.

Note 29.1.5.2 "Analyses of sensitivity to macro-economic assumptions" of note 29.1 "Nuclear provisions in France" to the consolidated financial statements as of 31 December 2018 shows the connection between "costs based on year-end economic conditions", which represent estimated amounts as at 31 December 2018, and "provisions made at present value". As regards spent fuel management, the costs based on year-end economic conditions are estimated at €18,737 million euros and the corresponding provision is €10,698 million.

However, the Group cannot guarantee that its contracts, in France and abroad, will completely protect it from sudden or significant price increases. The Group cannot guarantee that when these long-term contracts expire, it will be able to renew them, in particular at an equivalent price. This could have an adverse impact on the Group's financial position.



## 2.2 CONTROL OF GROUP RISKS AND ACTIVITIES

The objective of this section is to focus on control procedures related to activities or risks deemed significant, and on the main long-term procedures in place in 2018, highlighting changes and key initiatives developed during 2018. These internal control and risk management procedures fall within the framework defined by the corpus of Group policies. They also obey the general principles set out in the AMF's risk management and internal control reference framework (published on 22 July 2010) and they are based on the changes made to the main international reporting guidelines, in particular COSO-2013.

### 2.2.1 CONTROL ENVIRONMENT

#### 2.2.1.1 General organisation

##### Framework: Group policy corpus

Since 2017, the EDF Group has organised the control of activities and risks around the Group policies validated and signed by the Executive Committee. This corpus defines sustainable and cross-functional requirements for all Group entities and subsidiaries. It covers the following topics: Steering and Operation, Ethics and Compliance, Safety and Security, Sustainable Development, Human Resources, Purchasing, Real Estate and General Services, Legal, Finance and Markets, Communication, Information Systems and Digital Transformation. Regular updates make it possible to adapt requirements to regulatory changes and strategic orientations.

##### Control system objectives

The system for controlling the risks and activities of the Group, defined in the "Group functioning principles/Risk management and internal control" policy aims to:

- identify and periodically reassess the significant risks and opportunities likely to impact the targets of the Group, in order to ensure the existence and control of relevant and effective action plans;
- constantly ensure:
  - compliance with laws and regulations,
  - compliance with Group policies,
  - the correct functioning of internal processes, notably those contributing to the protection of the Group's assets,
  - the reliability of financial information,
  - and, generally, the control of risks and activities of any kind.

##### Principles of execution

The fundamental principles of execution are based on the three lines of control model:

- first control line: each of the managers at every level, for the missions that are assigned to them, is responsible for: identifying and managing the main risks related to their activities; ensuring this control for the missions that they assign to their staff; ensuring that the measures for controlling identified risks are proportionately supported; formally and regularly reporting, to their own manager, on risks identified and on control measures through self-evaluations;
- second control line: the support functions define common requirements for the Group and supervise their control. Their contribution to controlling the activities of the Group is specified in section 2.2.1.4. "The second line of control of risks and activities: players and missions". Amongst them, the risk and internal-control functions organise the overall control measures and prepare reports intended for the Group's governing bodies. The specific measures aiming to control risks and activities are detailed in section 2.2.2 "Implementation of systems for the control of risks and activities";
- third control line: the independent audit system can check the appropriateness and effectiveness of the measures for managing the risks and activities of the Group's entities, check management of the main cross-functional processes and major projects of the Group, and more generally, check the level of control of the Group's risks (see section 2.2.1.5).

All of these measures based on the three control lines provide the managers and governing bodies of the Group with "reasonable assurance" concerning the identification and coverage of the main risks.

##### Scope

With regards to the scope controlled (excluding those subsidiaries that are operators of regulated infrastructure), these objectives and principles are implemented by the departments or subsidiaries managed by the members of the Executive Committee, who make sure that they are implemented in the Divisions, operational units or subsidiaries that they control.

With regards to the other subsidiaries of the Group (subsidiaries that are operators of regulated infrastructure and significant shareholdings), the representatives of EDF within the governing bodies make sure, for each subsidiary, that a system for controlling activities and risks is put in place. They provide regular information on the map of risks and internal control and audit activities (programme and main results). They can also check the effectiveness and appropriateness of each of these measures through a periodic audit of the respective entities. The applicable principles are nevertheless adapted for the operators of regulated infrastructure to ensure compliance with obligations relative to their management independence.

#### 2.2.1.2 Delegations of authority and technical authorisations

The Chairman and CEO delegates some of his/her powers to the members of the management team, in line with the organisation of the Group and with the responsibilities assigned to the heads of these entities.

The organisation put in place for procurement is designed to ensure proper control of the processes. Procurement contracts are signed, depending on thresholds, either by the Chairman and CEO, a Group Executive Director or any of their delegates following signature by the Procurement Department Director or any of their delegates. Signature by the Procurement Department Director or their delegates formally recognises that the instrument complies with the procurement process. Each Group Executive Director is expected to reinforce the internal control system for procurement instruments submitted for their signature and those procurement instruments directly handled by their department.

The Chairman and CEO delegates the nuclear operator liability to the Group Executive Director for the Nuclear and Fossil-fuel Fleet Department and the Group Executive Director for the New Nuclear Engineering and Projects Department, who then sub-delegate it to the Directors of the divisions involved, who in turn sub-delegate it to unit managers.

Authorisations are issued by each facility manager, who must ensure beforehand that the skills of the sub-delegates have been assessed and that resources have been provided to them. These requirements apply to all persons carrying out work, both for staff of EDF and service providers.

The Group Delegation of Authority Directive aims to inform and raise awareness among EDF entities of the nature, consequences and management rules of delegation of authority.

#### 2.2.1.3 The management bodies

The organisation of the Executive Management of EDF is described in section 4.3.1. "Members of the Executive Committee". Each member of the Executive Committee is responsible for implementing all actions necessary to controlling the risks within their scope.

##### Risk Committee

The Executive Committee meets at least twice a year on the occasion of a Risk Committee, where it examines in particular the mapping of the Group's risks and the assessment of internal control activities. It identifies the priority risks for the Group, shares their strategy for mitigation with regard to the strategy of the Group and designates the members of the Executive Committee who are its sponsors. The Risk Committee also examines the audit activities (annual programme, results).

## The Group Executive Committee Commitments Committee

To strengthen the appraisal and monitoring of projects, the Corporate Investment Committee of the Group Executive <sup>(1)</sup> (CECEG) thoroughly examines the most significant projects in terms of the extent of the commitments and/or the risks incurred before decisions are made by the Executive Committee (see section 2.2.2.2.3 "Approval of commitments").

### 2.2.1.4 The 2<sup>nd</sup> line of control of risks and activities: players and missions

The second line comprises all the Group's support functions (Procurement, Communication, Sustainable Development, Ethics and Compliance, Finance, Real Estate, Legal, Human Resources, Risks, Asset Security, General Services and Information Systems). These Departments implement, in conjunction with the Operational Directors, a global management and steering system for their business line within the Group. In particular, these support functions are responsible for organising and coordinating the implementation of Group policies.

Note: the Group's human resources aspects, including in particular the control of risks relating to the health and safety of employees and service providers, are detailed in Section 3.2.2.1 ("A standard-setter in Health & Safety: the well-being of the women and men in our company, and that of our contractors, is an absolute priority") of the Reference Document.

#### 2.2.1.4.1 Group Risk Department

The Group Risk Department (reporting to the General Secretary) has the following tasks:

- deploy the risk and internal control policy, organise the internal control function and, in particular, prepare and update the consolidated map of major risks and the assessment of the Group's internal control (see the detailed system in section 2.2.2.1.1 "Map of major risks and the activity and risk management report");
- alert the Chairman and CEO and the Executive Committee on emerging risks and risks that have not been sufficiently observed;
- ensure the control of energy markets risks by deploying the energy markets risk policy (see section 2.2.2.2.1 "Control of energy market risks");
- define and deploy the control of financial risks (interest rates, foreign exchange, liquidity and credit) and the risk of counterparty default (see section 2.2.2.2.2 "Control of financial risks");
- control the comprehensiveness and relevance of risk analyses for investment and long-term commitment projects submitted to the CECEG for decision (see section 2.2.2.2.3 "Approval of commitments");
- deploy the crisis management and business continuity policy and ensure that the crisis management organisation is maintained in an operational condition for the Group level (see section 2.2.2.1.2 "Crisis management and business continuity").

#### 2.2.1.4.2 The Financial Department

The Financial Department contributes to controlling the activities of the Group, notably through the following missions:

- Performance Management:
  - contributing to the management of the performance of the Group's entities by helping define the Group's performance plans and by challenging the measures implemented by the entities and business lines. To this end, the Financial Department implements a set of management indicators appropriate to the economic model of each activity of the Group, within the framework of the policy on the Management of Economic and Financial Performance <sup>(2)</sup>;
  - contributing to monitoring the implementation of the budget through performance reviews generalised within the Departments and the subsidiaries that are controlled;
  - conducting portfolio reviews and economic and financial optimisation analyses;

- developing and disseminating financial management methods and processes, contributing to the dissemination of the financial management culture within the Group;
- Reporting:
  - overseeing the processes of the Group's management cycle (budgets, revisions of forecasts and medium-term plans), summarising them and proposing choices at the level of the departments and subsidiaries, within the framework of the Accounting and Financial Reporting policy. The Financial Department's role is to alert and make proposals in the pre-decision-making analysis on the financial consequences of the operations envisaged, or the performance levels proposed;
  - developing medium- and long-term financial trajectories;
- Accountancy:
  - preparing EDF's financial statements and the Group's consolidated financial statements;
  - ensuring accounting compliance *using* the Group's Reporting Guidelines setting out the accounting standards and chart of accounts to be applied;
  - organising the Group's accounting and financial internal control system as defined in the Group "accounting and financial internal control" instruction, according to a system detailed in section 2.2.2.3 "The internal control procedures relating to reliability of financial and accounting information";
- Taxation:
  - ensuring the consistency of tax practices, the requirements of which are listed in the Group's Tax policy. The precise provisions in this area are discussed in section 3.5.2 "Tax transparency" of this document;
  - ensuring the proper implementation of legal and declarative obligations, notably by monitoring the subject;
  - ensuring the accounting follow-up of the deferred tax position and the periodic justification of the accounts;
  - identifying and controlling the Group's tax risks;
- Finance and Investments, Insurance:
  - ensuring that the Group is financed within the context of the policy on Financing, Cash and Financial Risk Control;
  - coordinating all the actions inherent in the Group's balance sheet and financial result, with the aim in particular of controlling the exposure of the Group's hedging assets, debt and the Group's overall balance sheet to financial risks;
  - managing the investments and acquisitions and disposals as well as the listed or unlisted dedicated assets;
  - appraising the investment projects presented to the Executive Committee Commitment Committee meetings to anticipate impacts and improve the reliability of the financial trajectories on the Group's balance sheet and profit and loss accounts, as defined by the Commitments policy;
  - developing and implementing innovative insurance coverages at the best market standards designed to support the development of the Group in all its dimensions, as defined by the insurance policy (see section 2.5 "Insurance");
- Financial communication of the Group according to the requirements of the Financial Communication policy (see section 2.2.2.3.4 "Financial communication");
- Finance Information System (IS): the Finance IS comprises a common basis for all the Group's departments, as well as tools specific to each of the entities or subsidiaries according to the specificities of the country or activity and raises several important issues in terms of data integrity and application availability. The Financial Department acts as the project owner.

(1) The composition of the Executive Committee's Commitments Committee is the same as that of the Executive Committee.

(2) This policy applies to all entities of EDF SA and subsidiaries, with the exception of regulated infrastructure operators, for whom shareholders' rights are exercised in the economic supervision framework specified by Directives 2009/72/CE and 2009/73/CE.

## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Control of Group risks and activities

#### 2.2.1.4.3 The Legal Department and the Contract Management Department

##### The Legal Department

The Legal Department, which reports to the General Secretary, is tasked with protecting the Group's interests and securing its activities, by providing support, advice and expertise. The Group's Legal Risk Management Steering policy, validated in 2018, defines its scope of activity. The legal department, headed by the Group General Counsel, is composed of the Legal Department of the EDF Group and those of the subsidiaries.

The legal department is systematically involved, as early as possible, with cases and projects involving challenges, in order to safeguard against any potential legal impacts. In this capacity, it notably carries out the following tasks:

- managing the main disputes in which the Group is a plaintiff or defendant <sup>(1)</sup>;
- supporting the Group's strategy and safeguarding high-stake activities;
- supporting the business lines in the preparation of structural operations and the negotiation of high-stake contracts, while ensuring the protection of the Group's commercial, industrial and financial interests and in particular the protection of its brands, expertise, know-how, data and inventions;
- monitoring of legislative and regulatory changes, raising alerts and carrying out actions to raise awareness.

The Legal Department also organises a secure process to inventory and digitise the major contractual commitments of EDF and of certain subsidiaries known as the "contratèque", to ensure that knowledge and control of EDF's sensitive contractual assets is guaranteed.

The Legal Department specifies, via the policy on governance of the subsidiaries and shareholdings, the conditions for the creation of each new legal entity, the procedures for appointing the corporate officers and expectations in terms of quality of governance within the Group.

##### The Contract Management Department

Improved management of contracts entered into by EDF is a major issue in controlling operations, deadlines and associated costs. It is the role of the Contract Management function which aims to improve the management of risks and create opportunities in the management of its contracts. This function calls upon Contract Managers positioned in the business lines throughout the contractual process. It is an additional line of defence in the management of contracts organised between corporate and the divisions. The Contract Management Department, which reports to the General Secretary, is responsible for structuring this function, leading the Contract Management process, measuring its performance and professionalising the players.

#### 2.2.1.4.4 The Group Ethics and Compliance Department

Reporting to the General Secretariat, the Group Ethics and Compliance Department (DECG) is responsible for disseminating knowledge of, and compliance with, the Group's ethical values, as well as the main regulations to which the Group is subject by virtue of its activity and geographical locations, in order to prevent the risk of sanctions. It federates and controls the Group compliance activities and aims to defend and promote the Group's culture of integrity, for the benefit of its image and reputation. It reports to the Executive Committee and the Governance and Corporate Responsibility Committee of the Board of Directors.

The DECG implements the Group Ethics and Compliance programme, initiated by the Chairman of the Group on 16 December 2015, based on the following standards (see section 3.5.1 "Ethics and Compliance"):

- the Group Ethics and Compliance Policy (PECG), validated by the Executive Committee on 17 May 2016, which compiles the main rules that Managers must know, respect and ensure compliance with in their entities, in strict accordance with the risks of these entities. The PECG is supplemented by instruction notes and support guides to facilitate its deployment, including integrity checks on

business relations, business ethics for trading in securities, personal data protection, fighting against fraud, gifts and invitations. The PECG is the supra-reference to the Group Ethics Charter and the Ethics and Compliance Code of Conduct, which can be updated according to new applicable regulations and is subject to audit;

- the Group Ethics Charter built around the Group's three values (Respect, Solidarity, Responsibility), which defines the requirements that should guide the actions and conduct of the Group employees on a daily basis. An updated version of the 2013 Charter will be deployed in 2019;
- the Ethics and Compliance Code of Conduct published on 1 June 2017 and set out in the entities internal regulations, which constitutes the reference document for the prevention of corruption and applies to all employees (requirements of the Sapin II Law);
- the EDF Group ethics and compliance whistleblowing system, which allows employees and external collaborators (temporary staff, employees of a service provider, etc.) or occasional employees (fixed-term contracts, apprentices, trainees, etc.) of the Group, as well as third parties to make a report in accordance with the "Sapin II" Law of 9 December 2016, relating to transparency, the fight against corruption and the modernisation of economic life, and the "Duty of Vigilance" Law of 27 March 2017 relating to the duty of care of parent companies and ordering companies;
- training and awareness-raising actions for managers, directors and employees and support for the network of Entity Ethics and Compliance Officers (ECO) in their missions.

#### 2.2.1.4.5 The Sustainable Development Department

The EDF Group takes into account the issues relating to sustainable development and includes them in its overall strategy. The CAP 2030 strategic project aiming to make EDF "an efficient and responsible electricity producer, champion of low-carbon growth" has set new prospects for the Sustainable Development and Environmental approach of the Group, including six corporate social responsibility goals explained in section 3.1.2 "Committed to sustainable development" of this Reference Document.

The Sustainable Development Committee (SDC) serves as the Environmental Management Board at the Group level and is in charge of coordinating the environmental management system in accordance with ISO 14001.

The EDF group maintains its ISO 14001 certification obtained for the first time on 9 April 2002. The scope of certification encompasses EDF, several French subsidiaries (including Dalkia, Électricité de Strasbourg, EDF Renewables, Citelum, etc.), and a number of international subsidiaries including EDF Energy, EDF Luminus, EDF Trading and Edison. The processes implemented as part of this certification help to reinforce the control of the Group's environmental risks, in particular with regard to regulatory aspects and priority environmental issues by assuring its stakeholders of a structured and tailored organisation.

All of the requirements relative to sustainable development at Group level are listed in the Group Sustainable Development policy, including, in particular, the requirements related to the challenges of climate change. The process of mapping climate-related risks and opportunities is included in the definition of EDF's strategies. An action plan provides for the updating of the Climate Change Strategy (mitigation and adaptation) taking into consideration physical, financial and societal effects. The Sustainable Development Department has the task of organising the management, coordination and control of this policy, for which the implementation and control are the responsibility of the divisions and entities of the Group.

The Corporate Social Responsibility Strategy Committee was set up in December 2018, in order to better coordinate all the CSR issues of the various Group entities and to ensure strategic management. The Corporate Social Responsibility Strategy Committee will monitor in particular the EDF Group's commitments in the area of the six CSRGs, the carbon commitment, the CSR agreement and the EV100 commitment.

(1) Excluding (i) disputes related to tax law, managed by the Financial Department, (ii) certain disputes related to employment law managed by the National Employment Law Division of the human resources department.

#### 2.2.1.4.6 The Group Information Systems Department

Among its various missions, the Group Information Systems Department (GISD) oversees the implementation of the policies on Information Systems Governance and Digital Transformation, Group Information Systems Security and Data Management and is in charge of leading internal control and hedging of associated risks (See section 2.2.2.2.4 "Security of Information Systems (IS)").

Also, the Group Information Systems Department co-organises, with the Legal Department, the Group instruction on the protection of personal data. The entities are liable for the application of this instruction pursuant to the application of the Ethics and Compliance policy of the Group.

#### 2.2.1.4.7 The Security and Economic Intelligence Department

The organisation of security within the EDF group aims to ensure compliance with the requirements defined in the Security of Assets against Malicious Acts Group policy. The Security and Economic Intelligence Department has the task of organising the management, coordination and control of this policy and in particular for preparing and providing to the entities the explanatory notes, practical guides and methodologies for applying the requirements of the policy.

#### 2.2.1.5 The 3<sup>rd</sup> line of control, the Group's audit unit

The Group's Audit unit is composed of all of the audit resources of the Group exercising an internal audit activity. Pursuant to a decision of the Chairman and CEO this function is supervised by the Group Audit Director. The Group audit unit includes the Audit Department ("DAi" reporting to the General Secretary) and audit teams specific to each of the main French and foreign subsidiaries. Relations between the Audit Department and the various audit teams, and their respective powers, take into account whether the teams belong to EDF or to subsidiaries that are operators of regulated infrastructure, for which the relationships are adapted to ensure compliance with the principle of management independence. The Audit Department carries out functional supervision of the business line (co-appointment and peer assessment of Audit Directors of the subsidiaries by the Audit Department – excluding RTE and Enedis –, exchanging best practices, training, sharing tools and methods, etc.). At the end of 2018, the Group audit unit consisted of 55 FTE <sup>(1)</sup>.

#### Operating standards for EDF and controlled subsidiaries

The DAi applies the international standards defined by the Institute of Internal Auditors, promotes them and monitors their compliance.

The missions, powers and responsibilities of the auditors as well as the rights and duties of the audited parties are set out in a charter which was updated in May 2016. This charter, signed by the Chairman and CEO reiterates the independent nature of the audit function and specifies the missions and commitments of the internal audit function, the duties and rights of the auditors and audited parties. It includes a code of ethics applicable to the Group audit unit as a whole. This code is intended to promote a culture of ethics and serves to reiterate that the auditor must comply with and apply certain basic principles relevant to the profession and the conducting of internal audits.

The Chief Audit Executive has direct access to the Chairman and Chief Executive Officer and reports on the Audit work to the Audit Committee, providing it with useful information on the adequacy of the workforce to carry out the duties to be performed.

All of the auditors are trained in the same methodology, compliant with international standards. They are recruited from the various businesses of the Group as well as from external audit firms. The auditors are evaluated at the end of each mission.

The key processes relevant to the proper functioning of the Audit Department for the entire chain of its activities (from the drafting of the audit programme up to monitoring of the implementation of recommendations) are set out and coordinated.

The audit unit regularly submits voluntarily to evaluation by IFACI <sup>(2)</sup>. The last evaluation of 2018 stated, as previously, that the audit practices were compliant with the international standards of the profession.

#### Functioning procedures

The Group's audit unit carries out comprehensive audits of EDF entities and controlled subsidiaries. These audits include the examination of the robustness of their internal control and are carried out every three to five years according to their extent. The Audit Department carries out cross-functional corporate audits, while the Audit Departments of the subsidiaries perform audits within their scope of responsibility. The Audit Department is the sole entity empowered to carry out audits of subsidiaries for corporate-level risks.

The audit programme is reviewed by the Chairman and CEO, the Risk Committee, and thereafter by the Board of Directors. It is drawn up to reflect:

- the need to audit the main Group entities at intervals suited to their importance in order to assess in particular that their internal control is correctly implemented;
- the main accounting and financial processes and "Group Head" processes (HR, IS);
- major projects;
- risks of the Group's risk mapping which were not addressed by the aforementioned audits at intervals suited to the critical nature of the risk;
- monitoring of Executive Management decisions.

Digital tools have been developed to support the auditors in exploiting bulk data and targeting discrepancies.

All audits give rise to recommendations which, once validated by the audited parties and their management, become the subject of action plans drafted by the aforementioned management and audited parties and are sent to the Audit Department. In the next 12 to 18 months, the Audit Department will ensure the application of these corrective actions or any other action decided by management in order to put a halt to any irregularities detected.

A half-yearly summary report is prepared. It summarises the significant events of the audits carried out by the unit, the main findings of the corporate audit and the corresponding recommendations. The half-yearly report presents the assessment of the audit programme, the satisfaction of the audited parties, as well as HR and budget reports. Furthermore, it identifies any recurring or generic problems observed in several audits and which merit special attention on the part of Management. It provides an audit-based vision of the level of control of the Group's risks. This report is presented to the Chairman and Chief Executive Officer, the Risk Committee and thereafter to the Audit Committee and the Board of Directors.

#### 2.2.1.6 External control

Like all listed companies, the EDF group is subject to review by the AMF (French Financial Markets Authority). As a company majority owned by the French State, EDF is also subject to control by the *Cour des Comptes* (French Court of Auditors), State Controllers, the Inspectorate of Finance, Economic Affairs Committees or ad hoc Committees of inquiry of the French National Assembly and Senate.

According to law, the Statutory Auditors certify the annual financial statements (parent company and consolidated financial statements) and perform a limited review of the Group's half-yearly condensed consolidated financial statements. Their report includes the verifications on the information on corporate governance required by the articles L. 225-237-3 *et seq.* of the French Commercial Code.

In the light of its activity, EDF is also subject to control, in France, by the Energy Regulation Commission (CRE) and the French Nuclear Safety Authority (ASN).

(1) Full-Time Equivalent.

(2) Institut français de l'Audit et du Contrôle Interne (French Institute of Audit and Internal Control).

## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Control of Group risks and activities

### 2.2.2 IMPLEMENTATION OF SYSTEMS FOR THE CONTROL OF RISKS AND ACTIVITIES

#### 2.2.2.1 General control systems

##### 2.2.2.1.1 Risk mapping and the report on the control of activities and risks

###### Report on the control of the activities and risks of the entities

Each Group entity (60 entities in 2018 within the scope of EDF and its controlled subsidiaries) prepares an annual report on the control of its activities and risks, based on a self-assessment, and a description of its progress actions. Each report gives rise to a commitment signed by the Director of the entity on the level of control achieved and the actions undertaken. In 2018, the self-assessment framework evolved to identify more relevant and fewer control points in order to meet the simplification challenges of CAP 2030, thus promoting better managerial involvement.

The report includes internal control, the report on the safeguarding of assets and the ethics and compliance report. The part relative to ethics and compliance fulfils the requirements of the Group Ethics and Compliance policy, including: the ethics alert system, prevention of the risk of corruption (control of the integrity of business relations, supervision of gifts and invitations); financial ethics (prevention of the risk of money laundering and the financing of terrorism, prevention of market abuse, compliance with the EMIR <sup>(1)</sup> regulation); prevention of breaches of competition law; prevention of conflicts of interest; compliance with rules on the protection of personal data; fraud prevention; preventing bullying and discrimination; compliance with sectoral regulations (REMIT <sup>(2)</sup> regulations on integrity and transparency in energy markets, regulations concerning dual-use goods); and, compliance with international sanctions programmes.

The part relative to security of assets fulfils the requirements of the Security of Assets against Malicious Acts Group policy, including: the safety of individuals during international travel, the security of material assets and the security of intangible assets (identification, classification and protection of sensitive information). In addition to these topics, self-assessments more generally report on the control of all their "business line" activities and all the requirements of the other cross-functional areas identified in Group policies, in line with their risk mapping. Finally, self-assessments report on the control of requirements relating to internal accounting and financial control, in line with the AMF framework (see section 2.2.2.3 "The internal control procedures relating to reliability of financial and accounting information").

###### Entity risk mapping

The entities produce an annual risk map based on a methodology common to the entire Group. The process of constructing the map of risks for the entities is based on:

- the principle management responsibility mentioned in section 2.2.1.1 "General organisation" above;
- the typology of risks, for identification that is as broad as possible, including internal and external risks, and operational and strategic risks, as well as opportunities;
- a qualitative evaluation method of the impact, the probability and the level of control of each risk;
- the description of action plans for dealing with risks and the evaluation of their effectiveness.

Numerous discussions have taken place between the Group Risk Division and the entities, with the aim of querying the relevance of risks and the soundness of the control actions undertaken.

**Methods - Tools:** a methodology guide is available to the entities in support of this approach. In addition, a Risk Management Information System (RMIS) has been deployed since 2016 and was made generally available to the whole Group in 2017 in order to promote and secure risk communication and consolidation.

###### Group risk mapping

On the basis of this reporting, supplemented by systematic cross-examination with the Internal Audit Division, the EDF group draws up a consolidated map of its major risks, including the overall assessment of internal control, in order to provide Management and governance bodies with a regularly updated consolidated view of major risks and their level of control <sup>(3)</sup>. These documents, prepared at the end of the year, are validated by the Risk Committee and are presented to the Board of Directors after examination by the Audit Committee.

Since 2015, the Risk Committee has identified within the Group risk mapping a smaller set of "priority risks" selected as a result of their operational or strategic importance. The connection between these risks and the strategic project CAP 2030 has been given priority so that, as far as possible, risk control action plans may be included in the corresponding projects.

##### 2.2.2.1.2 Crisis management and business continuity

The crisis-management and business-continuity policy defines the organisation principles for crisis management and business continuity and specifies the entire system necessary to its implementation. This policy consists in particular of:

- making sure of the existence of organisations for crisis management and permanent systems for raising alerts;
- checking the existence and regular update of relevant crisis-management procedures, with regard to the risks involved;
- defining, for periods of crisis, coordination procedures with all stakeholders;
- ensuring feedback from crises and crisis exercises is systematically applied in order to avoid or reduce the consequences of similar crises;
- checking the existence of business continuity plans within each entity;
- checking the implementation of professional development actions for all players in the crisis.

A crisis exercise programme allows these mechanisms to be tested in terms of their effectiveness and overall consistency. In 2018, particular attention was paid to adapting the Group's crisis organisation to the risk of a cyber crisis.

#### 2.2.2.2 Specific control systems excluding accounting and financial information

##### 2.2.2.2.1 Control of energy market risks

The Group annually validates the entities' hedging strategies, as well as the associated risk limits, after consulting the Group Risk Department in accordance with the Group's energy market risk policy. This policy sets out:

- the authorised hedging strategies;
- the governance and measurement system, clearly separating risk management and control responsibilities and enabling the Group's consolidated exposure to be monitored;
- the risk control processes involving the Group's Executive Management in the event that risk limits are exceeded; a strengthened control system has been put in place for the EDF Trading subsidiary in the light of the specific nature of trading activities;

(1) European Market Infrastructure regulation (EMIR): European regulation on market infrastructures. +

(2) Regulation on Wholesale Energy Market Integrity and Transparency (REMIT).

(3) Group risk mapping notably includes environmental risks and risks related to climate change (physical risks and transition risks). These risks are described in section 2.1 "Specific risks to which the Group is exposed"; the strategic response to the challenges of climate change is described in section 3.3 "Other subject areas of the sustainable development policy".



- the two-tiered organisation of the energy markets risk control unit, the entities carrying out operational control and the Group Risk Management Department ensuring second-level control.

An annual review of the implementation of this policy is presented by the Group Risk Department to the Audit Committee of the Board of Directors. The expectations, main provisions and procedures for implementing this policy are described in section 5.1.6. "Market risk management and control".

In addition, a Group REMIT directive defines the expectations for ensuring that the Group's entities comply with the European Regulation on the transparency and integrity of the wholesale energy market.

#### 2.2.2.2.2 Control of financial risks

The policy on financing, cash and the control of financial risks requires all entities of the Group to continuously and systematically identify financial risks (in particular, liquidity, interest rates, foreign exchange and counterparty). The Group Risk Department exercises 2<sup>nd</sup> level control of these risks via:

- verification that the principles of the policy have been properly applied (preparing work management frameworks, methodology, monitoring exposures, regular calculation of risk indicators and checking compliance with risk limits);
- the control of positions in the trading room in charge of cash management. For these activities, a system of indicators and risk limits checked on a daily and a weekly basis is in place. The Markets Committee (a body that brings together the Finance and Investment Department and the Group Risk Department) checks and reviews on a quarterly basis, where necessary, requests for exemptions to the work management framework and requests for investment in new financial products.

The policy on the constitution, management and control of the financial risks involving dedicated assets of EDF SA applies to the portfolio of dedicated assets which are managed by the Financial Department. The Group Risk Department prepares an annual risk mandate and specific working frameworks which define the principles for managing risks and the risk limits that are acceptable for this portfolio.

#### 2.2.2.2.3 Approval of commitments

The Commitments policy establishes that the Commitments Committee examines all of the commitment projects of the Group, excluding regulated subsidiaries, covering:

- investment, divestment, and merger and acquisition projects exceeding €50 million;
- expenditure covering supplies, works or services of an amount exceeding €200 million over the entire duration of contracts;
- long-term purchases or sales of energy and emission credits and CO<sub>2</sub> quotas for annual volumes or amounts exceeding 5TWh for electricity, 10TWh for gas and €150 million for coal, oil, emission credits and CO<sub>2</sub> allowances;
- the multiannual programme to supply back-end reactors and services of the nuclear fuel cycle;
- the annual programmes of commitments relative to decommissioning (including operations for the transfer of obligations) or those at the back-end of the nuclear fuel cycle;
- strategic projects likely to commit the Group over the long term through several investments below amounts of €50 million each.

The projects presented include an in-depth analysis of risks according to a methodological standard for the analysis of defined risks.

Whenever necessary, the proposed commitments are then reviewed by the Board of Directors as described in section 4.2.2.3 "Powers and duties of the Board of Directors". "Strategic disposal projects" are investigated separately and supervised by the Disposals Committee to preserve confidentiality and responsiveness.

#### 2.2.2.2.4 Security of Information Systems (IS)

The security of information systems is governed by the Information Systems Security Policy focusing on: strengthening the involvement of managers and the protection of assets associated with the information system; management of information systems security risks; taking new regulatory obligations into account (European regulations on the protection of personal data, Law on Military Programming, etc.).

Internal control and cover of the risks specific to IS issues is coordinated by the Group Information Systems Department based:

- on the IS Group Committee (which consists of the EDF SA information systems department and the CIOs of the main subsidiaries) for approval of the cross-functional risk mapping and control actions to be implemented;
- and on the Group's Information Systems Security Managers, for the consistency, coordination and monitoring of control actions following on from the various checks and audits of information systems security.

The main actions implemented in matters of IS security in 2018 are:

- transformation, through the publication of the Information Systems Governance and Digital Transformation Policy, of the Group's CISO into a true "Group Cyber Security Director" who prescribes for all the Group's IS, able to launch cyber security audits while respecting business prerogatives;
- implementation of a cybersecurity communication plan for all users and a specific awareness campaign for the Management Committees of the divisions and the Executive Committees of the subsidiaries;
- implementation of an annual cyber-security review involving Group Entities;
- ongoing strengthening of the safeguarding of the most critical assets;
- adaptation of the Group's crisis management system to better take into account cyber incidents;
- tests of the Disaster Recovery Plan and the preparation of a "Group-wide" cybersecurity crisis exercise for early 2019.

### 2.2.2.3 The internal control procedures relating to the reliability of financial and accounting information

#### 2.2.2.3.1 Reporting Guidelines

The internal control manual was entirely restructured in 2011 with regard to control of accounting and financial information in order to bring it into line with the AMF (French Financial Markets Authority) reference framework as revised in 2010. It was also revised in 2015 and 2016 to fit into the Group's new internal control dynamic. The fundamentals of governance, roles and responsibilities remain unchanged.

The accounting standards used by the EDF group (the scope of the Group's consolidated financial statements are included in the notes to the consolidated financial statements (see section 6 "Financial statements") comply with the international standards published by the International Accounting Standards Board ("IASB") approved by the European Union and applicable as at 31 December 2018. These international standards include the IAS (International Accounting Standards), IFRS (International Financial Reporting Standards) and the SIC and IFRIC interpretations. The accounting rules and methods are specified in the Group's accounting principles manual and summarised in the notes to the consolidated financial statements.

The principles applicable to the preparation and reporting to the Group's Finance Department are defined in the Accounting and Financial Reporting policy. The measures to be taken concerning the control procedures are described in the Group Accounting and Financial Internal Control directive. The Finance Management Directors of the Departments of the business lines and Subsidiaries sit on the Management Committee of the entities to which they belong. With the exception of the operators of regulated infrastructure, they are appointed and evaluated jointly by operational management and the management of the Management Control function. A network of correspondents from the operational Departments and subsidiaries facilitates dissemination of the instructions and harmonised implementation throughout the various Group entities.

Each EDF operational and functional Director makes a commitment each year with regard to the quality of the Internal Control system in the Accounting and Financial areas, the improvement goals for the coming period and the truthfulness and exhaustiveness of the accounting information for which they are responsible by preparing a commitment letter sent to the Group Accounting and Taxation Director. In return, each Director receives a letter assessing accounting quality from the Group Tax Accounting Director based on various evaluation elements (results of internal controls, accounting quality dashboard indicators, accounting assessment letter from the CSP2C, specific actions) which highlights the progress made and determines the improvement actions to be undertaken or continued. An indicator reference framework is used within EDF. It makes it possible to measure areas of conformity of the accounting information for each process. With regard to subsidiaries, each legal entity is responsible for the implementation of the Group's Accounting and Financial Internal Control Directive.

## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Control of Group risks and activities

#### 2.2.2.3.2 Procedures for preparing and controlling the consolidated financial statements

The consolidated financial statements are prepared by the Group Accounting and Taxation Department on the basis of the data entered locally by each entity (entities of the parent company and subsidiaries) in accordance with the Group standards and closing instructions, according to a single plan of charts. The scope of consolidation is closed after noting all companies of significance that are controlled, jointly-controlled or under significant influence. The non-significant nature of entities for which EDF holds an interest and which might fall within the scope of consolidation is examined regularly and submitted annually for the assessment of the Statutory Auditors.

The half-year consolidated financial statements are presented to the Audit Committee and then approved by the Board of Directors. The annual consolidated financial statements are reviewed by the Audit Committee, then closed at 31 December of the fiscal year by the Board of Directors and lastly approved by the Shareholders' Meeting.

Each annual and semi-annual results in the drawing up of instructions specifying the key deliverables expected from each stakeholder to the publication of the financial statements, the management report and the Reference Document for the annual closings. Meetings with EDF departments and the subsidiaries facilitate the preparation of these financial statements and make it possible to anticipate changes with regard to certain treatments thereby increasing the reliability of the accounting and financial information published. An analysis of the conditions of preparation (compliance with deadlines, quality of information, etc.) after the event allows for regular improvement of the consolidated financial statements preparation and analysis process.

Monthly reporting of information on the balance sheet accounts and the income statement can anticipate the processing of complex operations and contribute to making the results more reliable.

Forecasts and management acts are implemented using a single reference framework and tools shared between accounting and management. This system contributes to the coherence of Group management and facilitates dialogue at all levels of the organisation and helps promote exchange of information between actors and the quality of the information produced.

#### 2.2.2.3.3 Procedures for preparing and controlling the corporate financial statements

The financial statements are prepared annually and semi-annually by the Parent company Financial Statements Department of the Accounting Consolidation Division. The annual financial statements are closed on 31 December of the fiscal year, approved by the Board of Directors of EDF and then approved by the Shareholders' Meeting.

The condensed half-year financial statements are closed on 30 June of the fiscal year by the Board of Directors. EDF's transactional accounting (excluding the Nuclear Fuel Division, the Island Energy Systems Department, the Decommissioning and Waste Projects Department, and the Executive Management Department for payroll accounting) is handled by the Shared Accounting and Consulting Services Centre (CSP2C) of the Tertiary Services Department, which also maintains the transactional accounting of certain French subsidiaries. The processing of transactional accounting is organised by process. "Governance pacts" set the respective responsibilities of the Operational and Functional Departments, of the shared "Accounting" services centre or, where applicable, the accounting operators in the operational business lines and the Accounting Consolidation Division.

Meetings are organised on a quarterly basis with the EDF departments to prepare the financial statements and anticipate changes with regard to certain treatments to increase the reliability of the accounting and financial information published.

#### 2.2.2.3.4 Financial communication

The financial communication policy defines the rules to be complied with to ensure the reliability and consistency of the financial information disseminated by the Group. The financial communication controlled by the Investors and Markets Department aims to fulfil the two fundamental objectives of ensuring the provision of financial information that is of high quality, consistent and offers the same substance to different audiences, and to ensure the compliance of the financial information with the laws and regulations in force. Furthermore, the EDF group has adopted a code of market ethics reiterating the principles and rules applicable to transactions involving securities of the EDF or listed companies of the EDF group. Alongside the dissemination of this code, awareness-raising actions on exchange rules have been carried out among Group employees, especially as regards precautions and obligations related to inside information and black-out periods during which executive managers and certain employees holding inside information must refrain from making transactions involving the Company's shares.

#### 2.2.2.4 Specific business line provisions

##### 2.2.2.4.1 The nuclear field

The nuclear safety policy of the EDF group specifies that nuclear safety is the first priority, under all circumstances, in the nuclear activities of the EDF group. Safety is based on a clear principle of responsibility and control. Each company of the Group operating nuclear facilities acts within the framework of the legal and regulatory instructions specific to the country in which it is located and has the obligation to comply with them. Each one ensures the nuclear safety of its facilities and constantly improves the level, based on its methods, skills and values. The Group develops common principles aiming to obtain the best level of prevention of incidents and protection of workers, the public and the environment. These principles apply to all stages of the activity, both for new projects and for the existing fleets. The Group closely involves its industrial partners with the achievement of these objectives.

Each company is responsible for the proper conduct of its nuclear activities and sets the appropriate delegations at each decision and action level. The Group guarantees the allocation of the necessary resources for nuclear safety.

An internal entity in charge of an independent safety evaluation is put in place at the level of each site, each company and of the Group (IGSNR)<sup>(1)</sup>. Each one reports to the manager concerned, independently of other managerial functions; furthermore, each one has the duty to alert the superior hierarchical level if the reaction of the level directly involved is not what is expected.

The Group's nuclear operating companies regularly receive international evaluation teams (WANO<sup>(2)</sup> Peer Review and OSART<sup>(3)</sup> from the IAEA).

Clear and honest communication on the events and their possible impacts are promoted within the Group. This high-quality dialogue is sought and maintained with the salaried personnel and its representatives, subcontractors, the supervisory authorities (Nuclear Safety Authority in France, Office for Nuclear Generation in the United Kingdom), local communities and all other stakeholders in nuclear safety.

The Nuclear Safety Council, which the Chairman and CEO of EDF chairs, meets several times a year and, in February, examines the annual assessment of nuclear safety for the EDF group. A General Inspector for nuclear safety and radiation protection is appointed by the Chairman and CEO to whom he/she reports. He/she carries out inspection missions on all of the nuclear activities of the EDF group. Each year, it gives an opinion on safety within EDF. Its report is presented and debated in the Nuclear Safety Council. It is then made public.

(1) IGSNR: The General Inspector for Nuclear Safety and Radiation Protection.

(2) WANO: World Association of Nuclear Operators.

(3) OSART: Operational Safety Analysis Review Team, International Atomic Energy Agency (IAEA).

#### 2.2.2.4.2 The hydropower field

Hydropower safety comprises all the measures taken when designing and operating plants to reduce risks and hazards to people and property associated with water and the presence or operation of facilities. Hydropower safety is the major and permanent concern of the producer. It involves three main activities:

- measures to address the major risk associated with dam or reservoir failures, through the regular monitoring and maintenance of facilities under the supervision of public authorities, mainly the French regional environment, land use and housing authorities (*Directions Régionales de l'Environnement, de l'Aménagement et du Logement* – DREAL). Of the largest dams, 68 of them are subject to a special administrative procedure implemented by the competent prefect;
- the management of facilities during periods of exceptionally high water levels, in order to ensure safety at the facilities and for the surrounding communities;
- control of operational risks: changes in the level of the water bodies or the flow of watercourses downstream of the works.

EDF regularly monitors and maintains its dams, including through continuous monitoring. The real-time readings and analysis, at each site, of multiple data

(settlement, pressure, leakage measurements, combined with the visual inspection of the concrete and an inspection of the mechanical parts, etc.) enable EDF to conduct a regular assessment on the state of its dams. In Grenoble and Toulouse, EDF teams can analyse the largest dams or those dams that are the hardest to access, remotely and in real time, using a series of sensors.

Furthermore, a danger study including a complete technical examination is carried out for each of the large dams every ten years. This examination requires draining or an inspection of the submerged parts with sub-aquatic equipment. These operations are carried out under the supervision of public authorities (the DREAL office at the regional level as well as the Service technique de l'énergie électrique des grands barrages et de l'hydraulique, and STEGBH, the central French government agency specifically responsible for large dams and hydropower facilities).

At the organisational level, the Hydropower Safety Inspector prepares an annual report for the Chairman and CEO of EDF, to which he or she reports directly, as well as to those involved in hydropower safety. Issued after analyses, inspections and assessments carried out by the Hydropower Safety Inspector, this report aims to give an opinion on the level of hydropower safety of the Group's installations and provide a basis for reflection and progress to ensure its improvement and consolidation. This report is made public on the Group's website.

## 2.3 DEPENDENCY FACTORS

The EDF group does not consider itself to be dependent on any single customer.

EDF engages around 13,850 suppliers each year.

The Group Purchasing Department manages EDF's purchases, excluding fuel purchases and a portion of tertiary, IT and telecommunications purchases for certain subsidiaries. This totalled more than €7 billion in orders in 2018 (excluding suppliers belonging to the EDF Group).

In 2018, EDF's top five suppliers accounted for 10.4% (17.5% in 2017 and 16.4% in 2016) of the total amount ordered by EDF (excluding fuel purchases and Group subsidiaries), and the top ten accounted for 16.4% (23.9% in 2017 and 22.5% in 2016).

Suppliers' share of EDF purchases (excluding fuel)	2018	2017	2016
Top five suppliers	10.4%	17.5%	16.4%
The top ten suppliers	16.4%	23.9%	22.5%

The difference between 2017 and 2018 is mainly due to the fact that Framatome became a subsidiary of the EDF Group on 31 December 2017.

The top ten suppliers (in alphabetical order) in 2018 were: Alstom Power Service (General Electric Group), CAP GEMINI Technology services, Clemessy, ENDEL SAS (Engie Group), ONET Technologies TI, ORANO dismantling and services, SOPRA STERIA Group, SPIE Nuclear, Reel and Westinghouse Electrique France SAS.

Certain suppliers and subcontractors of products or services that the Group purchases in conjunction with its operations cannot be replaced, mainly in the nuclear field and, to a lesser extent, in the fields of information technology and telecommunications for specific and secure means of transmission.

EDF defines its so-called strategic suppliers through, on the one hand, their non-substitutability and, on the other hand, the volume of purchases.

The EDF group has developed expertise as an architect-builder of its power generation plants and as a nuclear fuel cycle integrator, which gives EDF technical expertise that is independent of that of its suppliers.

Lastly, the EDF group historically had very important commercial relations with the AREVA group, which worked on each stage of the nuclear fuel cycle and in the design, construction and maintenance of the nuclear boilers in EDF's fleet. In France, the AREVA group was EDF's main supplier in the nuclear sector and EDF was the AREVA's group's main customer. Since 31 December 2017, the activities of AREVA have been split in two: they are carried on partly by Orano, for the fuel cycle and by Framatome, a subsidiary of EDF, for the design, manufacture and maintenance of the boilers in the nuclear generation fleet. The situation of interdependency in relation to the entities of the Orano group remains today.

### 2.3.1 NUCLEAR FUEL CYCLE

The relationship between EDF and the Orano Group with respect to the fuel cycle is governed by multi-year contracts.

For the upstream nuclear fuel cycle, all types of fuels included (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues" – "The upstream cycle"), EDF relies heavily on the Orano group, which in 2018 accounted for around 34% of EDF's purchases, with Framatome accounting for 17% (compared to 52% in 2017 for the AREVA-Orano group as a whole):

- for its natural uranium requirements, EDF pursues a policy aimed at diversifying its sources of supply in terms of origins and suppliers. The Orano Group remains an important supplier to EDF in this field;
- in terms of the nuclear conversion process, a significant share of EDF's requirements are met by Orano, in competition with other worldwide suppliers;
- in the field of uranium enrichment, EDF has also diversified its supply sources and now uses several major worldwide suppliers. Orano's Georges Besse II plant provides a significant share of these services (see section 1.4.1.1.4 "Nuclear fuel cycle and related issues").
- for the manufacture of fuel assemblies, EDF uses two suppliers: Framatome and Westinghouse.

For the back-end nuclear fuel cycle (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues" – "The back-end cycle"), the Orano group has been appointed to perform all operations in France:

- spent fuel management operations (removal, immediate storage and processing) are carried out in the Orano plant at The Hague. The terms and conditions for these operations, as well as the recycling of processing by-products, have been agreed for the 2008-2040 period in the EDF-Orano master agreement of 19 December 2008 and included in successive application contracts (see note 29.1.1 to the consolidated financial statements for the fiscal year ended 31 December 2016). The contract for 2016-2023 was signed in February 2016 (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues" – "Front end");
- recycling, which covers the manufacture of MOX fuel, is carried out in Orano's MELOX plant.

### 2.3.2 POWER PLANT DEVELOPMENT AND MAINTENANCE

Framatome is EDF's main supplier of power plant construction and maintenance services. In particular, Framatome supplies nuclear boilers, their spare parts and the corresponding safety studies. In 2011, EDF signed two major contracts with Framatome, one for the production of 32 of the 44 steam generators for the 1,300MW segments, and the other for the renovation of the control-command systems for the 1,300MW reactors at the time of their third ten-year inspection. The production of the steam generators covered under the first contract is underway, although quality defects in the projects delay the installation of new components on the installations. The first installation for the second contract was undertaken in 2015, on Unit 2 of the Paluel power plant. It was completed in 2018, given the incident that occurred in March 2016 at this facility (a used steam generator fell during handling. See section 1.4.1.1.2 "Operation and technical performance of the nuclear fleet"). The renovation of the command and control systems, the subject of this contract, has since been successfully completed on the Paluel 1 and 3, Cattenom 1 and 2, and Saint Alban 1 and 2 units and is nearing completion on Flamanville 1. Moreover, a diversification programme has been under way for several years, in particular, with Westinghouse and Mitsubishi, for the replacement of certain major components of the boiler (12 of the 44 steam generators for the 1,300MW series will be provided by Westinghouse) and for maintenance services. The last 900MW (4 triplets) replacement steam generators were ordered from Mitsubishi in 2018.

To prepare for the renewal of its power generation facilities, EDF has decided to use the EPR technology developed with Framatome, and has initiated construction of the Flamanville EPR power plant. In connection with this project, in 2007, EDF signed a contract with Framatome for the supply of the EPR boiler.

EDF also has a relationship with the GE Group for the maintenance of certain components of its nuclear and fossil fuel-fired power plants. In addition, GE (ALSTOM) is supplying the engine room for the Flamanville 3 EPR. The goods and services that GE supplies to EDF are particularly important for the maintenance of the nuclear power plants' turbo-generators and of certain major components of the thermal fleet.

EDF does not consider itself to be dependent on the GE Group, which is subject to competition with regard to most of its activities. EDF has nonetheless sought to maintain its interests in the nuclear field following the purchase by General Electric of ALSTOM'S Energy division. The main challenge for EDF is twofold:

- ensure, at an acceptable cost and until the end of each unit's lifespan, the industrial capacity necessary to maintain under operational conditions and extend the lifespan of the nuclear generation fleet operated by EDF in France and the United Kingdom including the Flamanville 3 and Hinkley Point C EPR reactors;
- ensure the availability for future EDF nuclear projects of turbine offers under excellent technical and economic conditions.

Preservation of these strategic interests relies on framework agreements and the creation of the joint GEAST nuclear subsidiary dedicated to nuclear power plant machine room activities. The agreement between the French State, ALSTOM and General Electric (GE) signed on 21 June 2014 provides for a joint venture between GE and ALSTOM (GEAST), of which ALSTOM will hold 50% of the stake less one vote. GEAST is expected to develop ALSTOM's nuclear activities on an exclusive and worldwide basis, as well as ALSTOM's steam (non-nuclear) business in France alone. The French State holds a "golden share" in the joint venture, is represented therein by a director and has veto rights on certain governance issues. In 2018, GE acquired ALSTOM's shares in GEAST at ALSTOM's request. It is now a wholly owned subsidiary of GE. The rights of the State and the associated governance procedures remain unchanged. A steering committee with which EDF is associated monitors GEAST's activities and the proper implementation of these agreements.



## 2.4 LEGAL PROCEEDINGS AND ARBITRATION

In the ordinary course of its business, the Group is involved in certain legal, arbitration and administrative proceedings. Charges that result from such proceedings are only provided for where such charges are likely and can be either quantified or assessed within a reasonable range. In the latter case, the amount of the provision is calculated on a case-by-case basis, based on the best possible estimate. The amounts of any provisions made depend on the case-by-case risk assessments and do not depend primarily on the status of the proceedings; however, developments in the proceedings may nonetheless lead to a reassessment of such risks.

To the knowledge of the Company, except for the proceedings set out below, there are no other administrative, legal or arbitration proceedings (including pending or threatened proceedings), likely to have or having had in the past 12 months a material impact on the financial situation or the profitability of the Company and/or the group.

### 2.4.1 LEGAL PROCEEDINGS INVOLVING EDF

#### French Utilities Network (Réseau d'alimentation général – "RAG")

In October 2002, the European Commission initiated proceedings against France, claiming that State aid had been granted to EDF when its balance sheet was restructured on 1 January 1997. By a decision dated 16 December 2003, the European Commission set the principal amount of aid to be repaid at €889 million. On 11 February 2004, the French State issued a collection note for €1,224 million which covered the principal amount and interest. This amount was paid by EDF. On 27 April 2004, EDF initiated an action before the European Union General Court, at the time known as the European Court of First Instance, to annul the European Commission's decision. The European Union General Court issued, on 15 December 2009, a ruling annulling the European Commission's decision of 16 December 2003, holding that when making its decision, it should have applied the informed market economy investor test to determine whether or not the action constituted State aid. As this ruling was binding on both parties, the State repaid €1,224 million to EDF on 30 December 2009. On 26 February 2010, the European Commission filed an appeal against the European Union General Court's ruling before the Court of Justice of the European Union. By order dated 5 June 2012, the Court of Justice rejected the appeal by the European Commission and confirmed the order of the European Union General Court of 15 December 2009.

On 2 May 2013, the European Commission decided to reopen its investigation in order to check whether the State had acted as an informed market economy investor under the tests established by the European courts. On 22 July 2015, the European Commission issued a new decision ruling that the tax treatment of the provisions created between 1987 and 1996 for the renewal of the RAG facilities constituted incompatible State aid, considering that the tax exemption granted to EDF could not be treated as an investment for economic reasons. Following this decision, the State ordered EDF to repay the amount of the aid granted plus interest in accordance with the terms decided by the European Commission, corresponding to a total amount of €1.38 billion.

EDF has formally acknowledged this decision and repaid the sums demanded. However, the Group disputes the existence of unlawful State aid and on 22 December 2015, it initiated a new action for annulment before the European Union General Court. On 19 April 2016, the State became involved in these proceedings, in support of EDF. By a ruling dated 16 January 2018, the European Union General Court rejected this action and confirmed the decision of the European Commission.

On 27 March 2018, EDF appealed to the Court of Justice of the European Union against the judgement delivered on 16 January 2018 by the Court of First Instance of the European Union. On 13 December 2018, the Court of the European Union dismissed this appeal, thus confirming the European Commission's decision and definitively closing the dispute.

#### Competitive bidding for hydroelectric concessions in France

The Directorate-General for Competition of the European Commission (EC) has issued proceedings against the French State with respect to hydroelectric concessions in France, under Article 106, chapter 1 of the Treaty on the Functioning of the European Union (TFEU) combined with Article 102 of the same treaty.

The European Commission therefore sent a formal notice to the French State on 22 October 2015, stating that it considered the fact that most hydropower concessions in France are attributed to and reserved for EDF as a violation of the above articles, since these measures reinforce EDF's dominant position on the French retail electricity markets.

The State has replied to the formal notice, which marked a new adversarial exchange between the State and the EC, which does not affect the final decision that will be adopted by the EC. As the principal interested party, EDF received a copy of this notice. It sent the EC its observations in response to the notice on 4 January 2016, firmly contesting the EC's analysis and the grounds on which it is based.

Discussions between the European Commission and the French State and EDF are still ongoing.

#### Asbestos

In the past, EDF has used products containing asbestos. Thus, certain employees, in particular those working in fossil-fired power plant maintenance, may have been exposed to asbestos, principally before such asbestos was replaced or protective measures were implemented by EDF from the late 1970s.

Between 1997 and 31 December 2018, EDF and Enedis have been party to 694 inexcusable fault (*faute inexcusable*) actions in France in relation to the alleged exposure of its employees to asbestos in their workplace. Establishing a liability in such an action could lead to the payment of additional compensation by the employer to the victims or their legal successors.

As at the end of January 2019, there were 91 ongoing litigation cases, of which 16 for Enedis.

The cumulative amount of the final judgments against EDF in litigation cases relating to the inexcusable fault of the employer amounted to around €33.16 million as at 31 December 2018.

The number of cases of litigation initiated has stabilised since 2010 and since 2016 has been trending down (less than 20 new cases each year). Accordingly, there should not be any significant variations in the financial burden for the CNIEG (Pension fund for Electricity and Gas Industry companies). A €10 million provision was created in EDF's financial statements to cover the financial risk.

#### Solaire Direct

On 17 December 2013, the Competition Authority (ADLC) fined the EDF group €13.5 million for practices constituting an abuse of dominant position which, the ADLC felt, allowed it to favour its subsidiaries operating in the photovoltaic sector to the detriment of other market players. The ADLC criticised the fact that EDF had made various material and non-material resources available to its subsidiaries which could not be reproduced by competitors (in particular, the Bleu Ciel® brand, trademark and logo and customer data), thereby creating confusion among customers between its role as an electricity supplier subject to regulated rates and the role of its subsidiaries operating in the photovoltaic sector. EDF had lodged an appeal against this decision before the Court of Appeal in Paris.

On 21 May 2015, the Court of Appeal in Paris partially reversed the ADLC's decision and set aside the fine relating to the use of EDF's trademark and logo for the 2009-2010 period along with the increased fine for repeated breaches. Ultimately, the fine has thus been reduced from €13.5 million to €7.9 million.

The ADLC and EDF appealed to the Court of Cassation. By a ruling dated 27 September 2017, the Court of Cassation rejected EDF's arguments on appeal and annulled the 2015 ruling of the Paris Court of Appeal in that it dismissed the aggravating circumstance arising from repeated breaches. The Court of Cassation therefore referred the case back to the Paris Court of Appeal on the single question of determining the increase in the fine due to repeated breaches. In a decision dated 27 September 2018, the Paris Court of Appeal confirmed to EDF the increase of the fine by €1.9 million for recidivism. This decision, stipulating a fine of €7.9 million, is now final.

### Litigation by photovoltaic operators for compensation

On 13 May 2014, Solaire Direct issued proceedings against EDF, EDF EN, EDF ENR and EDF ENR Solaire before the Commercial Court in Paris seeking compensation for the damage it claims to have suffered as a result of the practices condemned by the ADLC in its decision issued on 17 December 2013, assessed by Solaire Direct at €8.7 million. On 16 December 2014, the Court ordered a stay of proceedings pending the judgment to be issued by the Court of Appeal in Paris on EDF's appeal against the above-mentioned ADLC decision. In a judgement dated 21 February 2017, the Commercial Court ordered a new stay of proceedings until the ruling of the Court of Cassation on the appeal filed by the ADLC against the decision dated 21 May 2015. The Court of Cassation gave its ruling (see the "Solaire Direct" dispute above) and the case was re-entered on the case list and Solaire Direct estimates its damages at €5.2 million. These proceedings are still pending.

On 11 December 2014, Apem Énergie, Arkeos, Biosystem-AD, Cap Eco Énergie, Cap Sud, Isowatt, PCI-m, Photen and Sol'Air Confort started proceedings against EDF, EDF ENR and EDF ENR Solaire before the Commercial Court in Paris on the same grounds. They claim alleged damages of €18.3 million. By judgement dated 27 September 2017, the court rejected the action of the plaintiffs on the grounds of limitation of action by lapse of time. Only six of the eleven companies appealed the decision. Total damages and interest claimed now stand at €9.4 million. These proceedings are still pending.

### Photovoltaic producers litigation

The announcement by the public authorities in autumn 2010 of an upcoming decrease in photovoltaic electricity purchase prices triggered a massive increase in requests for connections (this rush being explained by the fact that the date on which a full application was submitted would then determine the applicable price). Several successive ministerial orders were then issued reducing purchase prices.

As these reductions were not sufficient to stem the rush of applications for contracts, the government, by decree dated 9 December 2010, suspended the conclusion of new contracts for a period of three months and stated that if the financial and technical proposal for a request had not been approved before 2 December 2010, a new connection request would need to be submitted at the end of this three-month period.

In this context, a number of producers, having lost their right to the feed-in tariff in force before the moratorium, have instituted compensation proceedings against EDF distribution network operator (DNO) in the non-interconnected zones (NIZ) and Enedis, DNO in metropolitan France, on the grounds that the DNOs did not issue the technical and financial proposals relating to the connection within a time frame which would have enabled them to benefit from the more advantageous electricity purchase conditions (see section 2.4.2 "Procedures concerning EDF subsidiaries and holdings - Enedis")

By order dated 15 March 2017, the European Court of Justice confirmed that the orders of 10 July 2006 and 12 January 2010 fixing the purchase prices of electricity of photovoltaic origin constituted "intervention by the State or through the resources of the State", one of the four criteria for qualifying as state aid. It reiterated that such aid measures implemented without having been previously notified to the Commission are illegal. It is now for the national jurisdictions to implement the consequences of this, particularly by ruling out the application of these illegal orders.

Several decisions in favour of Enedis have been issued since the beginning of 2018 on this subject. In particular, the Versailles Court of Appeal dismissed, at the beginning of July 2018, 150 producers, either because Enedis' fault has not been established or because there is no causal link between Enedis' fault and the producers' prejudice, or by considering that the prejudice of producers is not compensable in so far as the 2006 and 2010 tariff orders are illegal, in the absence of notification to the European Commission under the control of State aid. A large majority of rulings have been appealed to the Court of Cassation.

Similarly, EDF has obtained a number of favourable decisions in recent months considering the damage to producers as irreparable because it is illegal.

In parallel with the indemnity disputes pending before the civil courts, EDF and Enedis solicited the benefit of their Civil Liability insurance policy. Insurers refused to apply their guarantee. The Court of Cassation ruled in a decision dated 9 June 2015, (Green Yellow) that Enedis' liability was to be covered by its insurers and that the DNO was liable. Following this judgement, Enedis and EDF summoned the insurers in April 2017 to have the existence of two partial serial claims recognised by the courts. Hence, if the courts confirmed the existence of two partial serial claims, there would be a single deductible and coverage cap for each of them for claims with the same technical cause.

### SUN'R

On 21 June 2012, SUN'R filed a complaint against EDF and Enedis, along with an application for protective measures (mesures conservatoires), with France's ADLC. SUN'R accused Enedis of delays in the procedure for the connection of its photovoltaic facilities and EDF of delays in the implementation of the mandatory purchase contracts and the payment of the related invoices. In addition, according to SUN'R, EDF ENR benefited from special treatment for the connection of its facilities by Enedis and the payment of its invoices by EDF.

In a decision of 14 February 2013, the ADLC issued a decision rejecting all the applications for protective measures made by SUN'R but the proceedings on the merits are still ongoing.

On 12 January 2018, ADLC's investigation services sent to the parties a discharge proposal, concluding that there were no anti-competitive practices by EDF, Enedis and RTE. On 4 July 2018, the ADLC closed the proceedings with a decision dismissing the case. At the same time as its complaint before the ADLC in 2012, SUN'R filed on 29 August 2012 a petition at an urgent applications hearing for expert assessment and provisional damages before the Administrative Court in Paris including a claim for provisional compensation of €1 million for EDF and €2.5 million for Enedis. By order of 27 November 2012, the urgent applications judge (juge des référés) at the Administrative Court in Paris dismissed this petition.

On 30 April 2015, SUN'R summoned Enedis and EDF SA before the Commercial Court of Paris seeking compensation for the loss allegedly caused to it by the delays in the procedure to connect its proposed solar energy plants to the electricity distribution network. It has asked the Court to stay the proceedings and claims, pending ADLC's decision on the merits of the case, a provisional amount of €10 million to be applied against its loss. In a judgment issued on 7 November 2016, the Commercial Court in Paris dismissed SUN'R's application for provisional damages and issued a stay of proceedings pending ADLC's decision on the merits of the case.

On 24 November 2015, Sun West, Azimut 56 and JB Solar initiated proceedings against Enedis and EDF before the Commercial Court of Paris on the same grounds. They are currently claiming almost €4 million to compensate their alleged loss but have asked the Court to stay the proceedings pending ADLC's decision on the merits of the case. In a judgement dated 4 December 2017, the Paris Commercial Court dismissed the application by Sun West, Azimut 56 and JB Solar for provisional damages and issued a stay of proceedings pending ADLC's decision on the merits of the case.

This decision was rendered on 4 July 2018, the date on which the ADLC adopted a decision to dismiss the case (definitively). The behaviours denounced by the distraining party are therefore deemed not to have been adopted.

The Commercial Court of Paris, by its ruling dated 10 December 2018, acknowledged SUN'R's withdrawal from its indemnity action and by its ruling dated 12 December 2018, acknowledged the withdrawal of Sun West, Azimut 56 and JB Solar. This case is therefore definitively closed.

### Eole Miquelon

On 20 July 2015, Eole Miquelon filed a complaint with ADLC on the practices implemented in the electricity industry in Miquelon.

Eole Miquelon operates a wind farm on the island and claims that EDF has restricted the use of wind energy produced from its facilities in order to give preferential treatment to the electricity it produces directly. Eole Miquelon claims it will be forced to close its operations on the island because of these practices. On 31 January 2018, the ADLC adopted a decision acknowledging the withdrawal of the distraining party and closing the case.

### Xélan

On 17 October 2016, Xélan brought a claim before the French Competition authority (Autorité de la concurrence) alleging mainly that EDF's refusal to share the consumption data of clients at regulated selling prices prevented Xélan from designing its own electricity supply offers based on energy consumption management. Following the filing of this claim, the Competition authority carried out on 22 and 23 November 2016 search and seizure operations at the premises of EDF and several of its affiliates. These operations do not in any way, however, prejudice the question as to whether there exists a violation that could be attributed to the EDF group. EDF and its subsidiaries filed appeals with the Court of Appeal of Versailles to challenge these search and seizure operations. By order of 12 April 2018, the President of the Versailles Court of Appeal dismissed the appeals relating to the order authorising access and seizure operations and stayed the appeal proceedings against the conduct of the operations. By order of 10 January 2019, the President of the Court of Appeal of Versailles dismissed the appeal against the conduct of the operations.

### CSPE ceiling investigation

On 27 March 2014, the European Commission opened an in-depth investigation into the reductions on the Contribution to the Public Electricity Service (CSPE) granted to large energy consumers and self-generators based on State aid rules. As an interested third party, EDF submitted its comments on the decision to the European Commission, following its publication in the *Official Journal of the European Union* on 3 October 2014.

By decision dated 31 July 2018, the EC considered that the exemptions from CSPE granted for self-consumption for electricity generation, of which EDF is one of the beneficiaries under its STEP, do not constitute State aid. Other CSPE capping mechanisms, on the other hand, have been qualified as State aid incompatible with the internal market, but this has no impact on EDF, which is not a beneficiary.

### Labour litigation

EDF is a party to a number of labour lawsuits relating in particular to working time. EDF does not consider that any of these lawsuits, taken individually, is likely to have a significant impact on its financial results or its financial position. However, as these disputes relate to situations that could involve a significant number of EDF's employees in France, if they were to multiply, they could then potentially have a significant negative impact on the Group's financial position, even though this risk is mitigated by the signature in 2016 of the agreement on the annualised calculation of working time by days.

### Environmental litigation

Due to its industrial activities, the Group is a party to various environmental lawsuits, in particular, regarding ground decontamination. As of the date of the filing of this Reference Document, the Group does not believe that any of these lawsuits, individually, is likely, in the event of an unfavourable outcome, to have a material negative impact on the Group's financial position.

### Tax disputes

For the period 2008 to 2015, EDF received proposals for adjustments related notably to the tax deductibility of certain long-term liabilities. This adjustment, reiterated each year, represented a combined corporate tax financial risk of around €563 million at the end of 2018. By two judgements in September 2017, the Administrative Court of Montreuil recognised that these liabilities were tax-deductible and validated the position adopted by the Company.

For fiscal years 2012 to 2015, the tax authorities notified the Company of certain recurrent adjustments concerning the contribution on value added by companies and challenged the deductibility of certain long-term provisions.

### Vent de Colère

Following the appeal lodged by the non-profit Vent de Colère against the order issued on 17 November 2008 setting the price at which wind-generated electricity is purchased, the Council of State stayed the proceedings and submitted a reference for a preliminary ruling to the Court of Justice of the European Union (CJEU) on whether the mechanism for financing the obligation to purchase electricity based on CSPE (Contribution au service public de l'électricité – Contribution to the Public Electricity Service) is to be regarded as an intervention by the State or through State resources within the meaning of, and for the application of, the provisions of the TEU relating to State aid.

On 19 December 2013, the Court issued its decision and confirmed that *"the new mechanism for offsetting in full the additional costs imposed on undertakings because of an obligation to purchase wind-generated electricity at a price higher than the market price that is financed by all final consumers of electricity (...) constitutes an intervention through State resources"*.

In a judgement issued on 28 May 2014, the Council of State set aside the order issued on 17 November 2008 on the grounds that the prices it sets constitute State aid that had not been notified to the European Commission prior to its implementation. As an alternative, on 17 June 2014, the Ministry of the Environment, Energy and the Sea signed an order setting the conditions for the purchase of wind-generated electricity produced on land. This new legislation restates the conditions for the purchase of wind-generated electricity stated in the 2008 order and the impact on the CSPE remains the same. The order of 17 June 2014 was appealed before the Council of State, which dismissed the appeal in a judgement handed down on 9 March 2016, in which the court held that this new order did not need to be notified to the European Commission, and also dismissed the claim that the rate of return awarded to wind-power producers for their locked-in capital was too high.

In an opinion issued in the Praxair case on 22 July 2015, the Council of State ruled that the income from the CSPE does not have a direct impact on the amount of the aid granted to producers using renewable energy. It inferred that the CSPE could not be treated as an integral part of the mechanism used to support the wind-power sector that was held to be unlawful in the Vent de Colère judgment issued on 28 May 2014 or any other mechanism used to support renewable energy. In a judgement issued on 23 February 2016, the Administrative Court of Appeal of Paris, applying the opinion issued by the Council of State, dismissed the CSPE repayment claims filed by Praxair. The company Messer France, representing the interests of Praxair, appealed this decision. By decision dated 22 February 2017, the Council of State decided to stay proceedings until the CJEU has given its opinion on the questions referred to it for a preliminary ruling on the compatibility of the CSPE with the directives laying down the general excise duty regime (92/12/EEC of 25 February 1992 and 2008/118/EC of 16 December 2008) and the framework for the taxation of energy products and electricity (2003/96/EC of 27 October 2003).

In a ruling dated 25 July 2018, the CJEU held that the CSPE could be qualified as a direct tax for specific purposes compatible with EU law, solely for the percentage of its income intended to finance electricity generation from renewable energy. Applying the solution adopted by the CJEU, the Council of State, in a decision dated 3 December 2018, considered that the revenues of CSPEs whose reimbursement Messer claimed had been allocated as a matter of priority renewable energy support and co-generation in mainland France and in non-interconnected zones and estimated that only the fraction of CSPEs that had not been allocated to that specific purpose could be returned to the applicant (i.e. in this case, 7.42% of the contribution paid in respect of 2009).

In addition, in a decision issued on 15 April 2016, the Council of State ordered the State to pay a €10,000 penalty for non-compliance per day late, if it failed to prove, within six months, that it had done everything necessary to enforce the decision issued on 28 May 2014 by sending an invoice to each producer that had received support between the date of the order (17 November 2008) and the date of the decision issued by the Commission (27 March 2014) for the interest calculated on the state aid paid during this period.

The collection notes have been received by the relevant project owner within the remit of EDF EN and on 15 December 2016, €4.5 million (for EDF EN's fraction) was paid as interest on the sums held to constitute State aid.

## SHEM

In order to ensure water supplies for the Canal des Nestes, concessionaires and operators of facilities located upstream (EDF and SHEM) are bound by regulatory obligations requiring them to release certain volumes of water each year ("agricultural releases"). Under an "agricultural releases agreement" dated 1 December 2003, EDF and SHEM agreed the technical and financial arrangements for the releases to be carried out by SHEM, on behalf of EDF and against payment.

From October 2010 onwards, as the allocation of the facilities between EDF and SHEM had been modified by the State in SHEM's favour following the renewal of hydroelectricity concessions, the State modified the allocation of the facilities currently affected by agricultural release obligations. As none of the facilities currently operated by EDF are affected by these obligations, EDF felt that the above-mentioned agreement dated 1 December 2003 had ceased to serve any purpose and therefore it rejected SHEM invoices for a total amount of €14.9 million exclusive of tax.

In October 2016, SHEM issued proceedings against EDF with the Commercial Court in Paris to obtain the payment of these invoices, as the administrative court had ruled that it lacked jurisdiction to hear the dispute. The case was argued on 4 October 2018.

In accordance with EDF's position, by a ruling handed down on 30 November 2018, the Court declared the agreement null and void and dismissed SHEM's claims in their entirety. SHEM has appealed against this decision.

## Action against the final investment decision for the project Hinkley Point C

Authorised in an order issued on 20 June 2016, EDF SA's central works council (hereinafter the "CCE") filed an urgent application against EDF with the Presiding Judge of the High Court of Paris, to be heard on 22 September 2016. In particular, the CCE asked the Presiding Judge of the Regional Court in Paris, ruling in urgent proceedings, to order EDF to provide a certain number of documents and/or information to the CCE, to extend the consultation period for EDF's CCE and to order EDF not to implement the Hinkley Point C project, and this was challenged by EDF. In a decision issued on 27 October 2016, the Presiding Judge of the High Court in Paris, ruling in urgent proceedings, held that the applications filed by the CCE were inadmissible and ordered it to pay €1,500 to EDF SA under Article 700 of the French Code of Civil Procedure. The CCE appealed this decision and a hearing took place before the Court of Appeal in Paris on 9 March 2017. A preliminary ruling on constitutionality (question prioritaire de constitutionnalité – QPC) challenging the compatibility of the law no. 2013-504 dated 14 June 2013 regarding employment protection which sets the conditions under which procedures for the information and consultation of employees representatives have to be conducted in this type of cases has been filed by the CCE. By decision dated 17 May 2017, the Court of Appeal ruled that the QPC raised by the appellants was not lacking in serious character, but did not send it to the Court of Cassation, as it had already had a QPC referred to it on the same question and therefore decided to stay the proceedings while waiting for its decision. The Constitutional Council, in its decision of 4 August 2017, validated the provisions of the French Labour Code that were disputed relative to the prearranged deadline. The proceedings were therefore resumed before the Paris Court of Appeal which, in a judgement dated 7 September 2018, ordered EDF to (i) transmit the full version of Escatha's report within one month of notification of the decision, subject to a penalty payment of €1,000 per day of delay recorded after the expiry of the deadline; and (ii) to convene the CCE "for an extraordinary meeting for consultation on the Hinkley Point C project within two months of the notification of the decision under the same penalty payment", and (iii) to pay all costs and €3,000 under Article 700 of the NCPC. However, the Court did not follow the ECC in its other requests. In particular, it did not order the suspension of the project, which can therefore continue. EDF executed the decision and filed an appeal in cassation.

## Greenpeace

Greenpeace declared that on 24 November 2016, it lodged a complaint against EDF and its Chairman & Chief Executive Officer with the National Financial Prosecutor for market-related offences, claiming that they presented an inaccurate balance sheet and disseminated misleading information. This complaint was lodged following the work conducted by AlphaValue on EDF's position, at the request of Greenpeace.

EDF challenged AlphaValue's findings and noted that its accounts had been audited and certified by its Statutory Auditors and that the cost of decommissioning its operational nuclear facilities had also been audited on behalf of the Ministry of the Environment, Energy and the Sea, a summary of which had been published on 15 January 2016, which on the whole backed up the Company's estimates.

EDF lodged a criminal complaint on 25 November 2016 to draw the consequences of these false allegations and misleading information.

## Referral to the Paris Commercial Court by AET

Within the framework of a 20-year basic electricity supply agreement entered into on 20 December 2007, for an annual capacity of 70MW, Azienda Elettrica Ticinese ("AET"), a public company of the Canton of Ticino asked the court to order a renegotiation of energy prices, claiming that the market prices had fallen below the prices agreed in the agreement since 2014 and at certain periods.

As the prices in the agreement were non-negotiable and there was no hardship clause, EDF proposed to adjust the prices, in compliance with the original economic balance, stressing that it was under no obligation to renegotiate the prices.

On 12 April 2016, AET issued proceedings against EDF with the Commercial Court in Paris, after the negotiations failed to result in a settlement. The Paris Commercial Court gave a decision on 4 December 2017 in favour of EDF rejecting the claims in their entirety. AET has appealed against this decision. The case is pending before the Paris Court of Appeal.

Also, AET summonsed EDF on 9 November 2017 in relation to the same contract to claim a share in the benefits of 70MW capacity mechanism. The Paris Commercial Court gave a decision on 22 January 2019 in favour of EDF rejecting the claim of AET.

## AMF investigation

Since 21 July 2016, EDF has been the subject of an investigation by the AMF into the financial information provided to the markets since July 2013. As part of this investigation, EDF has provided the AMF with certain information and a number of documents and responded to its questions. To the best of EDF's knowledge, this investigation is still ongoing and in no way implies a breach that could be attributed to the EDF Group.

## CRE/REMIT investigation

On 1 December 2016, the CRE (Energy Regulation Commission) launched an investigation into whether EDF and its subsidiaries EDF Trading Limited and EDF Markets Limited were guilty of engaging, since 1 April 2016, in practices that could constitute breaches of the provisions of regulation (EU) no. 1227/2011 of 25 October 2011 on wholesale energy market integrity and transparency (REMIT). The CRE informed EDF by letter dated 5 July 2018 that it had referred the matter to the Settlement of Disputes and Sanctions Committee (CoRDis).

On 1 December 2016, the CRE opened another investigation aiming to determine whether EDF and its subsidiaries EDF Trading Ltd. and EDF Markets Ltd. engaged in practices, from 1 January 2014, that could constitute breaches of the provisions of the REMIT regulation.

On 14 December 2017, the CRE also opened a third investigation aiming to establish whether EDF and any other person that may have been related to it engaged in practices, from 1 January 2017, that could constitute breaches of the provisions of regulation (EU) no. 1227/2011 dated 25 October 2011 on wholesale energy market integrity and transparency (REMIT).

They do not in any way mean that an offence has been committed that could be attributed to the EDF group.

## Re-commissioning of nuclear reactors no. 2 in Gravelines, no. 3 in Dampierre and no. 3 in Tricastin

Since 2015, following the detection of a flaw on the head domes of the Flamanville EPR vessel, EDF has carried out analyses on nuclear reactors in operation at the request and under the control of the ASN. These tests were designed to ensure that the channel heads (meaning the bottom part) of the steam generators used for the 18 reactors of the 900 or 1,450MWe series operated by EDF are not affected by flaws similar to those discovered in the Flamanville EPR vessel, namely a high carbon content that could affect their mechanical toughness. During the inspections of the steam generators, carbon concentrations were detected in some parts, and only some parts, of twelve reactors equipped with channel heads manufactured by the Japanese company JCFC (Japan Casting and Forging Corporation). These reactors include those at the Gravelines (no. 2), Dampierre (no. 3) and Tricastin (no. 3) nuclear power plants. After several controls conducted by EDF during scheduled shutdowns of these reactors and the provision of additional technical information to ASN proving the fitness for service of the channel heads of these steam generators, ASN consented to the restarting of each of the above-mentioned reactors.



## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Legal proceedings and arbitration

In three urgent applications filed with the Council of State on 23 December 2016 along with an ultra vires application (recours en excès de pouvoir), the "Observatoire du Nucléaire" association asked the court to suspend the effects of the ASN's consent to the restarting of the three reactors referred to above. As per ordinance dated 18 January 2017, the Council of State dismissed these urgent applications. After an investigation at the bar, the Council of State rejected the non-profits' requests by the decision of 3 October 2018.

#### Flaws affecting nuclear power stations

Following the discovery of a flaw affecting a steam generator in Fessenheim reactor 2 manufactured at the factories in Le Creusot (AREVA NP), Greenpeace and six other associations lodged a complaint against EDF and AREVA NP with the Public Prosecutor's Department in Paris on 14 October 2016 for four offences, including use of falsified documents, reckless endangerment and late reporting of an incident. In parallel, on 4 May 2016 the "Observatoire du Nucléaire" association filed a complaint with the Public Prosecutor's Department in Chalon-sur-Saône for forgery, use of falsified documents and endangerment against AREVA following the audit conducted on the activities of the factory in Le Creusot which revealed, in particular *"irregularities in the manufacturing control process for approximately 400 parts produced since 1965, around fifty of which appear to be in service in nuclear power stations in France."* ASN also declared that on 25 October 2016, it had reported the irregularities discovered at the factory in Le Creusot to the Public Prosecutor's Department in Chalon-sur-Saône under Article 40 of the French Code of Criminal Procedure (Code de procédure pénale).

#### Flamanville 3 – action against the modified decree giving construction approval

Three appeals have been filed against the amended construction authorisation decree for Flamanville 3. The first two were filed on 23 May 2017, before the Council of State, and were initiated by several non-profit organisations (one by CRILAN and the other by "Notre Affaire à tous") directly against the decree of 23 March 2017 amending the construction authorisation decree for Flamanville 3 and changing the commissioning time limit. In a decision dated 28 March 2018, the Council of State rejected the two applications and ordered each of the associations to pay €2,000 to EDF.

The third appeal was filed on 21 August 2017, also before the Council of State, by several non-profit organisations including Greenpeace, CRILAN and "Notre Affaire à tous" against the implicit refusal of the Prime Minister to revoke the amended construction authorisation decree for Flamanville 3. The investigation is still ongoing.

#### Flamanville 3 – action against the opinion of the Nuclear Safety Authority dated 10 October 2017

On 30 November 2017, several associations, including the "Sortir du nucléaire" network and Greenpeace France, introduced proceedings before the Council of State to request the cancellation of the opinion by the Nuclear Safety Authority dated 10 October 2017 relative to the anomaly in the steel in the bottom and lid of the Flamanville 3 reactor vessel. The Nuclear Safety Authority considered that this anomaly was not likely to compromise the commissioning of the reactor vessel providing specific checks were carried out during the operation of the facility.

On 27 November 2018, these same non-profits lodged a new appeal with the Council of State against the ASN's decision of 9 October 2018 on the Flamanville 3 vessel (see section 1.4.1.2.1 "Flamanville 3 EPR project"), a decision that follows on from the above-mentioned opinion of 10 October 2017.

#### Flamanville 3 - Petition from Greenpeace and the "Sortir du Nucléaire" Network

Greenpeace and the "Sortir du Nucléaire" Network jointly filed a complaint with the Cherbourg Public Prosecutor's Office on 18 July 2018 against EDF (operator), Framatome (manufacturer) and "X" for various violations of the Environmental Code and the regulations relating to basic nuclear facilities due to welding problems observed on the Flamanville site.

#### Fessenheim

On 14 March 2017, the Association Trinationale de Protection Nucléaire (ATPN), began proceedings before the Council of State to request the cancellation, firstly, of decision no. 2016-DC-0551 by the Nuclear Safety Authority dated 29 March 2016, setting the instructions relative to the procedures for the sampling and consumption of water, the discharge of effluents and monitoring the environment at the Fessenheim power plant and, secondly, of decision no. 2016-DC-0550 by the Nuclear Safety Authority setting the limit values for discharges to the environment of effluents from the same facility.

In its ruling of 14 June 2018, the Council of State partially annulled the above-mentioned decision setting the limit values for effluent discharges on the grounds that the derogations granted had not been justified. However, the Council of State stated that "in view of the economic and energy value of the operation of Fessenheim and the fact that the temporary maintenance in force of the limit values annulled by this decision, for the sole reason of a lack of motivation, does not entail any particular risk for the interests referred to in Article L. 593-1 of the Environment Code (...)" EDF is authorised to discharge the effluents in question into the environment in compliance with the cancelled limit values until the ASN takes a new decision setting new values by 1 October 2018 at the latest. The decision in question was adopted by the ASN on 17 July 2018 and approved two months later. For the rest, the Council of State rejected all the other pleas in law and the application for annulment of the above-mentioned decision relating to the sampling methods.

A second appeal was lodged on 15 May 2018 by the ATPN, this time against the decision of the President of the Nuclear Safety Authority dated 25 July 2016 by which he authorised EDF to significantly modify the elements that led to the authorisation to create the site. It is now up to the Council of State to decide on this request, which is currently under investigation.

Finally, by an order dated 14 June 2018, the Council of State rejected the application for interim measures filed by the ATPN to request the suspension of the ASN's decision of 12 March 2018 lifting the suspension of the Fessenheim HS test certificate granted to Areva NP. It is now up to the Council of State to decide on the merits of this request, which is currently under investigation.

#### Regulated electricity sales tariffs – appeal against the decision of 27 July 2018

On 28 September 2018, ENGIE lodged an appeal with the Council of State against the decisions of 27 July 2018 on regulated electricity sales tariffs applicable to residential and non-residential consumers in metropolitan France. In September, the National Association of Retail Energy Operators (the "ANODE") also filed a summary petition against these decisions and against the decision of 27 July 2018 on the Yellow and Green regulated electricity sales tariffs applicable to consumers in metropolitan France, which it supplemented with an explanatory memorandum on 27 December 2018.

ENGIE and ANODE have requested that the Council of State annul these decisions on the grounds, in particular, that, in their opinion, the level and method of tariff construction violates the principle of contestability.



### Hydropower concession of Loudenvielle - appeal by the municipality

By application dated 20 February 2018 filed before the Pau Administrative Court, the municipality of Loudenvielle requested the cancellation of the refusal by the Prefect of the Hautes-Pyrénées of 22 December 2017 to terminate the renewed hydropower concession for EDF for a period of 40 years by prefectural decree dated 14 February 2007. The municipality considers that the fact that this concession has been renewed for the benefit of EDF outside any advertising and competitive tendering procedure hinders its further implementation.

### Complaint by the Geneva authorities against the CNPE Bugey

In December 2018, the city and canton of Geneva filed a complaint with civil action for breaches of the INB regulations, on the basis of an expert report which they claim demonstrates vulnerabilities of essential power plant components, design weaknesses, seismic and flood risks of the site, tritium leaks and increased incidents. No investigation has yet been carried out against EDF CNPE Bugey in respect of this new complaint.

## 2.4.2 LEGAL PROCEEDINGS CONCERNING EDF'S SUBSIDIARIES AND HOLDINGS

### ENEDIS

#### Photovoltaic producers litigation

In 2010, announcements of cuts in electricity purchase prices led to a considerable surge in the number of connection requests received by Enedis units, primarily in August 2010 (due to the fact that at that time, the date on which a full request was filed determined the applicable prices). Three months later, the moratorium decree issued on 9 December 2010 suspended the conclusion of new contracts for a period of three months and stated that if the financial and technical proposal for a request had not been approved before 2 December 2010, a new connection request would need to be submitted at the end of this three-month period (see section 2.4.1 "Legal proceedings involving EDF").

At the end of this moratorium, new electricity purchase provisions were introduced. Within this framework, a system of invitations to tender was developed and, moreover, a new order set the new mandatory purchase price for photovoltaic electricity. This order, issued on 4 March 2011, led to a significant drop in photovoltaic electricity purchase prices.

The judgment handed down by the Council of State on 16 November 2011 dismissing the various appeals lodged against the moratorium decree issued in December 2010 led to a considerable surge in the number of proceedings issued against Enedis at the end of 2011, which continued in 2012, 2013, 2014 and 2015. The limitation period for issuing claims for compensation connected to this moratorium expired in March 2016. These proceedings were mainly issued by producers forced to abandon their projects as the operating conditions are less attractive than before due to the new electricity purchase prices. These producers believe that this situation was caused by Enedis, on the ground that Enedis failed to issue technical and financial proposals relating to connection in a timely manner, which would have allowed them to enjoy the more attractive electricity purchase conditions. The judgments issued at first instance, and by the Court of Appeal, contain diverging reasons and findings, with some courts dismissing all of the claims filed by the claimants while others award them compensation, but on the whole the compensation awarded is lower than requested.

Enedis solicited the benefit of its Civil Liability insurance policy. Insurers refused to apply their guarantee. The Court of Cassation ruled in a decision dated 9 June 2015, (Green Yellow) that Enedis' liability was to be covered by its insurers and that Enedis was liable. However, insurers keep refusing their guarantee for other pending cases. In 2017, Enedis summoned the insurers and asked the Nanterre Commercial Court to rule on the existence of a partial serial loss.

In December 2015, the Court of Appeal in Versailles decided to submit a reference for a preliminary ruling to the Court of Justice of the European Union (CJEU) on the compliance of the 2006 and 2010 pricing orders with European State aid laws.

The CJEU dismissed this reference for a preliminary ruling for procedural reasons. On 20 September 2016, the Court of Appeal in Versailles submitted a new reference for

a preliminary ruling to the CJEU relating to the compliance of the 2006 and 2010 pricing orders with European state aid laws and stayed the proceedings.

By order dated 15 March 2017, the European Court of Justice confirmed that the orders of 10 July 2006 and 12 January 2010 fixing the purchase prices of electricity of photovoltaic origin constituted "intervention by the State or through the resources of the State", one of the four criteria for qualifying as state aid. It reiterated that such aid measures implemented without having been previously notified to the Commission are illegal. It is now for the national jurisdictions to implement the consequences of this, particularly by ruling out the application of these illegal orders.

Several decisions in favour of Enedis have been issued on this subject since the beginning of 2018. In particular, the Versailles Court of Appeal dismissed, at the beginning of July, 150 producers, either because Enedis' fault has not been established or because there is no causal link between Enedis' fault and the producers' prejudice, or by considering that the prejudice of producers is not compensable in so far as the 2006 and 2010 tariff orders are illegal, in the absence of notification to the European Commission under the control of State aid. A large majority of rulings have been appealed to the Court of Cassation.

### ENGIE

On 23 December 2016, ENGIE issued proceedings against Enedis with the Commercial Court in Paris in relation to supplier remuneration for management costs for customers holding a single contract (see section 1.4.2.1.4 "Electricity supply contracts"). These proceedings are pending. A "question prioritaire de constitutionnalité" ("QPC") constitutional priority question was lodged by ENGIE against article 13 of the Law of 30 December 2017. This question was transferred by the Paris Commercial Court and then by the Court of Cassation to the Constitutional Council which should issue a decision about it by 8 May 2019.

### Quadlogic Corporation Controls

On 24 February 2016, Enedis received a claim form issued by an American company, Quadlogic Corporation Controls ("QCC"), before the Regional Court in Paris, in relation to an alleged infringement of a European patent held by QCC. Enedis strongly contests both QCC's inventive input and the alleged infringement. In November 2017, the Paris Regional Court gave a decision favourable to Enedis and cancelled, for France, the European patent of QCC. QCC appealed against this decision on 12 March 2018. These proceedings are pending before the Paris Court of Appeal.

### EDF International

#### Tax disputes

The tax inspections of EDF International for fiscal years 2009 to 2014 resulted in a challenge to the valuation of the convertible bonds put in place to refinance the acquisition of British Energy for a total amount of around €310 million. EDF International disputed these grounds for adjustment, against which it considers its chances of success to be likely in litigation.

### Edison

#### Proceedings concerning the sale of Ausimont (Bussi)

Further to a preliminary investigation initiated by the Public Prosecutor of Pescara (Abruzzo region) in relation to a suspected case of water pollution and ecological disaster affecting the river Aterno basin at Bussi sul Tirino, which for more than a century has been the site of an industrial complex belonging to Ausimont SpA that was sold to Solvay Solexis SpA in 2002, the Public Prosecutor of Pescara notified certain former Directors and managers of Solvay Solexis and Edison that the case would go to court on charges of water poisoning, ecological disaster and fraud to the prejudice of the site's purchaser, Solvay Solexis.

On 15 December 2009, the proceedings against Montedison (now Edison) for fraud were abandoned. The proceedings on the matters of environmental disaster and poisoning of water or foodstuffs continued and, on 18 April 2013, the competent judge decided to bring action against Montedison's former managers before the Assize Court in Chieti. In a decision issued on 7 February 2014 by the Assize Court, the case against Edison was dismissed and accordingly, it is no longer a party to the criminal proceedings. In a decision issued on 19 December 2014, the same Court acquitted all of the defendants. The Public Prosecutor referred the case to the Court of Cassation, which issued a decision on 18 March 2016 ruling that the appeal was inadmissible and referring the case back to the Assize Court of Appeal in L'Aquila.

## 2. RISK FACTORS AND CONTROL FRAMEWORK

### Legal proceedings and arbitration

The decision, given in February 2017 by the Appellate Assize Court, was appealed to the Court of Cassation.

In this context, a large quantity of industrial waste was found on a plot of land belonging to Edison adjacent to the plant, an attachment order has been placed on that land, and on 4 October 2007, the President of the Italian Council of Ministers appointed a deputy special commissioner empowered to undertake urgent measures: identification, safety and rehabilitation measures for the land. The commissioner has ordered Edison to prepare a survey of the zone, take urgent measures to make it safe and present proposals for decontamination of the ground and ground water. Edison, which has never used this site for its business, filed an appeal with the Regional Administrative Court in June 2008. The Regional Administrative Court rejected this appeal in March 2011 and Edison challenged this judgment before the Council of State.

Following the hearing of 15 January 2015, the Council of State definitively set aside the decision of the deputy special commissioner in a judgment handed down on 5 March 2015. Edison is therefore no longer required to carry out urgent interventions.

By decision dated 28 September 2018, the Court of Cassation annulled without referral the ruling of the Assize Court of Appeal of Aquila on the criminal proceedings against the Bussi sul Tirino industrial complex. The Assize Court of Appeal had (i) acquitted some defendants of environmental disaster and water poisoning charges on the grounds that they "had not committed the acts attributed to them"; (ii) considered that the accusation of environmental disaster attributed to the other defendants was time-barred, the limitation period having expired before the judgement of appeal was rendered; and (iii) considered that nothing was due for the damages allegedly suffered by the civil parties.

Also in this context, on 28 February 2018, the Province of Pescara notified Solvay Speciality Polymers Italy SpA (formerly Solvay Solexis SpA) and Edison SpA of the launch of an administrative procedure to determine who was responsible for the pollution of the land belonging to Ausimont SpA and the subject of the sale.

In 2012, an arbitration procedure was launched by Solvay SA and Solvay Speciality Polymers Italy SpA for violation of the representations and warranties in environmental matters, for the Bussi and Spinetta Marengo sites, contained in the Agora SpA concession agreement (company controlling Ausimont SpA), signed in December 2001 between Montedison SpA and Longside International SA, on the one hand, and Solvay Solexis SpA (Solvay Speciality Polymers Italy SpA), on the other.

#### Action by the Public Prosecutor of Alessandria

In 2009, the Public Prosecutor of Alessandria (Italy) sent certain managers and former Directors of Ausimont SpA (now named Solvay Solexis SpA, a company sold by Montedison to the Solvay group in 2002) notification of the conclusion of investigations related to the possible poisoning of water from the spring on the industrial site of Spinetta Marengo and surrounding sites, and the lack of any action for site rehabilitation. The investigation was closed on 16 January 2012.

The judge entertaining jurisdiction decided, on 16 January 2012, to bring action before the Assize Court in Alessandria against a number of former Montedison executives for behaviour that could constitute environmental and public safety offences. The trial before the Assize Court began on 17 October 2012.

At the end of the proceedings before the Assize Court on 18 December 2015, Ausimont's former managers and Montedison were acquitted of the water poisoning charges. Accordingly, Edison has not been held civilly liable, in any manner whatsoever. The judgment was published on 6 June 2016 and has been appealed to the Assize Court of Appeal in Turin. The hearings before the Court began in February 2018. The sentence is expected in the first half of 2018. On 4 January 2019, the Turin Assize Court published the full grounds for the decision confirming the acquittal of the former directors and employees of Montedison and Ausimont, concerning the alleged events of environmental disaster and water poisoning related to the management of the Spinetta Marengo Chemical industrial site.

In addition, an administrative decision ordered Solvay Solexis to rehabilitate the Spinetta Marengo site. Edison voluntarily intervened in the proceedings to defend its interests in relation with the claim filed by Solvay Solexis for the cancellation of this administrative decision, notably because the administrative decision doesn't impose any obligation on Edison to rehabilitate the site (this obligation is imposed exclusively on Solvay Solexis). The procedure is ongoing.

#### Carlo Tassara

The company Carlo Tassara, Edison's main minority shareholder, brought legal proceedings on 12 July 2012 before the Regional Administrative Court in Latium (Rome) requesting on the merits an increase in the price of the mandatory takeover bid launched by the EDF subsidiary Transalpina di Energia (TdE), following the acquisition of control of Edison on 24 May 2012. The parties against which the plaintiff brought these proceedings are CONSOB, the Italian financial market authority, EDF, as well as its Italian subsidiaries (MNTC, WGRM4 and TdE), Edison, Delmi and A2A.

At the same time, the plaintiff filed with CONSOB in May 2012 a request to increase the price of the mandatory takeover bid based on practically identical arguments to those filed for the proceedings on merits before the Administrative Court. CONSOB dismissed this request on 25 July 2012. The plaintiff did not appeal against this decision.

In March 2015, the plaintiff also issued civil proceedings before the Court in Milan seeking damages from EDF, A2A and Edison on the basis of a similar fact-based line of reasoning as that used for the administrative proceedings. The proceedings were served on EDF on 27 March 2015.

In this case, the plaintiff claims that the negotiations between EDF and A2A that led to the takeover of Edison and Edipower were not conducted in line with Edison's sound management principle and harmed the interests of its minority shareholders. The plaintiff alleges that it was forced to sell its shares under the mandatory takeover bid launched following the acquisition of control of Edison as otherwise its holding in approximately 10% of Edison's share capital would have lost all liquidity. For the record, the bid price was €0.89 per common share. The plaintiff alleges a loss caused by a drop in value of approximately €294 million in the Edison securities recorded on its balance sheet as at 31 December 2011. However, it has not given an exact figure for the damages it claims and asks the court to appoint a court expert to assess the exact amount of its loss.

On 26 January 2016, a procedural hearing was held before the Civil Court in Milan. The court decided that replies must be filed by 29 March and 18 April. In a decision issued on 5 May 2016, registered and notified to the parties on 2 November 2016, the Court dismissed the procedural pleas and the applications to strike out filed against the plaintiff and set the date of the first directions hearing (20 December 2016). At this hearing, the timetable for the submission of the parties' statements of case was decided. The hearing for the clarification of the pleadings has been scheduled for 19 March 2019. This is the closing hearing of the investigation phase. However, several pleadings may be exchanged before the deliberation.

#### Measures taken by employees concerning exposure to asbestos or other harmful chemical substances

Over the last years, Edison has faced a significant increase in the number of claims for damages arising from the death or illness of employees that were allegedly caused by exposure to several forms of asbestos at factories owned by Montedison, or other judicial cases assumed by Edison as a result of corporate acquisitions.

Furthermore, Edison is involved in several criminal proceedings filed by former employees of companies belonging to the Edison group or their legal successors, arising from exposure to harmful chemical substances emitted by Montedison's facilities (since transferred to Enimont which became Enichem, a subsidiary of ENI).

#### Environmental litigation

Edison is involved in several criminal proceedings currently underway concerning damages caused by the operation of Montedison's chemical factories (petrochemical facilities in Porto Marghera, Crotone, Mantua and Cesano Maderno) prior to their sale to Enimont. These criminal proceedings also include actions brought by third parties concerning personal injuries related to the alleged environmental damage.

In the first half of 2018, the public prosecutor of Pescara (Abruzzo region) opened a preliminary investigation against Edison's directors on the assumption that remediation activities were not carried out at the Piano D'Orta industrial site (Pescara province, Abruzzo region) where, until the late 1960s, there was a Montecatini plant.

## 2.4.3 LITIGATION ARISING AFTER THE CLOSING OF THE 2018 FINANCIAL YEAR

None

## 2.5 INSURANCE

In order to protect its assets and limit the impact of certain events on its financial position, the EDF group has dedicated insurance programmes that cover its major risks in terms of property damage, civil liability and insurance of persons. Nuclear risks are subject to the specific civil liability regime described below.

### 2.5.1 INSURANCE ORGANISATION AND POLICY

The Group Insurance Division is responsible, while respecting the management independence of the regulated infrastructure operators, for preparing the insurance policy of the EDF group and organising its implementation throughout the Group, in order to continuously optimise the overall costs of its insurable risks <sup>(1)</sup>.

Its duties are to:

- continuously analyse cover for the EDF Group's risks in conjunction with the Group Risk Department: analysis by business line, entity and project;
- establish rules for the Group's entire scope that enable covering all risks that can and must be covered, as well as optimising the total cost thereof and managing volatility;
- promote and apply these rules to all Group entities, using appropriate means and in compliance with governance rules; and
- develop and monitor the tools necessary to perform the above tasks, including within the subsidiaries reporting to the Insurance Division: EDF Assurances and the Group's captive insurance companies (see section 2.5.2. "Use of captive insurance companies and mutual insurance companies").

The Insurance Managers of entities and controlled subsidiaries that join the Group's programmes are responsible for:

- ensuring that all risks are insured;
- scheduling prevention inspections and overseeing implementation of the resulting recommendations;
- reviewing cover strategies and amounts declared (risk quantification);
- analysing losses and participating in claims handling.

This work, which is carried in close conjunction with the Group Insurance Division, enables to continuously improve the quality of information about insurable risks as programmes are renewed and prevention inspections are carried out (assessment of maximum possible losses – "MPL"). In connection with prevention actions, the Insurance Division establishes and oversees implementation of the site inspections programmes.

The Group insurance policy was approved by the Executive Committee in January 2017.

#### Objectives

The insurance policy stipulates the risks that the Group decides to transfer to the market and the general principles for optimising such transfers: grouping purchases by setting up Group insurance programmes, allocating risks between traditional markets and other types of cover (specialised mutual insurance companies, transfers to the financial markets, etc.), individual and Group excesses (in general, only major risks are transferred), optimising intermediation costs.

#### Implementation methods

Since 2004, the Audit Committee is presented with an annual update on the costs of covering EDF's risks through insurance or by transferring risks to the financial markets. An update on insurance, as well as a review of the insurability of Group risks, was presented to the Audit Committee in December 2018.

Since 2011, a Strategic Insurance Policy Committee ("COSA"), currently chaired by the Finance and Investments Director, provides an opportunity for the business lines and the Finance department to reflect on changes to and procedures for implementing the insurance policy, in particular the main characteristics of the programmes.

The Insurance Division and the Group Risk Department produce an annual analysis of the risk mapping at Group level, supplemented by the insurance coverage system in place. Based on this shared view, EDF is in a position to improve, and, where necessary, extend the coverage of insurable risks in accordance with the principles established by the Group in this area.

The goal of the Group's insurance programmes is to integrate the controlled subsidiaries as broadly as possible, in order to homogenise risk coverage and streamline its management, on the one hand, and to control the corresponding insurance costs, on the other hand.

In accordance with the principle of independence of management of the regulated subsidiaries, RTE is not included in the Group's insurance programmes <sup>(2)</sup>.

Insurance contracts, according to market practice, include exclusions, limits and sub-limits.

### 2.5.2 USE OF CAPTIVE INSURANCE COMPANIES AND MUTUAL INSURANCE COMPANIES

Like all major French and international groups, EDF uses captive insurance companies and mutual insurance companies to supplement coverage provided by the traditional insurance markets.

The EDF's captive insurance companies are:

- Wagram Insurance Company DAC, an insurance company founded in 2003 in Dublin, which is involved in the majority of the Group's insurance programmes;
- Océane Re, a reinsurance company established in 2003 in Luxembourg, to reinsure EDF's nuclear civil liability.

In addition, Framatome has had a reinsurance company (Tereco) in Luxembourg since 21 December 2018.

EDF is also a member of the Oil Insurance Limited (OIL) mutual insurance company in order to deal with the risks of damage (excluding overhead networks) to the property owned by the Group or under concession (EDF and its consolidated subsidiaries). OIL is an insurance mutual company which provides its members with cover for property damage. The scope covered includes inter alia nuclear power plants (the conventional portion), fossil fuel-fired power plants, hydropower facilities, network substations and exploration and production assets.

The Group's damage insurance programmes combine this cover provided by OIL and covers provided by market insurers.

The EDF Group is also a member of the European Liability Insurance for the Nuclear Industry (ELINI), the European Mutual Association for Nuclear Insurance (EMANI), the Nuclear Industry Reinsurance Association (NIRA) and Blue Re, which are mutual insurance companies that manage cover in this field for European nuclear power operators.

The captive and mutual insurance companies enable EDF to reduce the total amount of premiums paid and, more generally, the cost of its insurance schemes.

(1) Risks that can be transferred to the insurance markets and the alternative markets.

(2) Exit effective since 31.03.15.

#### 2.5.3 CIVIL LIABILITY INSURANCE (NOT INCLUDING NUCLEAR CIVIL LIABILITY)

EDF holds general civil liability insurance covering EDF, Enedis and their controlled subsidiaries against the financial consequences of civil liability (not including nuclear damage) that they may incur in doing business as a result of damage caused to third parties. In particular, this programme covers the risks of civil liability associated with the operation of structures (hydroelectric dams, fossil fuel-fired power plants, substations and other network facilities), risks associated with development of the Group's renewable energy activities (wind, solar, etc.), as well as risks associated with environmental damage (emissions of solid, liquid or gaseous substances).

This cover is purchased to the extent of available capacity under acceptable financial terms on the insurance and reinsurance markets. Maximum cover is €1 billion. Under this programme, the share of risk retained by the Group with regard to an insurable accident ("retention"), including the share of Wagram Insurance company DAC and Océane Re, does not exceed €10 million per insurable accident. Subsidiaries generally opt for lower deductibles that are more consistent with their financial capacity.

#### 2.5.4 CIVIL LIABILITY INSURANCE FOR CORPORATE OFFICERS AND DIRECTORS

EDF holds civil liability insurance covering corporate officers and directors of EDF, Enedis and their controlled subsidiaries against the financial consequences of their civil liability incurred in performing their management functions.

#### 2.5.5 DAMAGE INSURANCE (EXCLUDING NUCLEAR ASSETS)

##### 2.5.5.1 Conventional damage programme

The scope of the conventional damage programme includes almost all subsidiaries of EDF, notably Enedis, EDF Energy, Edison and Dalkia.

Wagram Insurance Company DAC, the Group's captive insurance company, together with other insurers and reinsurers, provide extensions of cover (property damage and business interruption) in addition to the covers provided by OIL, bringing the maximum up to €1 billion.

Under this conventional damage programme, the Group's retention per claim, including the deductible (which varies by subsidiary) and the share of the risk retained by Wagram Insurance Company DAC and by Océane Re, does not exceed €15 million.

This programme provides cover for business interruption for most subsidiaries in the event of property damage, but not for EDF, which does not benefit from this cover. The actions implemented and measures taken to prevent industrial and environmental risks and limit their impact are described in section 2.2.2 "Implementation of systems for the control of risks and activities".

##### 2.5.5.2 Cover for "construction" risks

EDF has taken out insurance policies covering specific construction risks (construction all-risk and erection/testing all-risk policies). These policies are not included in any Group programme but are purchased on an ad hoc basis for major construction projects such as the EPRS of Flamanville and Hinkley Point C, the construction of combined cycle power plants, dams, etc.

These covers are specifically monitored and are renegotiated if unforeseen events occur during the construction projects.

##### 2.5.5.3 Storm cover

In connection with the renewal of the storm insurance coverage, Enedis signed with Swiss Re on 27 June 2016 a parametric insurance contract covering the aerial transmission network against the consequences of exceptional storms.

With a term of five years and total cover of €275 million, this innovative insurance contract triggers, in the event of a claim, parametric compensation based on a composite index for wind speeds recorded by Météo-France stations weighted by the vulnerability of the distribution network in each region of the Enedis concession area.

##### 2.5.5.4 Cyber risk cover

Since 1 July 2017, cyber risk cover has been put in place. The €100 million coverage policy underwritten for two years covers all EDF SA entities and the subsidiaries of the Group.

Its purpose is to cover the expenses incurred to handle major disruptions caused by a cyber-attack against the Group's information systems.

#### 2.5.6 SPECIFIC INSURANCE FOR NUCLEAR FACILITY OPERATIONS

##### 2.5.6.1 Civil liability of nuclear facility operators

In France, EDF's current insurance policies are in compliance with French Act no. 68-943 of 30 October 1968, Act no. 90-488 of 16 June 1990, and Act no. 2006-686 of 13 June 2006 (known as the "TSN" Act), now codified in the French Environmental Code and which codified the civil liability obligations imposed on nuclear facility operators by the Paris Convention (see section 1.5.6.2.2 "Specific regulations applicable to basic nuclear facilities").

The French Law on Energy Transition for Green Growth enacted on 17 August 2015 subsequently amended the provisions of Articles L. 597-28 and L. 597-32 of the French Environmental Code and, in particular, the limits on the civil liability of nuclear operators which, since 18 February 2016, were brought to €700 million for nuclear installations (€70 million for low-risk installations) and €80 million for risks during transport.

In order to comply with the new statutory ceilings, EDF issued a tender notice on 10 August 2015 entitled "EDF SA Nuclear Liability Insurance Programme" to obtain and set up appropriate insurance coverage for nuclear civil liability and related claims management.

The insurance coverage obtained following this invitation to tender allows the Group to meet the new obligations while controlling their financial impact. The insurance is shared between the nuclear insurance market (AXA, reinsured by the French nuclear pool Assuratome), the Group's captive insurance companies, and the nuclear mutual insurance company ELINI.

This cover took effect on 18 February 2016 for a three-year term. In view of the likely evolution of the obligations imposed on the operator during the period (notably the entry into force of the Protocols amending the Paris and Brussels Conventions) (see section 1.5.6.2.2 "Specific regulations applicable to basic nuclear facilities"), clauses allowing an exit from the contract have been included.

Claims management has been entrusted to the mutual insurance company ELINI, for its computerised claims processing system, and to the company EQUAD which has the necessary human and network resources.

In the United Kingdom, where EDF Energy operates nuclear power plants, the nuclear operator's civil liability rules are similar to French rules. The UK Parliament approved on 4 May 2016 the "Nuclear Installations Order" (order transposing the above-mentioned amending Protocols of February 2004), which makes substantially the same changes as the French TSN Act in 2006 but which, for the most part, shall enter into force only in conjunction with the Protocols.

This Order will raise the British operators' obligations from the current limit of £140 million to the equivalent of €700 million, and they will be progressively increased over a five-year period to reach a cap of €1.2 billion.

EDF Energy is currently insured by ELINI and Wagram Insurance Company DAC. The captive insurer Océane Re also carries the risk via a reinsurance contract for Wagram Insurance Company DAC.

For further information on the legislation concerning nuclear operators' civil liability, see section 1.5.6.2.2 "Specific regulations applicable to basic nuclear facilities";

### 2.5.6.2 Civil liability for transport of nuclear substances

Under the Paris Convention, the operator that is the "shipper" is civilly liable for transport of nuclear substances (unless stipulated otherwise). On 18 February 2016, this liability limit was increased to €80 million with an unchanged scope of damages (for more information see section 2.5.6.1 "Civil liability of nuclear facility operators" and section 1.5.6.2.2 "Specific regulations applicable to basic nuclear facilities"); the scope of damages admissible for compensation will then be widened when the amended Paris Convention comes into force. This liability is as of now covered by the aforementioned nuclear operator civil liability policy.

### 2.5.6.3 Damage to nuclear facilities

The cover obtained through EDF's membership in the OIL mutual insurance company provides protection against material damage in cold areas, excluding the consequences of a nuclear accident, of 60% of \$400 million in excess of a deductible of \$15 million, both in France and the United Kingdom.

Until 30 September 2018, in addition to this coverage, property damage (including following a nuclear accident) to EDF's nuclear facilities in France and to EDF Energy's nuclear facilities in the United Kingdom, as well as nuclear decontamination costs, are covered by a joint insurance programme underwritten primarily by the NRI British

insurance pool, AXA and Allianz (reinsured by Assuratome, the French nuclear pool) and EMANI (nuclear mutual insurance company) (see section 2.5.2 "Use of captive insurance companies and mutual insurance companies" and section 2.5.7. "Premiums") for a total capacity of €1,760 million, over and above an amount of €240 million.

As of 1 October 2018:

- in France, the protection provided by OIL is supplemented, for the consequences of a nuclear accident, including the cost of decontaminating the site, by an insurance coverage of €90 million in excess of a deductible of €10 million using the EMANI nuclear mutual insurance company, Axa and Allianz (reinsured by Assuratome), and Wagram Insurance Company DAC (reinsured by Océane Re).
- in the United Kingdom, protection is supplemented for the consequences of a nuclear accident, including site decontamination costs, by an insurance programme with a total capacity of €1,510 million, exceeding an amount of €240 million provided by the EMANI nuclear mutual insurance company, the British nuclear pool NRI and Northcourt, which includes specialised British insurers.

Furthermore, EDF Inc. is a member of NEIL (Nuclear Electric Insurance Limited) – a mutual nuclear insurance company in the United States, so as to cover the activities of CENG (Constellation Energy Nuclear Group) in the United States.

## 2.5.7 PREMIUMS

The total amount of Group insurance premiums for all types of cover was €248 million in 2018.



## 2. RISK FACTORS AND CONTROL FRAMEWORK



# 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

<b>3.1</b>	<b>EDF'S COMMITMENTS IN THE AREA OF SUSTAINABLE DEVELOPMENT</b>	<b>150</b>
3.1.1	Understanding stakeholders and the environment	150
3.1.2	Committed to sustainable development	152
3.1.3	Governance of sustainable development	153
<b>3.2</b>	<b>EDF'S CORPORATE SOCIAL RESPONSIBILITY GOALS</b>	<b>158</b>
3.2.1	Committed to climate action	158
3.2.2	Committed to human development	161
3.2.3	Committed to supporting fragile populations	166
3.2.4	Committed to helping each customer consume better	168
3.2.5	Committed to consultation	172
3.2.6	Committed to biodiversity	174
<b>3.3</b>	<b>OTHER AREAS OF THE SUSTAINABLE DEVELOPMENT POLICY</b>	<b>180</b>
3.3.1	Adapting to climate change	180
3.3.2	Optimising the use of natural resources and preserving the environment	181
3.3.3	Paying close attention to people	188
<b>3.4</b>	<b>FURTHER HUMAN RESOURCES CONSIDERATIONS</b>	<b>195</b>
3.4.1	Professional excellence, employment and skill development	195
3.4.2	Providing the conditions for well-being: organisation and quality of working life	199
3.4.3	Compensation and social welfare: an attractive employer	199
3.4.4	An employer engaged alongside its stakeholders	201
<b>3.5</b>	<b>ETHICS, COMPLIANCE, TAX TRANSPARENCY</b>	<b>206</b>
3.5.1	Ethics and compliance	206
3.5.2	Tax transparency	211
<b>3.6</b>	<b>SPONSORSHIP</b>	<b>213</b>
<b>3.7</b>	<b>NON-FINANCIAL RATING</b>	<b>214</b>
<b>3.8</b>	<b>APPENDICES AND CORRESPONDENCE TABLES</b>	<b>215</b>
3.8.1	Vigilance plan	215
3.8.2	UN sustainable development goals	217
3.8.3	TCFD recommendations	219
3.8.4	Materiality matrix	221
<b>3.9</b>	<b>REPORTING SYSTEM AND METHODOLOGY</b>	<b>223</b>
3.9.1	Reporting system	223
3.9.2	Methodology for social and environmental data	223
3.9.3	Indicators	227
<b>3.10</b>	<b>REPORT BY ONE OF THE STATUTORY AUDITORS, APPOINTED AS INDEPENDENT THIRD PARTY</b>	<b>233</b>

## THE NEW CONTEXT OF NON-FINANCIAL REPORTING

Order 2017-1180 of 19 July 2017 and Decree 2017-1265 of 9 August 2017 transposed European Directive 2014/95/EU amending Article 225 of the Commercial Code, which requires companies falling within its scope to report social, environmental and societal information in their management report. EDF falls within the scope of application of this regulation aiming to draw up a non-financial performance report for the year 2018.

EDF presents its business model in chapter 1 of this document and the analysis of its principal risks in chapter 2, including priority CSR risks. In this chapter 3, EDF describes how these risks are covered by reasonable due diligence policies and procedures, and mentions key performance indicators when it is relevant. In addition, this chapter covers the policies implemented in respect of the challenges indicated in the materiality matrix, drawn up in 2017 as part of a process of consultation with stakeholders (for a detailed description of this matrix, see section 3.8.4).

This chapter shows how EDF is committed to sustainable development, first and foremost involving its six corporate responsibility goals (see sections 3.2.1 to 3.2.6), then through other themes set out in the sustainable development policy (see section 3.3), or associated with human resources (see section 3.4). Ethics, compliance and tax transparency are addressed in section 3.5, sponsorship in section 3.6, and non-financial rating in section 3.7. EDF's vigilance plan is developed in section 3.8.1. In addition, EDF's contribution to the UN's sustainable development goals is mapped in section 3.8.2 and the manner in which EDF implements the recommendations of the TCFD is summed up in section 3.8.3.

The key performance indicators of the Group's policies chosen in respect of declaring the non-financial performance can be seen in the text of the Registration Document by means of the marker [\*] and are summarised in the concordance table in section 8.5.4.

### 3.1 EDF'S COMMITMENTS IN THE AREA OF SUSTAINABLE DEVELOPMENT

EDF is committed to sustainable development (section 3.1.2) based on an approach of listening and deeper understanding of its stakeholders (section 3.1.1). Implementation is done as part of the governance described in section 3.1.3.

#### 3.1.1 UNDERSTANDING STAKEHOLDERS AND THE ENVIRONMENT

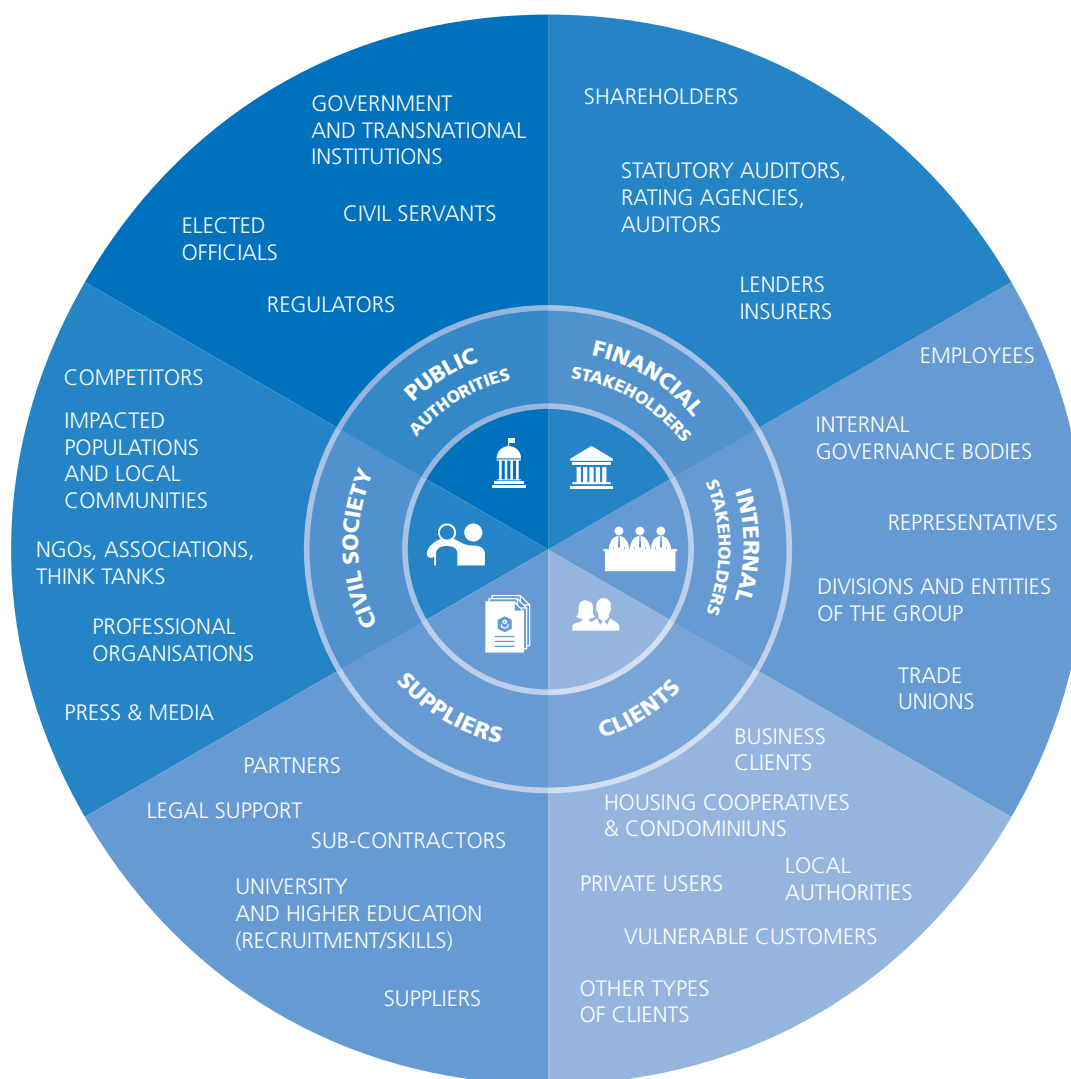
##### 3.1.1.1 Mapping of the Group's stakeholders

To meet the expectations of all of its stakeholders, EDF has set up dialogue, listening, analysis and follow-up tools: surveys, partnerships, forums for dialogue and follow-up committees based on a mapping of its stakeholders.

This mapping aims to help ensure proper deployment of its sustainable development policy for the benefit of its performance. Dialogue with stakeholders is one of the objectives falling within the domain of the Executive Director in charge of the Department for Innovation of Corporate Social Responsibility Strategy. The stakeholder mapping was approved by the Executive Committee and relations with local communities are included in the field of internal control. Mapping provides Group management and companies with a framework for organising dialogue <sup>(1)</sup>. In addition, as part of ISO 9001 and 140001 V2015 certification, the Group's management and companies systematically map their stakeholders and define appropriate modes of dialogue.

(1) *Accompanied by a stakeholder action guide produced in 2015 based on the guiding principles of Committee 21.*

[\*] **IND** Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4)



### 3.1.1.2 Stakeholder dialogue mechanisms

#### 3.1.1.2.1 Surveys and listening practices

Formal listening to stakeholder expectations has historically been highly developed in the generation and marketing businesses in France, as well as at EDF Energy and EDF Renewables.

Surveys monitored year after year through questionnaires and with stable groups make it possible to measure changes in the expectations of the populations:

- local resident survey on nuclear, classic thermal and hydropower generation <sup>(1)</sup>: carried out since 2009 by official survey companies such as IPSOS, these studies measure local residents' perceptions of nearby plants and energy. Nineteen nuclear generation sites, 6 fossil thermal sites, 14 hydropower sites and 2 nuclear sites under decommissioning (Creys-Malville and Brennilis) in 2018. With

respect to nuclear power plants, for example, the surveys highlight the positive impact in terms of employment (83%), economic activity (77%), commerce (65%) and community equipment (62%);

- sustainable Development Survey (SDS): this monitors European opinion on topics relating to the environment, energy and sustainable development, and is carried out by the R&D department. There is a clear increase in the level of environmental concern in the three countries surveyed (France, Germany and Great Britain);
- internal Environmental Survey (BIPE): this survey is carried out with a sample of EDF and Enedis employees <sup>(2)</sup>. The questions relate to: the environment, energy, CSR and innovative concepts. The main results are presented in section 3.1.3.3.5 "Sustainable Development (SD) Training and Awareness Raising - Change in the perceptions of internal and external audiences" <sup>(3)</sup>.

(1) Nineteen nuclear generation sites, 6 fossil thermal sites, 14 hydropower sites and 2 nuclear sites under decommissioning (Creys-Malville and Brennilis) were the subject of this survey in 2018

(2) Enedis is an independantly managed subsidiary.

(3) Other than the internal investigation "MyEDF", see section 3.4 "Further Human Resources considerations".

### 3.1.1.2.2 Stakeholder panels

For over 20 years, the EDF group has relied on different external stakeholder councils, at *corporate*, country and subsidiary level. Several panels of experts provide Group managers with their view on the major topics of interest to EDF.

The Sustainable Development Council is made up of external specialists who represent various issues associated with the impact of EDF's facilities and businesses. It challenges EDF managers and experts as early as possible over the Company's proposed actions regarding sustainable development. In 2018, the panel met to discuss responsible communication and the decommissioning of nuclear power plants.

EDF's Scientific Council, chaired by Sébastien Candel, Chairman of the Academy of Sciences, met three times in 2018. The subjects concerned the uses of hydrogen by EDF, the uses of quantum physics by EDF, and EDF's research and development guidelines.

EDF's medical council, chaired by Professor André Aurengo, member of the French Academy of Medicine, is a body for reflection and advice on a number of current health topics connected to EDF's activities. The main subjects treated in 2018 concerned electromagnetic fields, the prevention of electrical risks and the management of pathogenic waste.

In 2017, in partnership with Usbek & Rica, EDF created a Council of Future Generations, a space for open and pluralistic dialogue to discuss the future of energy. Its aim is to renew the manner in which EDF dialogues with society and to stimulate reflection on major issues of the future by opening up the floor and pointing out differences to feed public debate. It brings together forty employees representing the diversity of the EDF group's businesses and companies in France (excluding RTE and Enedis) and around thirty external participants, recognised for their commitment to sustainable development, energy transition, the social and solidarity economy and the transformation of organisations and mentalities. This Council held two sessions in 2018: "Can we talk calmly about nuclear energy?" and "What (r)evolutions for what mobilities?".

In 2018, the Nuclear and Thermal Fleet Department (DPNT), in conjunction with the Renewable Energy Division, initiated a specific approach aimed at listening to new societal expectations about energy autonomy, self-consumption and decentralised production, and how these issues challenge the current electricity system built around notions of solidarity, interconnection and power supply security. A "Thinktank" composed of a dozen personalities from very diverse backgrounds (non-profits, academics, journalists and economists) produced an initial analysis. The reflection was followed and accompanied by a group of company managers, associated throughout the work process.

In 2018, EDF set up a Scientific Committee on Communication, composed of ten research professors specialising in the field of communication. The first meeting discussed responsible communication.

In the UK, EDF Energy has a "Sustainable Business Panel" to advise the CEO and Executive Committee on issues relating to sustainable development. It is composed of internal and external experts chosen for their strategic skills and expertise in sustainable development. The Sustainable Business Panel meets twice a year, chaired by the EDF Energy director of strategy and public affairs, with the labour market and skills in a decarbonated economy being the topic of discussion in 2018.

Created in 2015, the Enedis Stakeholder Council brings together leading personalities from the corporate world, academics and heads of non-profits, under the aegis of the Sustainable Development Department. The Council's goal is to bring a constructive view to the issues linked to societal changes that are liable to have an impact on the future of the company and its businesses. It enriches the company's reflections on its strategy, sheds light on certain current or future issues through its external and multi-disciplinary vision, and makes recommendations. Two subjects were covered in 2018: extended social responsibility of the company and fuel poverty.

Edison set up a Sustainable Development Council in 2018. The first meeting was dedicated to the new sustainable development policy and goals. The Panel notably encouraged Edison to continue its inclusive innovation action. The second meeting focused on sustainable living in the digital age. The Panel is also involved in the analysis of Edison's non-financial challenges.

### 3.1.1.3 Participation in think tanks and business associations at the international level

EDF feeds on the most advanced discussions and research on sustainable development through think tanks and various research institutes. The objective is to exchange about the best practices and also to enrich the quality of discussions for public decision-makers during events such as negotiations on climate change (COP).

In 2018, EDF worked on carbon neutrality with think tanks like I4CE <sup>(1)</sup> and IDDRI <sup>(2)</sup>. Within the EpE <sup>(3)</sup>, EDF also contributed to a global study on the carbon neutrality of France in 2050.

EDF relies on the work of the SDSN <sup>(4)</sup>, an extensive network of researchers and academics initiated by the UN Secretary-General. In this context, in 2018, EDF notably supported the Global Environment Pact aimed at harmonising environmental standards worldwide.

EDF participates in several organisations bringing together companies which are active in the environmental field, like the UN Global Compact and EpE, for instance. In 2018, a report on carbon prices and a report on the decarbonisation of the economy were supported with the WBCSD <sup>(5)</sup>.

This involvement allows EDF to foster strategies that reconcile sustainable development and business, like the Climate Group's Electric Vehicle 100, EV100 initiative, where EDF is committed to converting its fleet to electric vehicles by 2030 and becoming a key player in clean electric mobility in the coming years (see section 3.2.4.5 "Electric Mobility").

## 3.1.2 COMMITTED TO SUSTAINABLE DEVELOPMENT

### 3.1.2.1 Corporate Social Responsibility Goals and the Sustainable Development policy

The Corporate Social Responsibility Goals announced by the Group during the Shareholders' Meeting of 12 May 2016 translate the Group's commitment to its strategic transformation taking into account the UN's 17 Sustainable Development Goals, which, while not directly targeted at companies are not attainable without their active contribution.

These ambitious CSR goals lay down a roadmap for the Group's businesses and subsidiaries for success with the CAP 2030 strategy. Six major themes have been adopted. Three of them are related to the environment and natural resources: climate, biodiversity and energy efficiency. Two others serve to confirm EDF's commitment to society, through support for the most vulnerable communities and the systematic implementation of consultation mechanisms for new projects worldwide. The sixth goal is a social one: it concerns human development to ensure our employees' safety and equal treatment.

(1) Institute For Climate Economics.

(2) Sustainable Development and International Relations Institute.

(3) Association Française des Entreprises pour l'Environnement: French Association of Business for the Environment.

(4) Sustainable Development Solutions Network.

(5) World Business Council on Sustainable Development.



These goals are integrated into the Group's sustainable development policy, which is intended to specify all the requirements of the Group in terms of sustainable development <sup>(1)</sup>.

### 3.1.2.2 Integration of the corporate responsibility goals into the Group's strategic process and project screening

The six Corporate Social Responsibility Goals reflect long-term commitments (2030). The implementation requirements are set out in screening letters specifying the contribution of each of the Group's entities and subsidiaries to the achievement of the common objective. The system for monitoring these commitments is integrated into the Group's strategic planning loop. Annual performance reviews allow entities and subsidiaries to monitor and control their actual performance.

Similarly, projects and investments subject to the approval of the Commitments Committee of the Group Executive Committee <sup>(2)</sup> (CECEG) are the subject of a specific opinion of the Sustainable Development Department based on a screening grid that translates the issues of the six corporate responsibility goals into operational terms. Where necessary, the Sustainable Development Department conducts or organises due diligence specific to these issues.

## 3.1.3 GOVERNANCE OF SUSTAINABLE DEVELOPMENT



### 3.1.3.1 Governance

Corporate social responsibility is at the core of the EDF group's strategy. One of the committees of the Board of Directors, the Governance and Corporate Social Responsibility Committee, is in charge of the following corporate social responsibility topics, including issues related to climate change and their impact on the EDF group.

The corporate social responsibility approach was discussed during the strategic seminar of the Board of Directors in September 2018: monitoring the implementation of the six Corporate Social Responsibility Goals, deployment of the Group Sustainable Development Policy, social and financial innovations for energy transition.

Monitoring and implementation of the commitment to reduce direct CO<sub>2</sub> emissions, announced in the Shareholders' Meeting of 12 May 2018, was presented to the Governance and Corporate Social Responsibility Committee meeting on 29 November 2018 (see section 4.2 "Composition and working of the Board of Directors").

### 3.1.3.2 Organisation

The Sustainable Development Department reports to the Innovation, Corporate Social Responsibility and Strategy Director, a member of the Executive Committee.

- It contributes to the Group's strategic transformation by accompanying business lines and projects in specifically taking into account environmental and social issues (opportunities and risks) in their business decisions and conduct, the integration of the six Corporate Social Responsibility Goals into the strategic screening of operating entities and process of screening new projects from the point of view of sustainable development <sup>(3)</sup>. It is particularly responsible for monitoring the Group's target for reducing direct GHG emissions "scope 1" <sup>(4)</sup> to less than 30 Mt in 2030.

- It contributes by strengthening and making the Group's non-financial performance visible, i.e. in guaranteeing the quality of data while taking into account the expectations of stakeholders (investors, customers, agencies, NGOs), and making the Group's contribution to energy transition visible.
- It coordinates sustainable development in the Group: corporate coordination of the business lines and subsidiaries through the SDC <sup>(5)</sup> (Sustainable Development Committee), coordination of the dedicated internal networks such as the EMS and the predictive watch networks, coordination of relations and dialogue with external partners.
- It brings together and coordinates the expertise necessary for taking into account sustainable development issues, particularly the implementation of the Corporate Social Responsibility Goals. Over and above the internal skills of the Sustainable Development Department, this relies on partnerships with institutions, think tanks and NGOs.

In December 2018, the Corporate Social Responsibility Strategy Committee was set up in order to better coordinate all CSR issues raised by various Group entities and to ensure strategic management. The Corporate Social Responsibility Strategy Committee is composed in particular of the Executive Director Human Resources, the Executive Director Finance and the Group Secretary General, and is chaired by the Executive Director for Innovation, Corporate Responsibility and Strategy. The CSR Strategy Committee is not a substitute for existing bodies. It reports its activities to the Executive Committee at least once a year and is at the disposal of the Board of Directors, to which it submits the minutes of its meetings.

### 3.1.3.3 Transformation drivers

#### 3.1.3.3.1 A supervisory organisation

The environmental and energy policies require EDF to be able to anticipate them, seize the opportunities thereof and also take the necessary measures early enough. This system addresses three fundamental challenges for the Group:

- the challenge of regulatory compliance, to assure EDF's ability to demonstrate that it takes regulations of every kind into account;
- a business challenge regarding the impact of the various regulatory texts on value creation;
- a reputational challenge, all stakeholders (including the financial and non-financial rating agencies) being increasingly involved in these aspects.

The Sustainable Development Department coordinates a predictive watch system in order to best mobilise and coordinate internal resources. The watch system aims to:

- strengthen the detection and classification of risks and opportunities;
- facilitate sharing among business lines, geographical divisions and Group companies on transversal issues so as to maximise synergies;
- improve managers' visibility of the risks and opportunities;
- contribute to the increase of the effectiveness of actions in defence of the Group's interests, in France and internationally.

The predictive watch process is based on the work of thematic groups known as "networks": water, waste and soil, air, biodiversity, industrial risks, energy efficiency, energy poverty, health and climate change. Each network comprises fifteen members from different Group businesses that meet every quarter to share an overall vision. Each network works closely with the Legal, Public Affairs and European Affairs Departments. The pilots of each network meet every month a Sustainable Development Agency which monitors the transversality of approaches and ensures that the Group's challenges are optimally taken into consideration with an overall, long-term view.

(1) See section 3.3 "Other subject areas of the sustainable development policy".

(2) This undertaking concerns new projects involving investments of more than €50 million, entailing a significant impact on regions and the environment. The Group plans to lower this investment threshold to €30 million by 2030.

(3) See section 3.1.2.2 "Integration of the corporate responsibility goals into the Group's strategic process and project screening".

(4) See Section 3.9.2.2 "Further details on the environmental data" for the definition of "Scope 1".

(5) In 2018, the SDC met five times. It reviewed the carbon trajectory, the biodiversity agenda, the organisation of non-financial reporting and the Group's Environmental Management System.

### 3.1.3.3.2 Management of environmental risks

Conscious of the potential impact of its activities on the environment, the EDF group implements a policy for the management of its risks at the operational, financial and organisational levels in compliance with the regulations in force.

Environmental risks, including those associated with climate change, are fully integrated into the Group's EMS and internal control system in coordination with the Group risk management function. They are subject to action plans resulting from strategic priorities in the Group's sustainable development policy.

The 2018 risk mapping <sup>(1)</sup> update reconfirmed the risk analysis and did not highlight new environmental risks. At the end of 2018, with the sale of the Dunkirk LNG terminal and the acquisition of Framatome, the Group has nine high-threshold SEVESO sites and 38 low-threshold sites <sup>(2)</sup>.

In 2018, as in previous years, the most significant factors in terms of the economic and financial challenges related to environmental risks pertain to the following subjects: climate change and GHG emissions; the roll-out of energy efficiency initiatives; the impacts of EDF's activities on the air, water and soil and the production of waste; protection of biodiversity and services provided by ecosystems and the management of water resources.

#### Preventing risks and pollution

In order to control risks of industrial incidents or accidents that could harm the natural environment or public health, EDF has implemented:

- a Group environmental management system that is constantly monitored and improved in the entities and at the sites;
- an active investment policy and an industrial asset decommissioning programme for assets no longer in operation, which includes decontamination operations where necessary;
- an employee training and awareness-raising programme for all stakeholders, including feedback from crises experienced and exercises;
- inspections and audits at the generation sites;
- a crisis management policy which requires the regular testing of crisis systems through an annual programme of crisis response drills (see section 2.2.2.1.2 "Crisis management and business continuity").

In order to reduce these risks, the Group's entities have also implemented a programme to eliminate or substitute certain substances (PCBs, chemical products) with more environmentally-friendly products. This work focuses as a priority on CMR (carcinogenic, mutagenic, or toxic for reproduction) substances or those considered extremely worrying. Following on from the studies of previous years, substitutions are now implemented: environmentally acceptable oils for hydraulic production, fluids for thermal and nuclear power plant turbines in France and the United Kingdom, varnishes and paints (Industrial Division, Property Management and Citelum in Italy),

etc. As part of an R & D project, activities aim to identify and evaluate mature and innovative liquid effluent treatment technologies to reduce harmful chemicals (bore, hydrazine, ammonia, C14, H3, nitrates, AOX, CRT, Cu/Zn, etc.).

Locally, each of the Group's operational units and companies identify events that could have an environmental impact, manage emergency situations that could result from them, conduct corresponding crisis response drills, implement monitoring and communicate on environmental events under its responsibility.

There were no high-stakes environmental events <sup>(3)</sup> during 2018. There were a few incidents, without any major environmental or health impacts, which mainly concerned leaks or spillages of hydrocarbons or chemical products. They were controlled according to the emergency procedures in effect which considerably limited their impact on the natural environment. However, some events are to be noted: the presence of yellow dustfall near the combined cycle gas turbine in Bouchain (France) with no certainty on the link with the startup emissions, and the death of some raptors on wind farms in France and Mexico. In addition, the period of heat and drought created unfavourable conditions for fish life and made water management difficult especially in the lower Ain valley and the étang de Berre.

Some environmental events may be followed by litigation arising from complaints filed by NGOs or non-profits or formal warnings from national regulatory authorities (the French Nuclear Safety Authority (ASN), the Prefecture, etc.) or by litigation relating to land transactions. In 2018, the total penalty amount imposed on EDF in France stood at approx. €1.94 million. It consists of two types of penalties: a ruling relating to an industrial event on the Bugey site in 2013 (€5,000 in damages), and two disputes that have come to an end and related to land sales transactions accompanied by soil cleaning work. It includes a land sale in Perpignan in 2010 and another sale in Saint-Malo in 2007 (land of a former gas plant).

#### The environmental management system (EMS)

In order to coordinate all the objectives and actions resulting from its commitments and its sustainable development policy, EDF group has put in place Group-wide coordination managed by a Sustainable Development Committee (SDC) and implemented as regards the environmental component (including aspects associated with climate change) with the aid of an environmental management system (EMS).

The EDF group's EMS is ISO 14001 2015 certified for a scope representing almost all the consolidated revenue of EDF and its subsidiaries (excluding Enedis) and associates <sup>(4)</sup>. In 2018, new subsidiaries joined the Group's scope of certification (Electricité de Strasbourg, Energy Services, and Electricité de Strasbourg, Networks, IFOPSE). Two subsidiaries are not certified but have environmental management systems (EMS) and participate in EMS coordination.

In 2018, and as part of the continuous improvement of the EMS, the AFNOR certifier emphasised on the even stronger integration of sustainable development in the Group's strategy, as well as efforts made to equip and simplify the process (e.g. like the operational implementation of the HSE tool in the regulatory compliance watch).

(1) See section 2.2.2.1.1 "Risk mapping and the report on the control of activities and risks".

(2) Upper and lower threshold: industrial establishments are "Seveso" classified according to their technological risk depending on the quantities and types of hazardous products they handle. There are two different thresholds which classify establishments as "Seveso low-threshold" or "Seveso high-threshold". There are two different thresholds which classify establishments as "Seveso low-threshold" or "Seveso high-threshold". The requirements vary significantly between these two types; they are very restrictive for the high-threshold, particularly with regard to the safety management system, informing the public and the prevention plan, etc.

(3) High-stake environmental event: an event causing serious environmental damage (areas, resources and natural environments, sites and landscapes, air quality, animal and plant species, biological diversity and balance) combined with extensive media coverage or a financial impact of more than €3 million. An event causing environmental damage and likely to affect human health falls within the scope of a high-stake environmental event for the EDF group.

(4) See results of environmental indicators.

The various actions carried out by the Group's departments and companies in 2018 are specified in subsequent chapters relating to the implementation of the Corporate Social Responsibility Goals and Sustainable Development Policy, particularly with regard to reducing the carbon footprint, improving environmental performance (including waste control and recovery) and the preservation of natural resources and biodiversity around industrial developments.

### 3.1.3.3.3 Expertise from sustainable development partnerships

Partnerships are an important lever for implementing Corporate Social Responsibility Goals, particularly in four areas: biodiversity, energy transition, vulnerable populations and fuel poverty, and consultation.

Partnerships bring essential expertise to the various business lines and companies of the Group on evolving issues and engage in or streamline dialogues with stakeholders at national and local level on these topics.

- In France, in terms of biodiversity, the Group relies on domestic partnerships built over time with major players in the sector: the National Natural History Museum (MNHN), the League for the Protection of Birds (LPO), the Nature Reserves of France (RNF), the French Committee of the International Union for Nature Conservation (IUCN), the Federation of National Botanical Conservation Bodies (FCBN), the Federation of Natural Site Conservation Bodies (FCEN), the Coastal Conservation Agency and the French Society for the study and protection of mammals (SFEPM). These partnerships focus mainly on the conduct of inventories, evaluations and the management of EDF's land assets in the field and on the upstream exchange of new projects.
- In total, EDF has forged over 100 partnerships through its business lines with non-profit organisations or research organisations such as the National Institute for Scientific and Technological Research for the Environment and Agriculture (Iretea) and the French Research Institute for Exploitation of the Sea (Ifremer).
- The partnership with the National Federation of Fishing in France (FNPF) continues through the financing and management of actions in favour of aquatic environments (one framework agreement and nearly 50 local agreements with departmental federations).
- Seminars with main partners maintain collective momentum in support of EDF's biodiversity approach, for example, in 2018 when preparing EDF's biodiversity roadmap (see chapter 3.2.6 "Committed to biodiversity").
- In the UK, for more than 20 years, EDF Energy has worked in partnership with the Suffolk Wildlife Trust at Sizewell and the Natural England Wildlife Trust.
- Regarding climate and ecological and solidarity transition in the broad sense, the partnership forged with the Sustainable Development and International Relations Institute (Iddri) allows EDF to engage in discussions on issues, develop expertise and identify emerging issues.
- Assisting vulnerable sections of the population in energy transition constitutes one of EDF's partnership areas, especially with the social and solidarity economy and social entrepreneurship sector. EDF initiated a partnership recently with ASHOKA France, one of the pioneers and major players in social entrepreneurship (described in chapter 3.34 Social innovation).

In terms of dialogue and consultation carried out in the regions of France, partnerships continue with the French coastal protection agency (Conservatoire du Littoral) on the dimension "support to local communities" and with the National School of Landscape Architecture (ENSP) so that the operational divisions of EDF increasingly include the landscape dimension in their activities. Thus, as part of the partnership with the ENSP, a regional education workshop "APR Brennilis" was organised on the re-qualification of the power plant on its territory.

EDF weaves various partnerships with national players such as condominium trustees for renovations, city authorities, or eco-mayors or involving the low-carbon white paper. The regional dimension is also extended to the national level, for example by business lines such as hydraulics for safety/security awareness campaigns around structures and water releases, or with the non-profit Remarkable Sites and Cities for supporting the development of our industrial heritage. Lastly,

many local partnerships are being created as part of the regional dialogue with regional players.

### 3.1.3.3.4 R&D resources for sustainable development

In terms of sustainable development, at the environmental level, EDF's R&D activities aim at preserving natural resources and human health via solutions for reducing discharge into water, air or soil and management of interactions between its generation facilities and biodiversity and the reduction of taxes in the logic of the circular economy. At the societal level, activities are also carried out on dialogue tools and consultation methods.

In France, €100.2 million, i.e. 20% of EDF's R&D budget is dedicated to protecting the environment. At Group level, total R & D expenses amounted to €711 million, split between EDF and seven subsidiaries, including three abroad (see section 1.6.1 "R&D Organisation and Key Figures").

For various illustrations of EDF's R&D commitment on major issues of sustainable development, see sections 3.2.1 (CSRG no. 1), 3.2.3 (CSRG no. 3), 3.2.4 (CSRG no. 4), 3.2.5 (CSRG no. 5) and 3.2.6 (CSRG no. 6), as well as the adaptation to climate change and natural resources sections in section 3.3 "Other subject areas of the sustainable development policy".

### 3.1.3.3.5 Sustainable Development Training and Awareness Raising



Societal, environmental and climatic issues related to electricity production are complex and various stakeholders of the Group do not know enough about them. EDF has prioritised its sustainable development training and awareness-raising activities in two subject areas:

- understanding the transformation of the Group's various businesses in relation to sustainable development and the six Corporate Social Responsibility Goals (CSRs) integrated into EDF's Strategic Communications Plan for the years 2018–2020: fight against climate change, human development, energy efficiency, energy poverty, dialogue and consultation, and biodiversity;
- making EDF's contribution to energy transition visible, while taking into account solidarity aspects.

### For employees

#### Training

In 2018, for the first time, the document that sets out "Company Training Guidelines" for three years includes a specific chapter dedicated to EDF's contribution to the energy transition, drawn up with the Sustainable Development Department.

Issues and business line priorities were defined to reinforce the skills and expertise of employees in environmental aspects, particularly with respect to regulatory requirements and standards. Training is prescribed and integrated into the "business" and the induction process for newcomers. At the Sales and Marketing Department and in the subsidiaries (Dalkia, Citelum, etc.), federated into a Group-level Academy of Energy Services since 2016, these courses mainly concern energy efficiency.

Cross-functional training related to the Corporate Social Responsibility Goals is deployed for all, on the one hand to take into account biodiversity in projects more effectively (96 employees trained in 2018) and, on the other hand, to improve dialogue with stakeholders (269 employees trained in 2018, i.e. 3,451 training hours, up 85% compared to 2017). Some of these training courses are decentralised in the regions, as part of regional involvement initiatives.

As part of the "Let's Talk Energy" measure deployed in the first half of 2018, nearly 200 employees, including 160 "dialogueurs", were trained in listening and dialogue methods, skills that can be transferred to dialogue with external stakeholders.

	2018
<b>In number of employees trained</b>	
Training in sustainable development	2,481
<i>Incl. the environment</i>	2,133
<b>In number of hours</b>	
Training in sustainable development	26,174
<i>Incl. the environment</i>	22,415

### Awareness-raising

To raise awareness among Group employees on priority topics relating to sustainable development and corporate social responsibility, communication actions are deployed through various Group resources, and in particular in its sustainable development community.

Since its creation in 2012, this community informs and educates employees on key issues related to energy transition and CSRG. Accessible to all Group employees, since it was opened, it has recorded nearly 1,000 articles (texts/videos published), 265,000 visits, 590,000 pages viewed, for an average reading time per visitor of about five minutes.

The topics covered concern both external news (EPP, COP 24, energy transition law, etc.), and the actions developed by the Group (low carbon solutions, reduction of CO<sub>2</sub> emissions, fight against fuel poverty, etc.) *via* different media: articles, videos, computer graphics. In 2018, the system incorporated monthly cartoons to make an impression. The community is also used to inform about events in which the Group's companies and business lines take part each year to support the SD policy, such as the Fête de la Nature or the European Week for Waste Reduction.

The Group's companies and business lines create awareness on sustainable development among their employees. Dalkia produced and broadcast a play on SD issues; EDF Renewables runs a programme on eco-responsibility, with calls for internal ideas, to mobilise employees around "eco-gestures" in the office; EDF China communicates several times a year on its carbon footprint and organises activities related to sustainable development for its employees. In Laos, the CEO of NTPC meets with all its employees every four months to share with them all information on sustainable development; EDF Luminus, through its Clim Action initiative, shares best practices with its employees to reduce their carbon footprint on a daily basis.

### For external stakeholders

The communication targets the general public, opinion leaders and young people. It has prioritised the Corporate Social Responsibility Goals, and more specifically the fight against climate change. 2018 was marked by EDF's commitment to responsible communication.

### Responsible communication

In 2018, the Group's Communications Department became involved in the new FAIRe programme proposed by the French Advertisers Association Union des annonceurs (UDA), making EDF one of thirty pioneering companies in the field of responsible communication. This ambitious programme combines 15 commitments in five subject areas:

- writing messages responsibly;
- eco-social-design of communication media;
- the controlled distribution of messages;
- taking into account all audiences;
- responsible relations with partners.

EDF's commitment was first implemented by writing an "EDF code of responsible communication". Written in collaboration with internal and external stakeholders (Sustainable Development Council, NGO), it includes 50 commitments, structured around 12 chapters including: respect for human dignity and its audiences; clear and responsible communication; respectful environmental communication; relationships with responsible suppliers engaged in CSR initiatives; communication focused on listening and discussion; and, impeccable digital communication.

"Responsible communication" training courses were deployed internally for the communication and management function.

### For the general public

EDF continued its communication on climate change issues and the solutions that the Company is implementing with its subsidiaries to decarbonise the economy, through the internet and social networks (videos on edf.fr, energy efficiency advice on EDF's Facebook and Twitter accounts, event communication on self-consumption etc.). In 2018, its Sowee brand launched the "Sowee Blog" on the internet, which is open to all and which provides concrete recommendations to reduce consumption and CO<sub>2</sub> emissions, particularly those related to heating.

Because biodiversity concerns all its production sites, EDF partners in the Fête de la nature, a national event supported by the Ministry of Ecological and Solidarity Transition. Thirty-one EDF sites took part in the 12<sup>th</sup> edition on the topic "See the invisible", with the notable inclusion of Corsica, Reunion, Guiana, Guadeloupe and Martinique, which are important sites of French biodiversity. The 80 events offered by EDF raised awareness among 4,800 visitors.

The 2018 edition of the "Journées de l'industrie électrique EDF", created in 2011, welcomed more than 20,000 visitors and offered low carbon options to the general public combining, for example, a visit to a hydraulic site with a wind farm or a visit to a nuclear power station with a photovoltaic park, as well as electric mobility events. Around one hundred French nuclear, thermal and hydropower sites were opened to local residents and school children: 400,000 visits in 2018, systematically integrating an educational conference on their operations and their economic and environmental impacts.

### For opinion leaders

In autumn 2018, EDF carried out a major operation called "Electric Days" (more than 9,000 visitors - local authorities, customers, partners, NGOs, young audiences, media), which presented innovations around four subject areas on which the Group is working: "low carbon", "smart home", "smart city" and "smart factory". A dozen conferences based on the Group's CSRGs marked the three days of the operation: helping vulnerable populations, access to carbon-free energy in developing countries, the rise of green finance transactions, "green bonds" in particular, new R&D climate services to integrate renewable energies in the networks in a better way, taking into account diversity in the electricity sector business, etc.

The Group continued the cycle of its "Energy Climate Encounters" started during COP21, where national and international experts share their approach towards climate issues and energy transition with targeted audiences (major companies, local authorities, government representatives, NGOs, etc.). In 2018, EDF thus organised three conferences and a debate with Jean Jouzel, climatologist and Pierre Larrourou, economist ("Avoiding climate and financial chaos"), and Benoît Leguet, director of I4CE, a think tank on financing energy transition ("Energy transition: finance commits!") and Pr Jeffrey Sachs, economist at Columbia University (Implementation of the Paris Agreement, three years after COP21"). The debate, organised as part of a partnership with the *Théâtre du Rond-Point*, brought together a larger audience, open to theatre subscribers. The topic was Carbon Neutrality in 2050.

In the French Overseas Departments and territories, the regional units prioritised their actions on energy poverty and organised symposiums on this theme with regional solidarity players. In the UK, EDF Energy continued its *Better Plan for a sustainable and responsible energy business* launched in 2017. This programme is an integral part of CAP 2030 and has been developed with the company's stakeholders. It is based on three pillars: *the decarbonisation of electricity* (Better Energy); energy efficiency and the taking into account of energy poverty (*Better Experience*); human development (*Better Lives*).

### For young people

Creating interest in the scientific, technical and industrial culture, helping to understand electricity better, and raising awareness of climate change issues are three of EDF's priority objectives for young people. Within the scope of an agreement signed in 2002 with the Ministry of National Education, the Company organises free conferences on electricity and sustainable development for primary, middle and high schools. In 2018, more than 100,000 school children took part in these conferences. The Company also provides education resources for young people and teachers on its website [edf.fr/energie-a-z](http://edf.fr/energie-a-z) (over 600,000 single visitors in 2018). In order to reach out to young people between 15-25 years of age, EDF is forging new partnerships with scientific mediators 2.0. For example, in 2018, the educational video on nuclear energy, published by youtuber Dr Nozman, generated 700,000 views. In the French Overseas Departments and local communities as well as in PACA and Brittany, EDF renewed its partnership created in 2016 with the regional education authorities and teaching associations for the "Watty at school" programme. Company employees and local associations go to primary and middle schools to raise awareness among 150,000 children every year on the need to save water and energy.

### Change in the perceptions of internal and external audiences

The Group measures the perception of sustainable development and its evolution over time through an annual survey of about 3,400 employees of EDF and Enedis<sup>(1)</sup>. In terms of knowledge and awareness of environmental issues, at least 80% of respondents said they had already heard of sustainable development, green energy or ethical charters, and one in five employees said they had received training on environmental issues or sustainable development in the last three years. In the course of their work, 65% of them said that they had already heard of (stable) corporate social responsibility commitments; 59% believed that environment was a priority in their unit, and 38% (down slightly) stated that they were aware of the Company's environmental policy.

The results of the 2018 survey follow on from the basic trends observed since 2010: major concerns over climate change, even considered as "very worrying" by 64% employees (65% in 2017; 45% in 2010). It is increasingly identified as the

consequence of human activity (78% stable compared with 2017). 97% of employees believe that climate change is under way, and 85% of employees also believe that it is possible to fight against climate change (stagnation). Nearly all the employees questioned were in favour of using renewable energies (89% for wind energy to 96% for hydropower, stable), and also stated that nuclear energy companies have a role to play in environmental protection (77%, stable). Up by one point, 86% expect energy suppliers to promote energy savings and 31% believe that these suppliers must also fight against fuel poverty (stable for five years). The circular economy continues to be a concept that is not very well understood by employees (20%).

EDF integrates three corporate responsibility criteria into variable compensation mechanisms when calculating employee profit-sharing, up to 40% of overall profit-sharing. For 2017-2019, it used the following criteria:

- a social criterion relating to participation in e-learning training in health and safety, accounting for 20% of total profit-sharing (target of 14,000 e-learning courses in 2018);
- two "Sustainable Development and Digital Development" criteria: one concerns the reduction of print jobs on the printers connected to the network (reduction target of 15% in 2018), and the other concerns the increased use of remote connection to replace physical connection (increase target of 15% in 2018), each accounting for 10% of total profit-sharing.

With regard to external audiences, the Group measures the change in perception on sustainable development-related topics through several surveys, which constitute a decision support tool for its awareness-raising activities. Key results for 2018 reveal that 57% people in France believe that EDF is concerned about the environment; for 20%, the Company generates energy with relatively low CO<sub>2</sub> emissions (stable compared to last year, the public still has difficulty linking nuclear generation to the absence of GHG emissions); for 29% (down 3 points) the Company acts in favour of energy transition and proposes new energy solutions. On the issue of the country's energy cap, 67% of French people trust EDF to develop renewable energy (+4 points) in a significant manner and 58% believe that the Company is preparing the energy future (+4 points).

(1) See section 3.1.1.2.1 "Surveys and listening practices".



## 3.2 EDF'S CORPORATE SOCIAL RESPONSIBILITY GOALS

### 3.2.1 COMMITTED TO CLIMATE ACTION



EDF group is aware of both the impact of its operations on climate change, and the impact of climate change on its operations. It deploys a strategy for fighting climate change, which includes a strategy of adapting to the physical effects of climate change and a decarbonisation strategy, with a goal in line with science and appropriate governance.

#### 3.2.1.1 EDF group's ambition (CSRG no. 1)

EDF group is one of the world's leading electricity producers, not only in terms of net installed capacity and electricity generation, but also in terms of carbon performance with a very low carbon intensity of 57gCO<sub>2</sub>/kWh <sup>(1)</sup>, which makes it the undisputed leader of the sector, with average global emissions maintained around 490g/kWh <sup>(2)</sup>.

The ambition of EDF group consists of going beyond the 2°C goal set by limiting the Group's direct CO<sub>2</sub> emissions to 30 Mt in 2030 (CSRG no. 1). In 2018, the indicator was at 35.5 Mt <sup>(3)</sup>. At the Shareholders' Meeting held in May 2018, the Chairman and CEO of EDF announced a more specific commitment: the Group is committed to reducing its direct greenhouse gas emissions to under 30 Mt in 2030, while contributing to carbon neutrality in 2050.

This goal is based on the methodologies developed within the "Science Based Targets" initiative to estimate sectoral contributions to the 2°C target; 2015, the year in which the Paris Agreement was signed and the Cap 2030 Strategy was launched, is the reference year for this goal, which contributes to the achievement of Sustainable Development Goals no. 13 (fight against climate change) and no. 7 (use of renewable energy) set by the UN.

EDF group has a low-carbon generation mix, combining renewable and nuclear generation. To maintain its leading position in low-carbon electricity generation and achieve its goal of reducing its direct GHG emissions, EDF group has two main levers: cutting CO<sub>2</sub> emissions from its generation asset portfolio and making relevant investment decisions.

Furthermore, R&D helps prepare the future generation fleet and energy system, by recommending measures for optimising thermal power plants <sup>(4)</sup>, integrating intermittent renewable energies, and through work on smart electricity systems.

#### 3.2.1.2 Increased transparency: Task Force on Climate Related Disclosures - TCFD

When the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD) published its recommendations, on 29 June 2017, on voluntary disclosures of financial risks relating to climate change, for use by companies in their communications to investors, lenders, insurers, and other stakeholders, EDF was one of the first organisations worldwide to adopt the recommendations.

In order to further increase climate change transparency, EDF undertakes a comprehensive process of aligning its climate change-related financial risk disclosures with the recommendations of the TCFD, in order to stay up-to-date with the requirements of financial markets with regard to climate change-related risks. This chapter is organised according to the TCFD recommendations plan.

A correspondence table for reading of this Reference Document from the perspective of the TCFD recommendations is available in section 3.8.3 "TCFD recommendations".

#### 3.2.1.2.1 Risks, opportunities and impacts of climate change on EDF

Energy production now accounts for approximately 60% of global anthropogenic greenhouse gas emissions, 40% <sup>(5)</sup> of which are linked to electricity and heat generation. The electricity and heat generation sector alone produces 25% of anthropogenic CO<sub>2</sub> emissions (IPCC, AR5). In France, the EDF group's Carbon performance gives it an edge, even though, because of its size, EDF group remains a major carbon emitter worldwide.

Decarbonising electricity generation is recognised as an effective way of reducing CO<sub>2</sub> emissions; at the same time, there is general consensus on the prospects of very strong growth in global electricity demand (almost 80% by 2050).

(1) Direct emissions, excluding life cycle analysis of generation plants and fuel.

(2) Most up-to-date statistic: CO<sub>2</sub> Emissions From Fuel Combustion, International Energy Agency, 2018 (figures for 2016).

(3) See section 3.9.3.1 "Group Indicators of the Sustainable Development policy and CSRG".

(4) See section 3.2.2.4.2 "Optimisation of environmental performances and modernisation of the thermal fleet".

(5) CO<sub>2</sub> Emissions From Fuel Combustion, International Energy Agency, 2018 (figures for 2016).

The EDF group must anticipate major changes:

- regulatory changes <sup>(1)</sup>: the PPE <sup>(2)</sup> or carbon budgets of the National Low Carbon Strategy in France; Climate Change Act, UK Environmental Permitting Regulations (EPR), Carbon Reduction Commitment Energy Efficiency scheme or Energy Efficiency Opportunities Scheme (ESOS) in the UK; and the 2020 and 2030 Climate and Energy Packages of the European Union;
- the EU-ETS reform which impacts CO<sub>2</sub> prices; regulatory changes tending towards an increase in CO<sub>2</sub> prices represent an opportunity for EDF, which is likely to increase the profitability of the Group's largely carbon free generation facilities;
- changes in technology: increasingly decentralised, low-carbon, digital energy, customers playing an increasingly active role in their electricity consumption and generation, emergence of new economic models.

The electricity sector must also face climatic changes that are likely to impact the Company's assets and change physical operating conditions. Physical and transition risks are described in section 2.1 "Specific risks to which the Group is exposed", and the EDF group's risk process is described in section 2.2 "Control of Group risks and activities".

In respect of these issues, climate change impacts EDF's operating activity and financial planning at multiple levels <sup>(3)</sup>:

- operations: the Group's thermal power plants use water as a cold source to optimise its output, and the EDF group acts in a number of ways to optimise its water usage and to reduce pressure on the environment (see section 3.3.2.2 "Water"). Moreover, the EDF group has initiated a programme to develop the flexibility of the existing nuclear facilities in order to support the accelerated development of intermittent renewable energies;
- products and services: the EDF group aims to create new decentralised competitive solutions, low-carbon energy services and smart grids to support customers and local communities in their energy transition (see section 1.3.2 "Priorities of the CAP 2030 strategy");
- EDF's value chain and suppliers: EDF pays particular attention to interactions between its value chain and climate change; for example, the purchase auditing systems, uranium supply and the bettercoal approach (involving coal supplier, Jera Trading), include an "environmental impact" component that takes into account both the issue of greenhouse gas emissions and the problem of exposure to the consequences of climate change;
- adapting to climate change: see section 3.3.1;
- operating costs and profit and loss statement: the fight against climate change impacts the Group's financial statements, especially through the price of CO<sub>2</sub>; due to the Group's low CO<sub>2</sub> emissions, an increase in CO<sub>2</sub> prices may appear as an opportunity;
- capital expense and allocation: to maintain its position as a leader in very low carbon growth the EDF group is intensifying the development of renewable energies and services while continuing its nuclear and grid investments. These investments represented almost €12.7 billion in 2018, i.e. 90% of the Group's net investments (excluding disposals);
- access to capital: since 2013, the Group has been using new financing tools and has conducted four Green Bond issues for a total of around €4.5 billion in order to support its development in renewable energies (section 6.8 "Information relating to the allocation of funds raised through Green Bonds issued by EDF");
- investments and acquisitions: climate change challenges, foremost among which the decarbonisation target (CSRG no. 1), are part of the Group's investment strategy and policy (see section 3.2.1.2.2 "EDF group's decarbonisation strategy");
- R&D investments: EDF's R&D plays a major role in developing low-carbon solutions (see section 1.6 "Research and Development, patents and licences"),

all the while reinforcing the safe and economically efficient operation of existing and future facilities.

### 3.2.1.2.2 EDF group's decarbonisation strategy

Based on CAP 2030 <sup>(4)</sup>, EDF group's decarbonisation strategy relied on an ambitious industrial policy focused on low-carbon generation. This policy entails action to promote increased electrification as a way of removing carbon from the economy. EDF is innovating to enable its customers to optimise their energy consumption.

#### 3.2.1.2.2.1 Maintaining its leading position in low carbon electricity generation

##### Drastically reduce CO<sub>2</sub> emissions from the fossil asset portfolio

EDF is committed to reducing CO<sub>2</sub> emissions from its energy mix both in France and abroad. This results in effective and planned closures, implementation of the strategic review of its fossil assets and improvement in the efficiency of its existing assets.

#### 1. Closure of coal and other fossil fuel units

Effective closures:

- in France, EDF changed its fossil generation resources voluntarily by closing 10 of its 13 coal-fired units (2,835MW), and by closing the fuel oil power plant in Aramon (1,370MW). Units 1 to 4 in Porcheville and unit 2 in Cordemais were permanently shut down in 2017 (2,975MW). The closure of unit 3 in Cordemais (700MW) took place in April 2018. These closures were accompanied by concrete actions to develop other economic activities and measures to reclassify the employees concerned;
- in Belgium, EDF Luminus started the process of closing down its gas-fired power plants <sup>(5)</sup>;
- in Italy, Edison set up the "AGP" (Advanced Gas Path) project in the Candela gas plant. With an investment of €7 million, this project has increased the plant's efficiency while reducing its specific emissions by 2%.

Scheduled closures:

- pursuant to the PPEs (multi-year energy programmes) of Corsica and French Guiana, the closures of the power plants in Vazzio (Corsica) and Dégrad des Cannes (French Guiana) are scheduled for 2023. In metropolitan France, the PPE project plans to shut down electricity generation plants operating exclusively on coal by 2022;
- in the UK, EDF Energy still operates almost 4GW of coal-fired power plants, which are currently essential to the UK's supply and demand balance. These power plants are to be closed by 2025, according to the decisions of the UK government. (See also 1.4.5.1.2.2 "Thermal generation and gas storage" on Cottam decision).

#### 2. Implementation of the strategic review of fossil assets

- EDF is implementing the results of the strategic review of its fossil fuel-based energy generation assets and also working to optimise the performance of its entire thermal fleet <sup>(6)</sup>.
- Therefore, EDF finalised the sale of EDF Polska's assets (cogeneration and electricity generation) in Poland at the end of 2017. This sale includes the Rybnik power plant, coal cogeneration power plants in Krakow, Czechnica, Gdansk, Gdynia and Wroclaw as well as gas cogeneration power plants in Torun, Zawidawie and Zielona Gora, representing total installed capacity of 4.4GWth and 1.4GWe respectively. It also includes heating networks in Czechnica, Torun, Zawidawie and Zielona Gora.

(1) Energy Technology Perspectives 2017, Scenario 2°C, International Energy Agency.

(2) PPE: multi-year energy programme.

(3) See section 3.2.1.2.3 "Governance of climate change".

(4) See section 1.3.2 "Priorities of the CAP 2030 strategy".

(5) See section 1.4.5.3.1 "Northern Europe".

(6) See section 1.4.1.4.2 "Issues relating to thermal generation".

### 3. Improvement in the efficiency of existing assets

- In Belgium, work on the Ghent Ham boiler has optimised its emissions.
- As part of its "better plan", EDF Energy aims to lower its emissions to 50 gCO<sub>2</sub>/kWh in order to maintain its position as UK's leading low-carbon producer. EDF Energy intends to make strategic investments in renewable energies and nuclear power in order to reach this ambitious target by 2032 <sup>(1)</sup>.

#### Maintaining its position as a leader in renewable energies

See section 1.3.2.2 "Very low carbon generation".

#### Relying on nuclear power, the cornerstone of EDF's low carbon strategy

- EDF's nuclear power contributes to carbon efficiency in France and Europe. While it is difficult to estimate the exact CO<sub>2</sub> emission savings in France, the average emissions from EDF's electricity generation are about 17 times lower than that of the sector in Europe <sup>(2)</sup>.
- The integration of a growing number of intermittent renewable sources of energy into the electricity system requires flexible means of generation.

#### Incorporating climate change priorities into its investment strategy and policy

Climate change represents a major financial challenge for EDF. In the context of its investment policy, EDF uses medium-long term scenarios that include carbon <sup>(3)</sup> prices enabling it to assess the profitability of future investments and plan the Group's strategy. Financial commitments are scrutinised in line with the CAP 2030 <sup>(4)</sup> strategy and commitments made by the Group, including the 2 degree decarbonisation objective. Scenarios including a high carbon price enable the Group to focus its investments on low-carbon assets, increasing the profitability of its largely low-carbon generation facilities. The description of the scenarios used in this respect, as well as their consequences are confidential.

#### Generating a comprehensive GHG report

Although the Group historically publishes its direct CO<sub>2</sub> emissions, since 2011 EDF has provided annual GHG reporting which also covers its indirect emissions (scopes 1, 2 and 3) thus going above and beyond its regulatory obligations. Since 2013, a gradual initiative has been in place to carry out GHG reporting at Group level, using a harmonised methodology based on the GHG Protocol Corporate Standard. The work undertaken gives a good idea of the direct and indirect emissions of the Group as a whole.

Direct emissions by the EDF group are almost all caused by fossil-fuelled electricity generation. In 2018, they amounted to around 35 million tonnes of CO<sub>2</sub>, with very few other sources of direct emissions.

Indirect emissions are higher than direct emissions, given the electricity generation decarbonisation policy and the relatively low level of direct emissions: most indirect emissions come from the combustion of gas sold by EDF, the electricity purchased to

serve end-customers, upstream fossil and nuclear fuels used in the power plants, and the emissions associated with the construction of power plants. Other indirect emissions, such as emissions associated with purchasing goods and services, employee travel and electricity consumed for own use, or emissions associated with the Group's investments in non-consolidated assets, are, proportionally, very limited.

#### Involving employees in the fight against climate change

In terms of employee compensation, EDF incorporates performance indicators that participate in its climate actions. This is the case for executive variable compensation, which is partly tied to the nuclear fleet's availability, since the latter does not generate direct CO<sub>2</sub> emissions. It is also the case of one of the profit-sharing criteria that promotes the use of digital tools during meetings rather than requiring employees to physically attend <sup>(5)</sup>.

#### 3.2.1.2.2.2 Helping customers consume less, more efficiently <sup>(6)</sup> and contributing to the process of removing carbon from the economy through low carbon electricity <sup>(7)</sup>

See section 3.2.4 "Committed to helping each customer consume better".

#### 3.2.1.2.2.3 Involve our stakeholders in climate action

See particularly section 3.1.1.2.2 "Stakeholder panels", section 3.1.3.3.3 "Expertise from sustainable development partnerships" and section 3.1.3.3.5 "Sustainable Development (SD) Training and Awareness Raising".

#### 3.2.1.2.3 Governance of climate change

The Board of Directors regularly reviews the opportunities, risks (in particular those related to climate change), their impact on the Group's strategy and the activities and the measures taken as a result <sup>(8)</sup>.

Regarding the consideration of climate change by Company management:

- the Executive Committee annually reviews the prospective balance sheet of emissions within the scope of the goal (CSRG no. 1) and its compatibility with the Group's decarbonisation path;
- the Sustainable Development Department ensures operational follow-up, in relation with the Corporate departments and subsidiaries concerned, by relying on the Sustainable Development Committee (SDC) and the Environmental Management System (EMS). The Sustainable Development Department also contributes to the management of the medium-term plan (see section 3.1.3 "Governance of sustainable development");
- the CSR Committee (see 3.1.3.1 Governance of sustainable development) ensures the strategic management of CSR issues including climate change and reports on its activities to the Group's Executive Committee at least once a year. Reports on its work are sent to the Board of Directors.

(1) It should be noted that the previous objective of less than 100 gCO<sub>2</sub>/kWh was achieved

(2) 17 gCO<sub>2</sub>/kWh for EDF to be compared to 299 gCO<sub>2</sub>/kWh EU28 (CO<sub>2</sub> EMISSIONS FROM FUEL COMBUSTION, International Energy Agency, 2018, data for 2016).

(3) In addition to other commodities and regulatory variables; for a description of the time-frames considered, see section 2.1 "Specific risks to which the Group is exposed".

(4) This is done within EDF's commitment Committee.

(5) Moreover, from 2019, the evaluation of managers will include ESG goals (Environment, Social, Governance).

(6) The materiality matrix identifies energy efficiency as one of its key priorities (materiality issue no. 10 Energy efficiency). This refers to services aiming to control electricity consumption (specifically using digital energy efficiency solutions) and awareness-raising initiatives carried out in order to promote moderate use of electricity. This priority also refers to the optimisation of grid output.

(7) Refers to the use of electricity instead of fossil fuels, and specifically to the development of electric mobility, new electric infrastructures and services contributing to sustainable cities, and to the increased market share in heating.

(8) See section 4.2.2.3 "Powers and duties of the Board of Directors".

**3.2.1.2.4 Targets, indicators, performance: transition risks****Limiting the Group's direct CO<sub>2</sub> emissions to 30 Mt in 2030, aiming to be carbon neutral in 2050**

The EDF group's Carbon performance continues to be exceptional:

<b>CO<sub>2</sub> emissions due to heat and electricity generation <sup>(1)</sup></b> (g CO <sub>2</sub> /kWh)	<b>2018</b>	<b>2017</b>	<b>2016</b>
EDF group [*]	57	82	77
EDF	17	25	19

(1) Direct emissions, excluding life cycle analysis of generation plants and fuel.

Use of this low-carbon electricity is a major positive contribution in terms of avoided emissions. The global average is 490g CO<sub>2</sub>/kWh<sup>(1)</sup> and the average of the European Union is 299g CO<sub>2</sub>/kWh<sup>(2)</sup>.

<b>CO<sub>2</sub> emissions due to heat and electricity generation <sup>(1)</sup></b> (Mt CO <sub>2</sub> )	<b>2018</b>	<b>2017</b>	<b>2016</b>
EDF group	34.9	50.5	47.7
EDF	7.5	10.7	8.3

(1) Direct emissions, excluding life cycle analysis of generation plants and fuel.

- In 2018, the EDF group committed to limiting its emissions to 30 million tonnes in 2030 (direct CO<sub>2</sub> emissions), and wishes to be carbon neutral by 2050 (see section 311 EDF group's goal);
- the decrease in greenhouse gas emissions observed between 2017 and 2018 is related to the sale of EDF Polska power plants and favourable circumstances in France: greater hydropower capacity and improved availability of French nuclear power plants;
- although up in 2018, a higher average CO<sub>2</sub> price would have made it possible to further reduce CO<sub>2</sub> emissions by modifying the merit order<sup>(3)</sup>, and therefore the use of coal-fired power plants (see section 1.3.1 "Environment and strategic challenges").

**Indirect CO<sub>2</sub> emissions**

The total direct CO<sub>2</sub> emissions from generation power plants (scope 1), emissions from the combustion of gas sold to end-customers (scope 3) and emissions from the use of electricity purchased to serve end-customers (scope 3<sup>(4)</sup>) account for 74% of the Group's direct and indirect emissions.

<b>Indirect emissions from the combustion of gas sold and use of electricity purchased to serve end-customers (Mt CO<sub>2</sub>)</b>	<b>2018</b>	<b>2017</b>	<b>2016</b>
EDF Group	72.9	64.2	61.5
EDF	7.2	7.8	7.0

**Other indicators linked to the transition risk**

In addition, section 1.3.3.1 presents indicators relating to the Group's investments for 2018 by type and section 3.2.1.2.2 shows the proportion of these investments corresponding to low carbon activities.

**3.2.1.2.5 Targets, indicators, performance: physical risks**

The physical risks that may impact the Group are potentially very varied. As far as the significant risk of water stress is concerned, the Group is committed to continuing to improve performance in terms of water withdrawal and consumption at existing power plants and to researching the most efficient way to use water across territories and major river basins. For indicators concerning the volumes of water withdrawn and returned by the Group, as well as the associated control strategy, see sections 3.9.3 "Indicators" and section 3.3.2.2.1 "A resource for energy production".

**3.2.2 COMMITTED TO HUMAN DEVELOPMENT****Corporate responsibility objective no. 2: to integrate the best practices of industrial groups in terms of human development: health/safety, gender equality and internal social promotion.**

In an environment that is undergoing rapid, far reaching changes, the human aspect is more than ever a core component of the CAP 2030 strategic plan, itself a key factor in the Group's performance. To tackle the industrial and commercial challenges it faces, EDF must remain a socially responsible and committed employer and a benchmark in terms of its employees' health, professionalism and commitment, by building their skills and fostering greater workforce diversity. EDF is committed to incorporating the best personnel development practices of industrial groups in order to maintain strong employee commitment.

(1) Most up-to-date statistic available for CO<sub>2</sub> emissions generated by power plants and combined cycles, CO<sub>2</sub> EMISSIONS FROM FUEL COMBUSTION, International Energy Agency, 2018, data for 2016.

(2) Id.

(3) Classification criteria for the means of generation based on their availability and price, which may determine their sequence.

(4) See section 3.9.2.2 "Further details on the environmental data" for a definition of "scope 3".

[\*] **IND** Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4)

### 3.2.2.1 A reference Company in terms of health and safety: the health and safety of our employees and the employees of our service providers, an absolute priority

#### 3.2.2.1.1 Guaranteeing the best health & safety conditions at work for all

The Group's new health and safety policy, adopted in April 2018, defines a common, consistent framework with which the policies and action plans of the Group's different subsidiaries must comply. This Group policy applies to all the companies controlled by the EDF group, in all the countries in which EDF operates, and concerns both its employees and its sub-contractors' employees working on its facilities and premises.

The Group's new Health and Safety policy is based on an undertaking signed by the Chairman and all members of Executive Committee.

This undertaking is accompanied by a roadmap that mobilises the Group's entities to achieve the objectives set.

There is an annual Group health & safety review.

The CAP 2030 programme's strategic health and safety objectives were defined in 2015. The Group strives to set an example in the area of Health and Safety. The main priority is to eradicate fatal accidents, then reduce the number of accidents and

combat absenteeism. This ambition and these priorities for the coming years are implemented in all the companies of the Group in order to:

- make health and safety one of the Group's major commitments and an essential component of its culture;
- place managers at the heart of the deployment of health & safety policy;
- empower all employees on a daily basis: for example, in 2018, EDF conducted 24,414 *e-learning* training courses on shared vigilance and 11,518 courses on safety culture, *i.e.* 35,933 against 14,000 covered under EDF's profit-sharing agreement. Employees were also mobilised as part of the annual Health and Safety Week in October, this year devoted to field presence and shared vigilance;
- protect and promote health of everyone: employees, service providers, clients and local people. In this regard, initiatives to raise awareness about preventing addictions were developed, and followed by the introduction of checks for alcohol and drug consumption.

In 2018, 33.9% of the EDF group's employees were covered by a Health and Safety Management System certification (OHSAS 18001, ISO 45001, MASE, VCA).

As an extension of the actions carried out in 2017, the construction of the Group's reference framework (BEST: Building Excellence in Safety Together), comprising eight Health and Safety management requirements (the Group Safety benchmark), was finalised in 2018 and posted on EDF's website. The Group's new Health and Safety policy specifies the conditions for the deployment of this new internal benchmark, which is based on a self-assessment process.

### Eradicating work-related deadly accidents

#### Eradicating fatal accidents at work

This was the first goal firmly set in 2015 for Group employees and service providers.

Group Data	2018	2017	2016	2015	2014
Total number of employee and service provider deaths	9 <sup>(1)</sup>	15	10	16	15
including number of employee deaths:	6	6	1	3	4
including number of service providers' deaths:	3	9	9	13	11

(1) With 1 death linked directly to work (fall of a service provider from a level on site), 3 commuting accidents, 4 dizzy spells and 1 employee found unconscious.

In 2018, continuing the initiatives started in 2015, the Group focused on 10 key rules, which were adopted following an analysis of deadly accidents in the EDF group over the last 30 years, which everyone must follow as they go about their work in order to avoid serious accidents and protect both themselves and those around them.

To continue developing the safety culture, other initiatives were taken in 2018 with the implementation of the collection of High Potential Events (HPE), more than half of which are near-accidents or dangerous situations and sharing at Group level of Experience Feedback on the elements resulting from the analysis of these events, in particular those related to the 10 key rules of the Group.

#### Reducing work related accidents

In 2018, the Group confirmed the positive results obtained for EDF employees since 2016 (number of work-related accidents that resulted in more than one day of absence from work, recorded over the current year and per million hours worked. Days of absence from work are linked to the year when they are taken even if the accident occurred the previous year), confirming its capacity to sustain this level, never before achieved at the Group scale.

In 2018, the EDF group published its overall frequency rate, including accidents and working hours for its employees and service provider employees, thus illustrating the prevention approach covering all stakeholders deployed in the Group for several years.



Group Data	2018	2017	2016
Group employee frequency rate	2.7	2.7	2.7
Overall Group frequency rate (EDF + service providers) [*]	3.5		

In order to have comparable data between Group entities and measure accident rates directly related to the performance of activities, EDF set-up a new "LTIR" indicator corresponding to the calculation of the frequency rate according to Anglo-Saxon standards. This indicator will be provided in 2019.

The 2020 objectives of the new health and safety policy are now expressed on the basis of this new indicator (EDF LTIR less than 1.4 and overall LTIR: EDF + service providers less than 1.8).

### Fight against absenteeism and quality of working life

Among the areas for improvement pinpointed, prevention of anxiety- and depression-related disorders, stress and musculoskeletal disorders (MSD), the three main causes of absenteeism, are regularly targeted by prevention initiatives.

In 2017, the participation of EDF employees in an online course on the prevention of MSDs was chosen as a safety criterion under of the profit-sharing agreement. In 2017, 8,675 employees completed this course, well above the 3,500 target set in the profit-sharing agreement.

Deployment in 2017 of the EDF SA labour agreement: "Improving the functioning and working conditions of teams on a daily basis for better quality of life in the workplace and better performance by organisations", signed on 8 July 2016, allows efforts within teams to improve quality of working life and the prevention of psychosocial risks.

In 2018, a Group-wide methodology for the evaluation of psychosocial risks was developed based on data from the employee perception survey (My EDF), cross-checked with the Gollac criteria. This new system makes it possible to improve the detection of group's potentially in difficulty and define more appropriate prevention actions.

### Health at work - work-related illnesses

#### Health at work, a major theme

The EDF group employs staff specialised in health at work. The Group also employs physicians who are experts in toxicology, ergonomics, epidemiology, first aid, and radiation protection. In addition to medical monitoring of employees, these healthcare workers are involved in setting up primary prevention programmes and are stakeholders on all the social dialogue bodies in the field of health at work.

Health in the workplace is the subject of an important social dialogue with the EDF SA central works council, with a session dedicated to the topic every year to examine the results of inter-establishment Work Health Services. A special commission was created in the body to monitor cases.

#### Occupational diseases

The annual data published by the Group's French companies (particularly EDF and Enedis) gives as the main causes of occupational diseases: asbestos (pleurisy, pleural plaques, primary cancer of the lung), movements and positions (shoulder condition, tendinitis, carpal canal), conditions caused by ionising radiation, silica (pneumoconiosis) and noise hazards (deafness).

#### Asbestos

In the past, the EDF group has used products, materials and facilities containing asbestos. In accordance with current regulations in France, the replacement of materials containing asbestos in EDF establishments and facilities began in the late 1980s, with all materials containing asbestos being treated, and EDF set up reporting measures and procedures to protect employees and third parties working at the Company.

In July 1998, EDF signed an agreement, revised in June 2002, with all trade union federations, for the prevention of and compensation for exposure to asbestos. Following this agreement, EDF introduced an early retirement plan for workers who are duly recognised as suffering from an occupational disease associated with asbestos. Voluntary financial assistance and a pension supplement both financed by EDF were established. EDF also provided social assistance to sick workers and their families with information and support during the compensation process. See section 2.4 "Legal proceedings and arbitration" for a description of current procedures.

#### Ionising radiation

The mobilisation of ground players has allowed a continuous improvement of performance on the protection of employees against the effects of ionising radiation. In France, the average annual individual dose of all the workers, employees of EDF and external companies, working on reactors was halved in less than ten years; in the United Kingdom, there was the same reduction, mainly thanks to optimised governance of maintenance and repair work. In 2018 in France and in the United Kingdom, and since 2003, no workers, employees or service providers exceeded the regulatory threshold (individual dose over 12 sliding months).

In France, in 2018, the average collective dose is 0.67mSv (man-Sievert) by reactor (0.61 and 0.76mSv by reactor in 2017 and 2016). In connection with the industrial programme for 2018, this result is and remains the fruit of the optimisation of sites and activities, especially of the efficiency of interventions for optimising the radiological condition of the circuits.

In 2018 in the United Kingdom, the average collective dose was 0.095mSv for the EPR reactor and 0.05mSv per AGR reactor (advanced gas reactors).

EDF is proactively implementing an ALARA (As Low as Reasonably Achievable) policy to limit the collective dose to take account of the workload involved in the industrial project on the fleet in operation over the coming years.

Efforts must be continued to implement the ALARA procedure on the ground in the years to come, and also in terms of the radiological cleanliness of circuits and premises to bring us up to the levels of the best operators. We must also continue efforts to control and reduce doses in the most exposed professions.

#### 3.2.2.1.2 Making health at work a subject of social dialogue

Within the Group, there is social dialogue on health at work at three levels:

- European level (presentation of the actions taken during the year to the European Works Council's Health & Safety workgroup);
- at Group France level (with the presentation of the year's key issues and figures to the France Group Committee); and
- at EDF level, with a national health at work group issuing recommendations on four themes: prevention of asbestos risk, impact of business line developments on medical teams, development of a health at work action plan and communication on health at work.

In 2018, joint work on health and safety was carried out with the European Works Council, through several exchanges (presentation of Group results and actions) but also within the framework of the joint working group that made it possible to prepare the reference framework for the best practices in health and safety management (BEST reference framework: Building Excellence in Safety Together) which has been widely circulated and is also available on the website [www.edf.fr](http://www.edf.fr).

A progress report on the strategic health and safety objectives was also presented to all of the bodies.

[\*] **IND** Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4)

### 3.2.2.2 Gender equality

EDF ensures diversity at all managements levels of the Company and is strongly committed to a policy to promote women to key positions. This commitment is based on increasing the attractiveness of technical jobs for young women and ensuring that equal opportunities are guaranteed for all of the Group's women and men throughout their careers.

The CSR World Agreement signed on 19 June 2018 (also see section 3.4) devotes its Article 6 to the challenges in respect of professional gender equality, recognising its desire to promote gender diversity in work teams across the business. At Group level, an indicator measures diversity in the Management Committees. At the end of 2018, this diversity of the Management Committee had reached 26.3% [\*] with women representing 24.6% of staff. In addition, women's share of the top 10% high-responsibility positions at EDF was 26.3% at the end of 2017 <sup>(1)</sup>.

Several Group companies began the process to gain European recognition regarding equal access to employment (EDF, EDF Energy Fenice) and were accordingly

awarded the *Gender Equality European & International Standard* (GEEIS). EDF and WIN France created a "Fem'Energia" prize which since 2006 has recognised and supported women involved in the nuclear industry. In 2018, the EDF group was involved in the "EQUAL BY 30" campaign to promote diversity in the energy sector.

Since 1 January 2018, Group companies such as EDF, Enedis, and Electricité de Strasbourg have deployed an agreement signed at the level of their professional branch that modernises support for employees in charge of their families, parents or family caregivers. The support offered is in a contemporary setting, open to all family formats (single parents, parents of children with disabilities, blended families, etc.) with a constant quest for equal access to women and men and non-discrimination.

Many companies (EDF, EDF EN, Enedis, Électricité de Strasbourg) deploy their policies as part of the three-year gender equality agreement.

By way of example, as part of its 2017-2020 gender equality agreement, EDF SA promises:

Main ambitions	Related objectives
Increased awareness among its staff of the bias created by stereotypes and to fight against any form of discrimination, sexism at work and more generally against violence done to women.	Distribution of an annual communication kit on "everyday sexism at work" to help <i>managers</i> to increase awareness among all work teams. Distribution of published guidelines on harassment and discrimination. Guidelines on moral and sexual harassment targeted at managers and HR. Deployment of a <i>serious game</i> "Experiencing Diversity Together" to enable employees to test and train themselves on issues of stereotypes and discrimination (with separate modules for the general public and managers). The Company has made the commitment to train 100% of its managers and HR staff involved in recruitment over the next five years.
Implementation of schemes that guarantee equal pay, that neutralise the impact of maternity or adoption on career development, and that also attempt to better understand, analyse and deal with persistent wage differentials.	To preserve equal pay for "equal work, equal skills and equal value", achieved since 2009. Systematic examination of the pay situation of women returning from maternity leave. External auditing & analysis of wage differentials at the Company (INED/INSEE researchers) in order to better identify, and correct, the sources of gender wage gaps at all pay levels. In 2018, EDF's gender equality index was 80/100.
Guaranteeing equal access to occupational and promotional training.	Annual training reviews by gender. Monitoring by gender of employees who have not attended a training course for 3 years. Covering of childcare costs incurred due to absence for promotional training and for any course and from the first day of training for single parents, or within the framework of particular family situations.
Mobilising all career path tools and stakeholders to advance gender-related representation of business lines in order to favour the recruitment of women in technical business lines and, more globally, to enable greater variety and diversity at work	Support for the "Énergies de Femmes" and "Elles Bougent" networks. Increased proportion of women recruited and mobilisation of Company's work/training networks to improve recruitment of women in technical departments. Promotion of fast-tracking between business lines enabling reconversion from tertiary to technical.
Finally, promoting employee engagement via better work-life balance, by adapted working conditions and the organisation of work encouraging women to hold key positions and responsibilities at the Company.	<p>Parenthood charter signed, adapted and implemented. Parenthood guide distributed to all employees. Aim to achieve diverse teams amongst Management and Directors. In 2018, at EDF, women represented 30.6% of staff, 29.8% of managers and 25.3% of Management Committee members.</p> <p>Deployment of teleworking and the right to disconnect for all. (over 6,000 teleworkers at the end of 2018)</p> <p>Mechanism to allow employees to opt to extend paternity leave by an additional 10 working days (15 days for multiple births).</p> <p>Experiment with a mechanism to provide help with homework and academic support entirely covered by the employer in organisations that may have difficult working hours.</p>

(1) In accordance with Article L. 225-37-4 (6°) of the Commercial Code, this percentage is calculated for functions with the highest responsibility from a sample of 6,232 people, representing 10% of the Company's workforce (statutory employees) at 31 December 2017, which includes executives and senior managers. The 2018 final figures were not available on the date of this Registration Document.

[\*] IND Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4)

### 3.2.2.3 Internal social promotion/developing the “social elevator” of tomorrow

#### 3.2.2.3.1 Promotional training courses promote the “social elevator” at all levels

Corporate Social Responsibility Goal no. 2 relates to the aim to develop the “social elevator” of tomorrow.

To contribute to this process, the Group focuses on the potential of its employees, whatever their level, by investing in multiple training systems or promotional support.

For example, this is reaffirmed as part of the 28 October 2016 EDF collective agreement for Skills for the 2017-2019 period. This agreement promotes different skill development methods at the initiative of the employer and of the individual, with an innovative boost to Personal Training Account (CPF) contributions, if the training is for certification in a priority area for the Company or employees who use their CPF belong to a priority training category (low-qualification employees, disabled employees, employees involved in promotional training, employees with little training, etc.).

#### Promotional systems as joint initiatives of Employees and the Company

EDF has thus built and negotiated with social partners for innovative mechanisms based on the Personal Training Account. The initiative rests with the employee and it is jointly financed by the Company. These mechanisms allow employees to fast-track their career and change *category* by obtaining a diploma.

This form of “social elevator” genuinely sets the Group apart and has proven its effectiveness:

- more than 35% of the EDF group's current managers in France became managers over the course of their careers;
- nearly 1,300 Group employees began a promotional diploma course over the last eight years, 125 of whom began attending them in 2018;
- 180 graduated the same year;

In 2018, the number of publications of EDF's promotional training offers exceeded the screening set by the Skills agreement by 30%. 105 publications planned, 136 realised.

In addition to promotional training, EDF has developed a reinforced support system for employees at expert level promoted to management by managerial decision allowing them to obtain a RNCP level II that they can apply during the course of their career. Eighty employees benefited from this system in 2018.

#### Promotional training systems for employees being retrained

The way training has been used to serve mobility priorities at the Group level remained very strong in 2018. Against the backdrop of intensifying competition and a situation in which the energy transition and process digitisation will have consequences for jobs, EDF is increasing its support for redeployment of sites and jobs and re-training programmes.

Thus, 80% of employees in professional re-training will have access to management *via* promotional training at the Bac+5 level. The promotional curriculum of future IT managers is a perfect illustration of this re-training.

The business line academies play an essential role in these systems since they are responsible for the content of redeployment and retraining courses.

#### 3.2.2.3.2 Work-study programmes: a solid history and a commitment for the future

The EDF group has been historically committed in favour of work-study programmes. It is a way to ensure excellent training, professional training and occupational integration of young people. (see section 3.4.3 “Compensation and social welfare: an attractive employer”)

The 2018 results continue this trend, with 6,958 work-study trainees within the EDF group at the end of 2018, including 3,461 trainees at EDF and 1,775 at Enedis. Among the work-study trainees who finished their contracts, 97% obtained their diploma and 92% found a job or started training at the end of their contract.

In 2018, Group initiatives already under way continued to operate:

- a proactive policy to hire work-study trainees in Group companies; within the scope of EDF, 31% of 2018 hires were of work-study trainees, a figure well above the commitment of 25% made in the EDF Skills agreement signed at the end of 2016;
- there were actions to help the work-study trainees not hired to find work, such as the organisation of *speed dating* events with the Group's service providers, business start-up assistance for work-study trainees who have formulated proposals, the organisation of workshops in conjunction with *Pôle Emploi* or enrolment on the “Engagement Jeune” inter-company platform, which allows EDF's work-study trainees to submit their curriculum vitae along with a short recommendation from their tutor.

As proof of this commitment by the Group to work-study programmes, in autumn 2016, Jean-Bernard Lévy became Chairman of *Fondation Innovations Pour les Apprentissages (FIPA)*, which is financially supported by major groups operating in France <sup>(1)</sup>.

(1) Under the aegis of the Ministry of Labour, Employment, Professional Training and Social Dialogue, and the Act Against Exclusion Foundation (FACE), FIPA's objective is to promote innovation in all kinds of work-study schemes through the financing of concrete projects proposed by companies that meet those companies' real needs.

### 3.2.3 COMMITTED TO SUPPORTING FRAGILE POPULATIONS



#### 3.2.3.1 EDF's commitment: providing 100% of vulnerable populations with information and support solutions in terms of energy consumption and access to rights (CSRG no. 3).

Energy poverty, various problems due to unsatisfactory access to energy is a complex phenomenon that has intensified in most developed countries, especially in Europe, in terms of number of households concerned or the severity of the impacts encountered.

In France, fuel poverty remains high: the analyses of the National Fuel Poverty Monitoring Centre, in which EDF is a partner, show 6.7 million people in a situation of fuel poverty and 7.2 million private dwellings with very poor thermal performance (Energy label F or G).

In the United Kingdom, the percentage of households estimated to be in a situation of fuel poverty has declined in recent years, as a result of a change in definitions and indicators. The incidence of the problem is actually on the rise. The energy poverty gap <sup>(1)</sup> is widening due to the rising cost of energy in the country. In November 2017, on a proposal from the energy regulator, the UK government decided to introduce an energy price ceiling of £1,137 a year starting in 2019, saving an average of 11 million customers £76 per year on their gas and electricity bills. This revisable cap applies to dual-energy customers subject to default tariffs after their fixed price offers have ended.

These two examples show that the national contexts, which are very different at the regulatory, economic, political and competitive levels, do not allow for the aggregated quantification of the number of households concerned, or the alignment of the solutions.

In this context, EDF has been working with the government, social services, and local authorities and non-profits to help combat fuel poverty. Above all, the Group acts to ensure that an electricity bill is not an additional aggravating factor for its most vulnerable customers. EDF's action includes research programmes, innovation and the implementation of concrete solutions, consisting of enhanced support for public measures and proactive actions by the Group.

The indicator used for CSRG no. 3 concerns the "number of energy supports". In France, it is a system deployed by telephone by 5,000 customer advisers and nearly 300 solidarity advisers, intended for any customer experiencing a difficulty and designed to analyse the situation and propose the most appropriate solutions. In 2018, there were 1,302,590 energy supports <sup>[\*]</sup>, which represents an increase compared to 2017 <sup>(2)</sup>.

#### 3.2.3.2 Implementation of operational solutions

In France, EDF's solidarity policy is based on three pillars: prevention, support and payment assistance. Furthermore, improved identification of vulnerable customers is a constant concern.

#### 3.2.3.2.1 Public schemes strongly supported by the EDF group

EDF implements public schemes provided for by regulations by adding its own support systems for vulnerable populations.

- In terms of prevention, EDF supports thermal renovations of homes occupied by very low-income residential customers notably by participating in the Habiter Mieux (Better Living) programme. This programme, implemented since 2011 by the State and piloted by the French Agency for Home Improvement Agence nationale de l'habitat (Anah), enabled the renovation of 240,000 homes occupied by owners in energy poverty. In November 2018, the government decided to increase the target by 50%, hitherto fixed at 75,000 home renovations per year.

In 2018, EDF renewed its partnership with the Abbé Pierre Foundation until the end of 2020, particularly through the "Roofs First" programme.

EDF also contributes a maximum of €57 million to the Guarantee Fund for Energy Renovation. This fund, eligible for energy savings certificates (CEE), makes it easier for low-income households to obtain a loan from the banks to carry out energy renovation work and finance the rest of the work.

- In terms of payment assistance, EDF implemented the deployment of energy vouchers <sup>(3)</sup> for vulnerable populations. After two years of experimentation, this scheme was rolled out throughout the country in January 2018 and 3.4 million vouchers were sent in April 2018.
- EDF actively supports its implementation with information and training activities for the social services which relay information to the public, on the one hand, and directly for its customers, on the other. The Company made arrangements to inform its customers of the arrival of the energy voucher and send reminders in case of non-receipt.

In order to familiarise vulnerable customers with the digital use of energy vouchers, EDF has renewed its partnership with Unis Cité (an association specialising in the Civic Service for young people) on digital inclusion (pilot operations in the territories of Saint-Nazaire and Clermont Ferrand). The goal is to enable the system to achieve a high rate of Cheque + Certification digitisation (31% at the end of October 2018) and improve the effective use of this aid by people who can benefit from it.

EDF continues its active and sustainable involvement alongside local authorities and social services in the implementation of local assistance for paying a part of the energy bills of the most vulnerable customers. EDF, EDF SEI (Island Energy Systems) and Electricité de Strasbourg participate in the regulation of unpaid bills by contributing to the Housing Solidarity Fund (FSL), which pays a part of the electricity bill for the poorest customers. EDF's contribution was more than €22 million in 2018.

In the UK, *Energy Carbon Obligation* (ECO) replaced Warm Front (WF), *Carbon Emissions Reductions Target* (CERT) and the Community Energy Saving Programme (CESP). This means that ECO, implemented by EDF Energy, encompasses both measures for reducing carbon emissions and fighting against fuel poverty through the improvement of energy efficiency.

In Italy, Edison offers the "social bonus". This public scheme reduces the electricity bill, based on income levels, and aims to help the most vulnerable families at the economic level and/or at the level of their health.

In Belgium, EDF Luminus developed all the public schemes specific to Flanders, Wallonia and the Brussels Capital Region.

(1) The "poverty" gap is the measure of the difference between the cost of an average bill for heating a house to a comfortable level and the cost of a bill for a customer who is in a situation of fuel poverty.

(2) See section 3.9.3.1 "Group Indicators of the Sustainable Development policy and CSRG".

(3) In accordance with the TECV law, social energy tariffs ended on 31 December 2017 and have been replaced by a new system: the energy voucher.

[\*] IND Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4).

### 3.2.3.2.2 EDF group's voluntary schemes

#### France

##### EDF in mainland France

EDF has developed human and digital support to control its energy consumption and save energy.

There are multiple digital solutions available to customers, such as:

- e.quilibre, EDF & MOI, Electriscor (see section 3.2.4.2.1 "Consumption control");
- the Prime Energie website offers financial assistance to carry out work to save energy. This site offers significant assistance to customers in a situation of energy poverty. Through this scheme, EDF was involved in the "Coup de Pouce" initiative supported by the Ministry of Ecological and Solidarity Transition, which ended on 31 March 2018.

All of the 5,000 EDF advisers are trained in Energy Support, through which they provide personalised advice on payment methods, ways to save energy, and help with the payment of bills. These advisers are mobilised to provide flexible solutions adapted to customers experiencing difficulties.

A series of personalised phone calls were made during the "winter truce" of 2017-2018 to customers who benefit from social energy tariffs and have outstanding bills to prevent these bills from piling up during the winter, and avoid an outage at the end of winter. In addition, the solidarity teams proactively contact customers experiencing payment difficulties to raise their awareness on controlling energy demand, offer support solutions and direct them to the relevant Social Services when necessary. At the same time, EDF reinforced its alert and monitoring methods (mailing, text campaigns, phone calls) of vulnerable customers disconnected or whose power was reduced at the beginning of winter, so that each of them could benefit from recovery before winter.

In addition, close to 300 "dedicated solidarity experts" work directly with social workers to best support the most vulnerable customers. Every year, EDF renews the partnership forged with the UNCCAS (National Union of Municipal Centres for Social Action) in 2008, adapted at the departmental and communal level. Like EDF SEI, EDF deploys the PASS (Portal for Access to Solidarity Service), which makes exchanges with social workers more fluid.

EDF has signed the "Team Pro Habiter Mieux [Pro Better Living Team]" charter, the objective of which is to strengthen the mobilisation of professionals in the fight against energy poverty and, in particular, the identification and information of disadvantaged households. These are social workers solicited by customers or to whom EDF refers customers (when they call Customer Relations Centres, with reminders of outstanding bills) who identify households.

EDF partners with charities such as the Secours Catholique, Secours Populaire and the French Red Cross which it supports in their actions to fight energy poverty. In all, there are almost 450 active partnerships.

At the regional and district level, EDF has developed modelling and simulation capabilities to identify areas of energy poverty and propose solutions and recommendations to alleviate this situation. In accordance with Article 28 of the law on energy transition for green growth, EDF is working on a solution for displaying consumption in real time, made available to vulnerable customers equipped with smart meters.

EDF, EDF SEI (Island Energy Systems) and ES (Electricité de Strasbourg) distribute Demand Side Management (DSM) kits, which include LED lamps.

##### EDF Island Energy Systems

EDF SEI continues to finance Demand Side Management vis-à-vis social-housing lessors (LED, thermal insulation programmes, etc.) and develop new offers in this area.

EDF SEI is developing information and support initiatives such as:

- the MAGE programme in Reunion aims to provide individual and collective support, over two years, to low-income households in public and private housing, to help them understand and control their water and energy

consumption, at the time of a change in context. To all participating persons supporting them, the programme provides a methodology and educational tools and measures to continuously assess the savings of these households;

- the SLIME programme in Reunion: these local intervention services for energy management are programmes managed by local authorities that are intended to detect and assist households in situations of energy poverty. They are coordinated by the French energy transition network (CLER);
- like in France, EDF SEI sent reminders to former customers who had benefited from the Basic Necessity Tariff (TPN) until 2017 to identify those who had received the energy voucher and had not yet used it;
- the "Watty at school" programme helps raise awareness about saving electricity: it allows children to develop good habits and encourages their families to change their habits. Each student can become an "ambassador" of the eco-gestures learnt during the programme.

##### Electricité de Strasbourg (ES)

ES organises meetings with customers to explain bills and provide advice and eco-gestures. They are led by the Solidarity Correspondent and can take place in educational apartments or in local charitable non-profits, municipal centres for social action (CCAS), or the Territorial Union of Medico-Social Action (UTAMS). The ES Solidarity team responds to social workers by facilitating the payment of bills through payment schedules or deadlines. A personalised support initiative is in place and each customer experiencing difficulty benefits, in particular, from continuation of their power supply at the subscribed-to level and the time to take the necessary steps with the social services. ES (Electricité de Strasbourg) has also provided for specific communication relating to the use of the energy voucher.

##### Sowee

The Sowee (see section 3.2.4.2.1 "Sowee: connected home") subsidiary of EDF manages the energy vouchers and enables better monitoring of customer budgets, by also providing tips for demand-side management on its website.

##### Enedis

Enedis<sup>(1)</sup> is developing initiatives as part of the Pimms certified Maison de Service Au Public (MSAP). They participate in the information and support of vulnerable populations in the areas of fuel poverty and access to rights: awareness workshops on eco-gestures, Linky workshops and digital training (e.g.: Pimms Melun has created the digital school), assisting customers in "pre-outage" situations in order to orient them towards solutions.

##### In the UK

EDF Energy is developing and strengthening its partnerships, for example with Plymouth Citizens Advice, which has been in existence for 10 years, adding a live chat channel that allows customers to make contact in a different way, which can help people who are struggling to talk about their situation. The partnership with Income Max and the EDF Energy Trust fund also continues to provide tailored support and information to indebted customers. EDF Energy collaborated with the charity MIND for mental health, but also launched a programme in 2018 to educate staff that would be in contact with vulnerable customers suffering from mental health problems. Finally, the relationship with the NGO Macmillan developed and materialised with the concrete support provided to people with cancer, including rate changes, and advice in terms of energy or payment schedules.

##### In Belgium

EDF Luminus offers the tool My Luminus, which allows customers to have an idea of their consumption habits and see where and how they can improve in order to consume less. In order to help customers who could be in difficulty and to avoid huge bills where possible, EDF Luminus makes it a point to warn its customers when their consumption is much higher than usual. EDF Luminus offers payment schedules. It participates in the energy poverty platform launched by the Roi Baudouin Foundation. The platform has played an active role with the legislator, and is now focusing on issues of payment default.

(1) Enedis is an independently managed subsidiary.



### 3.2.3.3 Action in terms of monitoring and research

EDF R&D runs an "Energy poverty: understand-innovate" programme to anticipate the changes in energy poverty and public policies, on the one hand, and to design and develop innovations allowing the entire ecosystem of solidarity to fight against energy poverty more efficiently, on the other hand. Contextual studies and prospective reflections of researchers allow this multidisciplinary team (sociology, engineering, economics, computer science, design, ergonomics, statistics) to nurture the three areas of actions (payment assistance, support, prevention) of EDF's solidarity policy. In France, EDF was involved in the work of the National Fuel Poverty Monitoring Centre.

### 3.2.3.4 Social innovation

Beyond monitoring and research, innovation, and particularly social innovation, may take the form of partnerships.

- Therefore, in 2018, EDF reinforced the partnership with ASHOKA France, one of the pioneers and major players in social entrepreneurship. The main objective of the partnership is to support EDF's social innovation. In 2018, EDF contributed to structuring a network of eight accelerators of social innovation existing in the country as part of a system allowing the sharing, mutual enrichment, and launch of joint initiatives. In this context, EDF was a partner in a call for solutions on the topic "Vulnerabilities". It focused on heads of projects developing innovative solutions and projects responding to vulnerabilities in the regions. Following this call, EDF decided to continue supporting two projects:

- "l'Échappée des copropriétés" will be accompanied in Toulouse by the Première Brique non-profit. It consists of supporting the renovation of fragile or degraded condominiums, through the mobilisation and participation of residents,
- JIB, a connected home system specifically adapted to motor disability, and extended to seniors (from an ultra-ergonomic smartphone application, JIB acts as an interface between various systems managing a wide range of uses).

- in October 2018, EDF implemented "Don d'énergie [Energy gift]", a social and digital innovation in partnership with the Abbé Pierre Foundation, for a limited number of customers to test the system. EDF's customers with the EDF & MOI application, can make a donation to help vulnerable households pay their electricity bill, irrespective of their electricity supplier. The allocation of these donations is entrusted to EDF's partner Abbé Pierre Foundation, as part of its mission to support the most vulnerable households. EDF contributes to this tax-free donation;
- EDF supports the National Association of Master Builders (ANCB), which manages programmes in the field to improve housing through self-rehabilitation works for people excluded from "traditional" solutions;
- in conjunction with various partners (for example, the Community Workshop in Toulouse, or the Energy Wall in Hem), EDF R&D experiments with new ways of reaching out and raising awareness among vulnerable populations.

### 3.2.4 COMMITTED TO HELPING EACH CUSTOMER CONSUME BETTER



EDF's commitment (CSRG no. 4) aims to support the energy transition of our customers with offers that are adapted to various markets (residential, business, cities and regions) and more broadly that of all energy consumers by developing electric mobility and by implementing storage solutions and intelligent networks.

#### 3.2.4.1 Innovate so that customers can consume better (CSRG no. 4)

The digital revolution opens up new prospects in this area, offering customers the possibility of being more actively involved in their consumption and indeed the production of energy, controlling their energy consumption, and limiting their CO<sub>2</sub> emissions. Electricity fosters the development of new, more effective offerings, most notably smart meters allowing more accurate and detailed analysis of consumption. This trend seems bound to intensify as technology continues to evolve.

The app e.quilibre, coupled with the Linky meter, allows EDF customers to benefit from personalised advice.

The indicator used for CSRG no. 4 concerns customer visits on digital consumption monitoring platforms, which stood at over 27 million in France in 2018<sup>(1)</sup>.[\*]

#### 3.2.4.2 Residential customers market: controlling energy consumption

Today, EDF provides energy to over 30 million residential customers, mainly in France, the UK, Belgium and Italy, and develops innovative digital offers for these customers. EDF's commitments are driven by two levers: helping individuals control their consumption and supporting them in saving energy.

##### 3.2.4.2.1 Consumption management

EDF's individual customers can use their computers or smartphones to monitor their consumption. The generalisation of smart meters will mark an additional step in controlling consumption.

##### e.quilibre

In France<sup>(2)</sup>, the e.quilibre solution allows customers to:

- monitor their consumption in kWh and euros month by month, including "at 30 minute intervals" for customers equipped with Linky which accepts these intervals;
- compare their estimated consumption with that of previous years and similar homes;
- identify electrical appliances with maximum consumption;
- find personalised advice for saving energy on a daily basis;
- for customers with Linky meters, set an annual consumption target, associated with email or SMS alerts in case of deviations.

In addition, all EDF customers have been receiving the "Bilan Ma Conso & Moi", a personalised consumption report, as well as an annual summary of their bills.

(1) See section 3.9.3.1 "Group Indicators of the Sustainable Development policy and CSRG".

(2) The e.quilibre solution was deployed in the French islands in 2018.

[\*] IND Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4)

### EDF & MOI app

EDF also has a free mobile app for its customers. Among other things, this app allows customers to monitor consumption and take a reading of their meter. The app is available on all download platforms.

### Edison World

In the same spirit, in Italy, Edison continued developing its platform "Edison World" to make it more easily accessible for customers. For example, *Energy Control Light* is the service available online on Edison's website, which helps customers understand their consumption pattern better and advises them on reducing related costs, based on actual data.

### Sowee: the connected home

Sowee markets its connected station to private users via its energy contracts. The station is compatible with gas-fired boilers and individual electric heating, which allows better control over their energy budget and comfort at home. It allows the setting of an hourly heating schedule (room-wise for electricity), and staying within a budget set by the customer. Other features are possible and can be remotely controlled from the Sowee application.

#### 3.2.4.2.2 Assisting customers

The customer who wishes to invest in energy savings can get suitable services and advice from EDF: diagnosis of the energy performance of their home, advice on heating systems (smart heaters, heat pumps, solar hot water) and installation of energy-efficient equipment (LEDs, regulators and heating programmers).

### Online tools

EDF offers several tools in France via its website:

- **electriscor**, an online platform which guides Internet users in their purchase of high-performance electrical appliances;
- the digital platform "Prime Energie", which shows Internet users how to obtain subsidies to help finance the work they want to do;
- several simulators allowing users to measure their home's energy label, estimate the cost of their renovation plans and find out if they can get any help to finance them;
- under the heading "Find a Pro", access to the EDF Home Solutions Partners page with the opinions of other customers;
- finally, the EDF Pulse & You platform enables EDF to construct future products and offers with the help of internet users. Since the launch of this platform in 2016, Internet users have shared more than 90,000 contributions. Many of these contributions have focused on testing and improving connected objects to optimise the comfort of the users of the future. These objects are offered with the help of 12 start-up partners.

### The "Coup de Pouce Économies d'Énergie" measure

- In France, more than 3 million households still use fuel oil for heating, of which 1 million low-income households are often forced to limit their use of heating.
- Heat pumps draw free, renewable energy present in the air or soil and provide homes with up to four times more energy than that consumed. Their carbon footprint is beneficial, with up to 90% less CO<sub>2</sub> emissions compared to fuel oil. And their high-energy efficiency allows heat pumps to reduce heating bills by €800 to €1,000 per year compared to an oil-fired boiler.
- Because carbon-free electricity is the future in homes heated with fossil fuels, EDF is launching an exceptional "Coup de pouce" bonus to help French households replace their oil-fired boilers with heat pumps.

### Self consumption

EDF ENR <sup>(1)</sup> markets its self-consumption offer "Mon Soleil & Moi", based on the R&D department's patented algorithms, which will double the self-consumption rate of the house and improve the coverage rate of its energy bill.

### Peer to peer trading

In 2018, the R&D department in the UK launched the "CommUNITY project", which will connect the residents of a building virtually with the photovoltaic production located on the roof of the building with a system and applications based on blockchain. Thus, the 60 residents will be allocated a portion of the solar energy generated and may decide to consume, transfer or sell it. This will enable testing of the technology, which will help develop new business models like "peer-to-peer" trading.

#### 3.2.4.3 Business customers market: support economic and environmental performance

### EDF

EDF offers customised services to companies and professionals that wish to optimise their energy flows to improve their economic performance and reduce their environmental footprint:

- the services offered by EDF to optimise energy include analyses, consumption monitoring, energy savings investments, profitability calculation, etc. EDF commits with specific contracts and energy productivity plans. EDF can assure optimisation of all the flows – electricity, gas, water, steam – of a company and handles the complete energy management of industrial sites;
- EDF guarantees certified "green" renewable electricity supply to companies, who so wish. EDF can also help a company choose the solution that is most suitable to its own energy generation (heat pump, photovoltaic panel, solar hot water, small wind turbine) and set it up;
- with CO<sub>2</sub> Trading, EDF offers companies to buy their excess quotas and/or sell the CO<sub>2</sub> quotas to companies experiencing a shortage.

In this area, EDF is currently experimenting with the FeelPro service in France, which is adapted to professional traders and offers them analyses of their equipment-wise consumption and their changes over time.

The Gamme Conso Service was extended to Expertise Conso in 2018, which allows the customer to monitor and control their consumption of other fluids (gas, water, etc.) and other equipment by instrumentalising their site.

### Agregio

With the support of the EDF Pulse Expansion teams in particular, the EDF group offers Agregio services to its customers. This subsidiary serves electricity producers with renewable generation capacities, and companies with load shedding capacities, which they can promote in the electricity markets in the best possible manner.

- For electricity producers, Agregio offers tailored solutions to optimise and sell their production on the markets and secure income over time. This is a strong expectation of renewable electricity producers, who no longer benefit from purchase obligations;
- Agregio is also aimed at industrial and tertiary consumers, who are willing to reduce or shift their consumption in exchange for compensation, according to the needs of the electricity system.

### EDF Store & Forecast

Another subsidiary of the Group, EDF Store & Forecast, develops and markets a software solution for energy optimisation of local electricity systems through energy forecasting and storage. EDF adapts its Energy Management System to its customers' facilities for smart and independent management: management of the variability of renewable energies, services to the electricity system, economic optimisation of the demand/supply balance, maximisation of self-consumption and reduction of energy bills.

(1) EDF Energies Nouvelles Réparties.

# 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

## EDF's Corporate Social Responsibility Goals

### UK

In the UK, EDF Energy has developed a tool called the "Customer Profiling Tool" to identify opportunities for improving energy efficiency and the flexibility of industrial customers through the analysis of their processes and load curve. With the support of the R&D department, EDF Energy has also developed the PowerShift platform (modelling tools, optimisation algorithms, control strategies), which will allow key customers to monitor their facilities by taking energy cost variations into consideration.

### Belgium

EDF Luminus launched an app called "*Luminus Energy Management*" in Belgium in May 2018, which allows customers to manage their energy smartly. For example, they can monitor changes in *forward* prices, be informed of market changes in real time, set their prices when they deem relevant or reopen their position to benefit from price reductions, while being guided by EDF Luminus.

### Dalkia

Dalkia established the DESC (Dalkia Energy Savings Center), an interactive platform to monitor building energy consumption. Dalkia continues to work on an app that gathers all energy data for each site. The app includes Artificial Intelligence algorithms, which facilitate the identification of performance deviations and the targeting sites to be handled on a priority basis.

#### 3.2.4.4 Fostering energy transition in towns and communities

The EDF group is committed to the energy transition of towns and communities. These play a vital role in combating climate change. EDF develops tailor-made solutions to assist local authorities in their energy-related projects. EDF's support focuses on strategic energy planning and advice, energy generation from local resources, the energy and environmental performance of buildings and facilities, street lighting and mobility.

In France, this support is carried out through EDF's participation in over 1,000 projects, which include individual and collective self-consumption projects, or local energy management at the level of a building, an island or a district. Examples: the Ydeal Confluence project in Lyon (collective self-consumption with management of a stationary battery), *Les Souffleurs*/Logis Cévenols residence in Alès (collective self-consumption with management of sanitary hot water tanks).

By taking into account the specificities of the local community, Dalkia supports communities in defining an energy strategy in the region by creating an ethical energy system by reducing the consumption of primary energy, producing energy locally in a better manner, distributing energy effectively, and strengthening cooperation between the players.

EDF SEI carried out a number of initiatives in 2018. Thus, on the island of Sein the plant for the production of drinking water through osmosis has been interfaced with the Energy Management System of EDF SEI to coordinate its functioning with the production of renewable energy and thus contribute towards maximising the renewable portion in the island's energy mix. EDF SEI also launched the first plan for the Grid Connection of Renewable Energies of French Guiana in order to optimise and facilitate the development of 136MW of additional renewable energy generation capacity. Consultations were also started in Martinique and Guadeloupe.

In partnership with the Provence Alpes Cotes d'Azur Region, the R&D department is conducting a prospective study on the strategy for the decarbonisation of energy in the regional grid to be carbon neutral by 2050, and is developing a decision-support tool for new eco-friendly, low-energy concepts for a future district of 65,000 inhabitants in Moscow.

Enedis<sup>(1)</sup> has set-up a data transmission mechanism that helps carry out collective self-consumption operations, which has enabled the first local projects of this kind see the light of day. Enedis also continued and amplified the provision of energy data, *via* a dedicated data agency open to all electricity and gas distributors, to

support local authorities in the knowledge/control of the consumption of their buildings or energy renovation programmes.

Electricité de Strasbourg supports the transition of urban heat networks in Greater Strasbourg towards even greater interconnection, scalability and innovation with so-called communicating networks, in order to lower heating loads and integrate a future mix of renewable energies. It also develops mini-heating networks on ENR generation intended for neighbourhoods, buildings and common property (biomass, geothermal energy, groundwater heat pump, etc.).

Finally, Citelum deals, in particular, with controlling the energy consumption of the public lighting networks, and sets up systems that quickly remedy the problems observed by operators or reported by residents. These types of systems were set up, for example, in Dijon, but also in Italy, Brazil, Mexico or Chile.

EDF action within the framework of the French energy savings certificates (CEE) programme is described in sections 1.4.2.2 "Customer Department" and 1.5.6 "Regulations applicable to the environment, nuclear, health, hygiene and safety".

#### 3.2.4.5 Electric mobility

Apart from better control of energy consumption, energy transition involves a change in consumer behaviour, particularly in their mobility, a major source of CO<sub>2</sub> emissions.

##### 3.2.4.5.1 A new impetus

2018 was a key year for EDF group's positioning in the electric mobility market with the launch of the Electric Mobility Plan on 10 October 2018. Through this plan, the EDF group aims to be the leading energy provider in this area from 2022 in its four largest European markets: France, the UK, Italy and Belgium.

Electric mobility will see sustained growth over the next few years. Today, the transport sector is the principal contributor of green house gas emissions in Europe. Given this context, carbon-free electricity is the solution of the future for clean transport.

##### 3.2.4.5.2 The Electric Mobility Plan

With the Electric Mobility Plan, EDF has accelerated its goals with concrete objectives resting on three pillars:

- being the leading supplier of electricity for electric vehicles in 2022: the EDF group intends to provide electricity to 600,000 electric vehicles, *i.e.* 30% of market share in its four target countries;
- being the leading electric terminal network operator: the EDF group intends to be the leading operator of public and private charging infrastructure in its four core countries in Europe. Thus, through its subsidiary IZIVIA (formerly Sodetrel), the Group will deploy 75,000 terminals and provide its European customers with access to 250,000 interoperable terminals by 2022;
- being the European "*smart charging*" leader: the EDF group wants to become the smart charging leader in Europe with the target of operating 4,000 "smart" terminals as of 2020.

##### 3.2.4.5.3 New partnerships

The Electric Mobility Plan is based on new partnerships with innovative players, who are market leaders.

- EDF and NUVVE: a California start-up based in San Diego, specialising in aggregation and pricing in the energy markets of flexibilities linked to the charging of electric vehicles;
- EDF and Ubitricity: Ubitricity specialises in innovative solutions for street lamp charging. It is present in several countries in Europe and around the world;
- EDF and Renault are partners for developing joint offers and experimenting with electric mobility solutions in island regions and cities;
- EDF Energy and Nissan International are partners in the United Kingdom for developing joint offers for electric mobility, smart charging, second-life battery use, storage and renewable energy;

(1) Enedis is an independently managed subsidiary.

- EDF and Toyota have been partners since 2007 for electric mobility in terms of R&D, and since 2017 in the area of carbon-free industrial performance on the Onnaing site in Valenciennes;
- EDF and Valeo are partners for monitoring the development of future battery technologies and charging solutions, as well as for developing mobility services.

### 3.2.4.5.4 Commitment regarding EDF's fleet

In addition to the Electric Mobility Services offered to its customers and the R&D programmes, EDF has launched two development initiatives for Electric Vehicles within the Group:

- signing of the EV 100 undertaking on 11 December 2017 with the NGO "The Climate Group". The EDF group is the first French group to sign this undertaking, which aims at having a fleet of 100% electric light vehicles by 2030. Of its fleet of light vehicles, currently more than 40,000 vehicles worldwide (mainly in Europe), more than 6% (over 2,500 Electric Vehicles) is already electric. This Group Project includes both the vehicles and charging infrastructure divisions (more than 1,500 sites to be equipped across the world by 2030);

EV100 indicator - Group	Unit	2018
The EDF group's EV rate in the fleet of light vehicles	%	> 6.1

- the implementation of an "Electric Mobility" Offer for Group Employees: a first offer will be available in 2019 to employees in metropolitan France, who will have access to the Group's future framework contract with selected suppliers, as well as offers on virtuous charging services (network of terminals, *smart-charging*) marketed by its subsidiaries, particularly by IZIVIA (formerly Sodetrel).

### 3.2.4.5.5 Initiatives already launched by subsidiaries and entities of the EDF group

Measures related to electric mobility are already being carried out by the entities of the EDF group:

- in 2018, EDF Energy launched a complete solution, intended to help companies in the transition to electric mobility;
- Edison launched the PLUG & GO offer for domestic customers, an integrated service including a rental base, provision and installation of a wall housing for domestic charging and a bonus of €180, equivalent to one year of free charging; Edison launched the SUN & GO offer, the service intended for SMEs integrating photovoltaic systems, storage and electric charging systems. In addition, a new application on the geolocation of public charging stations has been put in place;
- in 2018, EDF carried out about two dozen studies for local authorities who wish to deploy charging points in their regions. Studies on fleets of vehicles as well as preview studies of electric bus lines and their power supply were also carried out;
- EDF SEI: 2018 saw the creation of the Advenir label for sustainable mobility in the islands in collaboration with Ademe, DGEC and AVERE. This label enables the financing of charging stations that comply with precise specifications: limitation and modulation of power of the terminals based on a signal emitted by EDF SEI. Based on the generation mix (costs and CO<sub>2</sub> emissions) this signal, available on the EDF SEI's Open Data site identifies favourable and unfavourable periods for charging;
- Enedis<sup>(1)</sup>: the MOBE-P and MOBE-O support offers were deployed in the first half of 2018 in response to the expectations of the local authorities. Enedis has developed an application for the real time simulation of the impact of the connection to the distribution network of one or more electric vehicle charging stations. In addition, Enedis has signed a partnership with the Automobile Platform for the development of electric mobility in France, the inclusion whereof will facilitate the connection of the charging infrastructure and reduce the impact of connection work for the local authority.

(1) Enedis is an independently managed subsidiary.

(2) This Article concerns the possibility of experimenting with local energy loops.

## 3.2.4.6 Storage solutions and smart grids

### 3.2.4.6.1 EDF's storage plan

In a changing energy landscape, EDF is speeding up the development of electricity storage to become the European leader in the sector. Storage is an essential lever for energy transition, alongside energy efficiency and nuclear and renewable energies. A pioneer in the field, the Group is already present in the main areas of application of storage technologies, in particular batteries and Pumped Energy Transfer Stations (hydraulic STEP).

EDF aims to develop 10GW of new storage facilities across the world by 2035 in addition to the 5GW already operated by the Group. This acceleration represents an investment of €8 billion over the 2018-2035 period.

EDF's goals cover all electricity storage markets in order to ensure the proper functioning of the balance between the electricity system, private and business customers and regions. The Group aims, particularly, to be the leader in France and Europe in the individual customer market with its range of self-consumption offers integrating batteries. The African continent is also a priority market for the Group, which aims to develop a portfolio of 1.2 million "off-grid" customers (without access to electricity) by 2035 with help from local partnerships.

Over the next 12 months, the Group aims:

- to commission at least three battery projects for the performance and balance of the electricity system;
- the extension of the offer of access to electricity with solar panels and batteries in Ghana, after the success in Ivory Coast.

In the wake of the rapid development in storage technologies, EDF is also reinforcing its Research and Development strategy by doubling its research investment on storage for the electricity system to reach €70 million over the 2018-2020 period. At the same time, EDF Pulse Expansion will dedicate €15 million over the 2017-2019 period, i.e. a third of its investments, to projects and start-ups related to electricity storage and flexibility.

### 3.2.4.6.2 Smart grids

The energy transition and digital revolution deeply transform the management of the electricity distribution network.

The change in electricity needs leads to favouring the deployment of new *smart grids*, rather than massively replacing existing electricity systems.

For Enedis, 2018 was marked by the preparation of a new road map with details of the priority sites and necessary future transformations to help make Enedis the benchmark operator of the electricity distribution system in France and Europe.

New projects were launched across the region in order to test innovative technical solutions:

- regarding the New Connection Solutions project (NSR), which reflects the CRE deliberation of 12 June 2014 on the development of smart grids, Enedis is continuing to study solutions in the form of experimental offers to connect customers quickly and at a lower cost. Four experiments have been ongoing for three years;
- Article 199<sup>(2)</sup> of the Law on Energy Transition for Green Growth was implemented in the Northern region of Pas-de-Calais, in the form of an experiment in the use of flexibility to shift investments to the source substations over time;
- a new "SMAC" project began in Champagne-Ardenne this year and aims to encourage the charging of electric vehicles based on wind generation forecasts and network status;
- 2018 marked the closure and capitalisation of the "SOLENN" projects in Lorient and Ploemeur, with promising results on targeted capping, and of "Smart Grid Vendée" on energy optimisation at the scale of a local authority;



- regarding the “Réseaux Electriques Intelligents” (REI) smart grid project launched by the French government, 2018 was marked by the large scale deployment of three winning projects coordinated by regional authorities: “SMILE” (Brittany and Pays de la Loire - smart connection offers), “Flexgrid” (PACA – aggregation of a portfolio of over 60 energy saving and smart grid action projects), and “You&Grid” (Hauts-de-France - deployment, by 2020, of a host of mature services and technologies in terms of smart grids);
- at the international level, EDF <sup>(1)</sup> and Enedis designed, built and commissioned the MASERA <sup>(2)</sup> demonstrator in one year. It is part of the REIDS (Renewable Energy Integration Demonstrator – Singapore) demonstration platform. The demonstrator is composed of various innovative solutions: two-sided photovoltaic panels, a Lithium-Ion storage system, a Zinc-Air battery, an electric vehicle, a consumption metering system and a control system for optimising generation. The demonstrator will allow the EDF group to offer affordable and efficient microgrids for remote areas in Southeast Asia.

The first thermal and electric dual *smart grid* of France will be released in early 2019 in the eco-district at the heart of Nanterre University. Dalkia Smart Building, a subsidiary of Dalkia, designs and builds large urban real estate projects with a partner. This smart grid is able to pool five renewable energy and recovery (EnR&R) sources. It will supply homes, offices and businesses in the district with heating, hot water and air-conditioning. With at least 60% EnR&R used, this smart grid will allow 100% self-consumption of the electricity generated, which will be adjusted in real time.

### 3.2.5 COMMITTED TO CONSULTATION



To meet the expectations of all of its stakeholders, EDF has set up dialogue, listening, analysis and follow-up tools: surveys, mapping, partnerships, forums for dialogue with stakeholders and follow-up committees.

#### 3.2.5.1 EDF's commitment to organise a worldwide dialogue and consultation process around our projects (CSRG no. 5)

The Group is committed to organising, systematically and worldwide, an initiative of dialogue and consultation which is transparent and open for each new project.

In order to ensure follow-up of the consultation carried out, the EDF group attempts to list the number of projects concerned that fulfil the three criteria mentioned above to which the following procedures will be applied: identify stakeholders, launch consultation as far upstream as possible, provide transparent access to stakeholders to clear information on the project, gather stakeholders opinions on the project and address them, set up a system for dealing with suggestions and complaints, and ensure that local populations are able to participate in the consultation process.

The EDF group has defined the scope of application starting 1 January 2017. Any new project of more than €50 million and for which an investment decision is taken (thus subject to a review by the Financial Commitment Committee) and having a significant impact on the regions or the environment will be concerned.

In 2018, projects falling within the defined criteria accounted for the review of 46 files by the CECEG 82% [\*] of these were the subject of a consultation<sup>(3)</sup>.

The EDF group is committed implementing the rules governing dialogue, according to international standards on stakeholder participation, including the standards of the IFC <sup>(4)</sup> and to ensuring that such consultations are publicly reported.

Every year, the results of all Corporate Social Responsibility Goals, including dialogue and consultation, are presented to the Governance and Corporate Social Responsibility Committee. This committee is chaired by a member of the Board of Directors and monitored by the Director of Innovation, Corporate Social Responsibility and Strategy (DIRES), an Executive Committee member himself (see section 3.1.3.1 “Governance”).

#### 3.2.5.2 Consult with stakeholders

Regardless of the countries of the world, civil society expects more dialogue and vigilance with regard to projects likely to alter the environment. EDF has decided to intensify dialogue with stakeholders and regional players.

Dialogue and listening upstream of a project provides a better understanding of the issues involved for a region so that the project can be better adapted. For the EDF group it is ultimately a matter of always moving forward in the way it operates locally and cooperates with the region over time. EDF's aim is to renew and make systematic its practice of engaging in dialogue so as to better take into consideration the aspirations of inhabitants and other stakeholders in different regions.

For example, EDF Renewables conducted a co-construction project with local residents for the Wavignies wind project in Oise. The “Building the Wavignies Wind Project Together” approach was a great success, notably through the creation of a Liaison Committee and a series of public workshops where residents' proposals were integrated into the project design. As a result, six wind turbines will be built instead of the five planned initially.

As part of preparing the site for the replacement of Sabart penstocks in Ariège, EDF Hydro Southwest implemented an approach of continuous dialogue with the region, with a dedicated website and events at various key stages associating partner companies, local elected representatives, local non-profits, economic players and employees.

Edison worked with the local communities of Valchiavenna (Northern Italy), close to a hydropower plant. A Tracciolino tourist route that served only the dam and the plant was transferred to the community. In addition, an educational programme to develop the entrepreneurial spirit was created with the objective of developing the region using new technologies.

In French Guiana, EDF PEI (*Production Electrique Insulaire*) undertook consultations around the Larivot (thermal hybrid and PV plant) project from May to July 2018 in the municipalities of Matoury, Cayenne and Remire-Montjoly. The three public meetings organised helped expose the different issues of the project and gather public opinion on the project as a whole. At the same time, two theme-based workshops on two key issues of the project were organised in the presence of stakeholders. Furthermore, under the auspices of the Local Authorities, and throughout the project, a local Consultation Committee of the Larivot power station made it possible to prolong the dialogue between the main regional stakeholders concerned <sup>(5)</sup>.

Following many questions regarding the deployment of smart meters, Enedis engaged in consultation at the request of the local authorities and various stakeholders (social-housing lessors, etc.). The *task force* composed of five people, dedicated to this consultation, carried out 374 interventions in 2 and ½ years. This doesn't include everything done directly by the regional departments (interventions before municipal teams, permanent office in the town hall, public meetings, etc.).

(1) EDF at the helm of a consortium of French smart grids/smart cities companies.

(2) Microgrid for Affordable and Sustainable Electricity in Remote Areas.

(3) See section 3.9.3.1 “Group Indicators of the Sustainable Development policy and CSRG”.

(4) International Finance Corporation - World Bank.

(5) The website [centraledularivot.com](http://centraledularivot.com) was set up for this purpose.

[\*] IND Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4).



In India and Mexico, Citelum sets up regular meetings with stakeholders interested in its projects, connects with customers to follow their needs and invites subcontractors to the main events (safety week, inauguration of the training centre). This entity publishes weekly reports with the people involved and subcontractors and has developed a customer management system with call centres to handle their complaints.

### 3.2.5.3 Professionalise dialogue with recognised standards and through innovation

The key to success for projects and their integration into the region's economic and social development programmes is working together with local authorities, local populations and associations. Regular information and open dialogue are carried out close to the sites, and consultations and innovative public meetings are held on the sites or for the projects.

#### 3.2.5.3.1 Building on the best national and international standards to support projects

All of the projects are based on the social and environmental performance standards of the International Finance Corporation (IFC) <sup>(1)</sup>, whether for projects led by EDF Renewables in France, the Middle East, Africa or South America, or by the International Division. The protocol developed by the IHA (International Hydropower Association) has, for example, been used in metropolitan France to evaluate the Romanche-Gavet project on around twenty criteria and is now the evaluation grid for international projects in various stages of development.

At the request of the Group's operational divisions, R&D carries out comparative studies on the acceptability of operations and projects, based on socio-political standards. EDF Hydro also has a dedicated societal team, which carries out analyses and consultations in France and abroad. In Cameroon, permanent dialogue has been developed for 10 years for the construction of the Nachtigal dam. A dedicated and localised team in Batchenga, regularly informs all stakeholders regarding the progress of the project (local administrative, municipal, traditional authorities, decentralised government services, development projects, associations, cooperatives, and more broadly the local populations). For example, the project team carried out a radio campaign on FM, broadcasting messages in French and in the other languages used in the area: Eton, Ewondo Sanaga and Mvoute.

#### 3.2.5.3.2 Developing innovative dialogues

Identification of project stakeholders is systematically carried out, making it possible to deploy diverse partnerships and innovative methods of dialogue. For example, in 2018:

- EDF has forged a partnership with the l'École Nationale Supérieure des Paysages (ENSP), which recently made it possible to create training media to support project managers <sup>(2)</sup> and to deploy regional educational workshops in Brennilis regarding the future of the site;
- the partnership with the *National Federation of Fishing in France (FNPF)* facilitates the financing and management of actions in favour of aquatic environments, where nearly 50 agreements were signed with departmental fishing federations, based on one framework agreement;
- in Flamanville, EDF set up a Social Dialogue Monitoring Committee with five representatives from the representative departmental unions at the national level. It addresses all the issues of the EPR Grand Chantier programme and the issues related to the progress of the site, safety and the employment or demobilisation of employees. This Committee is reappointed until the end of the project;
- the provisions proposed by EDF to improve the safety level of its 900MW nuclear reactors as part of their fourth periodic review are the subject of an unprecedented consultation: under the aegis of a High Committee for Transparency and Nuclear Information (HCTISN), it is a matter of associating

the public with the challenges and objectives of this programme and making it possible to shed light on subsequent decisions. All the main institutional players in the safety of nuclear power plants in France are involved: the National Association of Committees and Local Information Commissions (ANCCLI), the Nuclear Safety Authority (ASN) and the Institute for Radiation Protection and Nuclear Safety (IRSN). Eight nuclear power plants are involved: Blayais, Bugey, Chinon, Cruas-Meysses, Dampierre-en-Burly, Gravelines, Saint-Laurent-des-eaux and Tricastin. This is a first phase of exchange with the public, in the run up to the public inquiries that will take place reactor by reactor. A digital platform is dedicated <sup>(3)</sup> and meetings are scheduled by the local information commissions;

- the Nuclear Generation Division develops Consultation and Coordination bodies (ICC), permanent local structures for supporting economic development. At end-2018, 13 of the 19 ICCs were set up, in conjunction with the prefectures of the place where they are located. The plan aims to develop synergies between the players and increase the local value created by the power plant, which is a lever for the success of the *Grand Carénage* programme (logistics, traffic, housing, safety, training and skills needs);
- as far as the early closure of the Fessenheim power plant is concerned, EDF attends consultation meetings organised under the aegis of the prefecture of Bas-Rhin. This bodies make it possible, in particular, to inform a large public of local stakeholders regarding the industrial stages for the shut down of reactors 1 and 2, as well as the support system planned by EDF for site employees and service providing companies. This dialogue is carried out in conjunction with the Association of Contractor Companies Operating in the East (GIMEST);
- EDF Hydro experiments with the use of digital information exchange and multi-service data platforms for local stakeholders. In 2018, test workshops were conducted in the upstream phase based on the models. For its wind projects, and in addition to the usual public meetings, EDF Luminus has developed dialogue platforms in Wallonia and Flanders;
- EDF Norte Fluminense in Brazil and EDF Renewables in Mexico developed new tools for managing suggestions or claims from customers, employees and suppliers.

### 3.2.5.4 Making your voice heard and participating in public debates

The draft revision of the multi-year energy programme of the mainland metropolis was submitted to the National Public Debate Commission. EDF participated in four of the nine controversies workshops <sup>(4)</sup>. EDF published a participant's guide presenting the Group's stance and expressing its convictions, and participated in sixty-four debates with target audiences (consumers, artisans and merchants, fuel-poor households and chambers of commerce).

### 3.2.5.5 Listening to employees and talking about energy

From January to April 2018, the 101,000 employees of EDF and its subsidiaries in France were invited for dialogue around the Company's strategic vision ("Talking about Energies").

These exchanges identified 20 key challenges for the Company and raised 200 proposals. On 2 July 2018, the review of these proposals by the Executive Committee was followed by more than 10,000 employees around three subject areas: putting customers and uses at the heart of our business model, engaging resolutely in innovative business areas, and transforming our modes of operation. The implementation of "Let's Talk Energy" continued with employee volunteers.

This initiative received the participation and consultation trophy on 19 November 2018, organised by the Gazette des Communes and the Décider Ensemble association under the auspices of the Ministry of Ecological and Solidarity Transition, the National Public Debate Commission and the Commissioner-General for Sustainable Development.

(1) Besides compliance with local regulations.

(2) "Site landscape and landscape site".

(3) [concertation.suretenucleaire.fr](http://concertation.suretenucleaire.fr).

(4) Electricity consumption, nuclear energy, hydropower, employment and energy transition, to which was added an energy and opinions workshop conducted by an EDF representative.

### 3.2.6 COMMITTED TO BIODIVERSITY



Due to the location of most of its industrial facilities in or near protected areas, the Group has made biodiversity a major commitment for several decades. EDF is a landowner and a manager of natural resources of great importance. Improving our knowledge of this heritage, reducing the impacts of our activities, and enriching local biodiversity are part of the performance goals for these industrial sites. The importance of the issue explains why the Group committed to biodiversity as early as the 1970s, with for example, the creation of a national laboratory on hydroecological issues in France, and the drawing up of a Biodiversity policy in 2006.

The pressures of the Company's activities on biodiversity mainly concern <sup>(1)</sup>:

- water and aquatic biodiversity, largely as a result of:
  - hydraulic generation structures (power plants, dams and water intakes), which bring about modifications of the biodiversity upstream of the structures in the event of flood defence, and downstream, due to the fragmentation of areas and flow limitations or variations,
  - thermal structures, to a lesser extent;
- addressing the degradation and fragmentation of natural terrestrial habitats, due to the land occupied by the existing sites or projects, as well as part of new projects;
- overhead transmission systems and wind turbines, which pose a threat to birds and bats.

In order to better assess the threats and opportunities related to the impacts and dependency of the Company's activity on ecosystems, EDF is trialling the Ecosystem Services Review (ESR) method <sup>(2)</sup>.

This process of continuous improvement has earned several Group companies recognition for their initiatives:

- in Mexico, Citelum has been recognised by the COEBIO (Council that distinguishes companies responsible for bioethics);
- in the UK, EDF Energy is one of the five companies to have met the Wildlife Trusts' Biodiversity Benchmark on multiple sites;
- in France, EDF has been recognised for its commitment to the National Strategy for Biodiversity (SNB) by the Ministry of Ecology for the 2014-2017 period. Developed with its partners, this commitment has resulted in a major focus and concrete actions implemented in favour of biodiversity. Its goal is to contribute to slowing down biodiversity erosion and to supporting local movements. A final report was sent in the first half of 2018 to the Ministry of Ecological and Solidarity Transition.

#### 3.2.6.1 EDF's commitment: to launch a positive approach to biodiversity, not to limit itself solely to knowledge in the long term, but to have a positive impact on biodiversity (CSRG no. 6)

This goal, committed to for the whole Group, concerns the entire life cycle of installations, from the project study stage, to construction and operation through to the end of the life of installations. It spans the whole length of the value chain, including procurement policies and relationships with suppliers and sub-contractors.

The Group intends to develop a positive approach to biodiversity, by striving to improve its practices and by avoiding as much as possible irreversible damage to the natural environment. In fact, EDF does not want to limit itself to a defensive approach to biodiversity, by solely focusing on reducing the impacts of its industrial operations on ecosystems.

In 2018, the Group's commitment to the act4nature initiative specified the modalities for rolling out this CSRG, which is now broken down into five main objectives: mobilising the Group's entities, understanding biodiversity issues and implementing concrete actions, innovating for biodiversity, engaging in a participatory and open process, and contributing to public policies.

#### 3.2.6.2 Mobilise all the entities of the Group

EDF's commitment in favour of biodiversity mobilises the entire Company, its business lines, employees, activities and its projects. This is done through targeted training and reinforcement of the mitigation hierarchy (Avoid, Reduce, Compensate) for all projects.

The CSRG and the act4nature commitment are implemented in each of the Group's companies in a manner tailored to their activities, and in compliance with local regulations. Certain companies have a specific biodiversity policy, such as EDF Energy which has equipped each nuclear site with a specific biodiversity action plan, the detailed results of which are given in the annual site reports. For its part, Enedis is publicly involved in act4nature. EDF's contribution is specified in a roadmap for each of its business lines.

##### 3.2.6.2.1 Training and awareness raising

Training and raising awareness of the Company's employees are important levers for progress with regard to biodiversity issues across the whole value chain. Each company manages its own training and internal awareness courses for biodiversity. Training is often carried out with the help of non-profit naturalist partners:

- in France, eight business guides have been published, written in a manner which very closely addresses the biodiversity issues and challenges specific to each operational activity. Training is organised both at the national level and within the entities. In 2018, 96 employees benefited from national training;
- in the UK, in September 2018, EDF Energy brought together nearly 1,900 employees and local communities at the Heysham site for a biodiversity event.

(1) GRI indicator: G4 EN12 - Disclosure 304-2.

(2) Method developed by the World Resource Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).

### 3.2.6.2.2 Avoid, Reduce and Compensate <sup>(1)</sup>

The biodiversity CSRG aims to have a positive approach to biodiversity. EDF Energy set the goal of having a positive net impact before 2030. The Group applies the principles of the *mitigation hierarchy* <sup>(2)</sup> or the *ad hoc* regulations of the country where it is located, which are sometimes more demanding (particularly in Europe): thus, in France, the Group companies apply the mitigation hierarchy (Avoid, Reduce, Compensate) doctrine. The Company's practices in this area were challenged by the international recommendations promoted by the BBOP <sup>(3)</sup>.

Environmental issues, including biodiversity, are integrated throughout the engineering and operational process, from the beginning and design phases of the projects to promoting prevention and reduction. EDF seeks to reduce the footprint of new projects to a minimum and, in the case of decommissioning, to restore the natural environment. Similar processes are also carried out at facilities in operation. Their impacts on the environment and biodiversity are the subject of monitoring conducted by public bodies (in France: Ifremer, IRSN, Irstea, AFB/Onema). The results are published and are accessible. In addition, EDF assesses the risks in investment projects.

#### Avoid, reduce

- In the UK, as part of the offshore wind farm demonstrator project at Blyth, EDF Renewables UK reduces its impacts using the GBF (gravity based foundation) technique. The technique avoids digging foundations in the ocean floor. This is done in partnership with the University of Newcastle, which monitors the presence of marine mammals around the site;
- in Cameroon, a first E&S study was conducted on the Nachtigal project in 2006, then updated in 2011. Additional biodiversity studies were conducted in 2014 and 2015 to complete these impact studies and enable the drafting of an in-depth operational E&S Management Plan and a biodiversity action plan in 2016. Specific plans on the offsetting (fish) and support (endemic species of aquatic flora) measures were also implemented in 2017. Further studies (including a thesis) aim to better understand certain species of fish and aquatic flora and to put forward effective reduction and mitigation measures in respect of the project;
- in France, in the areas operated by Enedis <sup>(4)</sup>, new HV lines were completed 98% underground and 100% underground or unobtrusively for LV. Overall, 45% of all HV and LV networks are underground.

#### Compensate

- In Laos, NTPC is conducting discussions with the Laotian government on the transformation of the Nakai Nam Theun Wildlife National Protected Area (WNP) into a national park. This will recognise the quality of biodiversity protection in the protected area, offsetting the creation of the reservoir upstream of the dam;
- in France, in the Belledonne en Isère mountain range, the Company conducted an experiment on the offsetting proposals with the Initiative Biodiversité

Combe-Madame non-profit organisation and the key community players. It is aimed at restoring sub-alpine environments and enabling the return of remarkable species of fauna and flora. This experiment is part of the action initiated by the Ministry of Ecological and Solidarity Transition, to test the relevance and feasibility of the offsetting proposals. The project took off in 2015; in 2016, the assessment of the initial condition of the site was completed and preliminary work for reopening the environments started; in 2017, actions were also carried out with the *Fédération des Alpes de l'Isère*, LPO Isère, ONCFS and Irstea to reconcile economic and tourism uses with the biodiversity of the site. In 2018, the site did not apply for approval from the Ministry to propose offsetting units through the offer. However, actions in favour of biodiversity are being continued with local partners;

- EDF's R&D department also carries out research on the assessment of ecological equivalence. Thus, EDF recently financed a thesis with Irstea and the Natural History Museum concerning the preparation of a method to verify the achievement of ecological equivalence. This involves measuring, using indicators, the losses related to the impacts and comparing the losses resulting from a development and gains resulting from the offsetting measure. The thesis was defended in 2017.

### 3.2.6.3 Knowing biodiversity issues and acting concretely

Knowing issues related to the Company's land requires having detailed knowledge of its ecological sensitivity site by site - that is to say, appreciating the quality of their biodiversity and that of the regions where they are situated - and at the same time, knowing the areas involved, entity by entity. This is how the responsibility of each of the Group's companies in respect of biodiversity can be assessed.

#### 3.2.6.3.1 Knowing the ecological quality of land

The vast majority of EDF production sites are located close to protected sites (in France, 80% of hydropower sites are situated in or near a Natura 2000 site). These sites are preserved from agriculture and urbanisation and are located close to watercourses. They bring together several factors that are conducive to biodiversity. The ecological management implemented on these sites aims to foster biodiversity.

In order to acquire knowledge regarding the quality of the ecosystems present, EDF carries out an assessment of the biodiversity issues on its industrial sites and their immediate surroundings. Mandated by the Company in June 2017, UNEP – WCMC (World Conservation Monitoring Center) began a huge study to assess the ecological sensitivity of places where the Group's industrial sites are located <sup>(5)</sup>, which represents approximately 1,000 sites.

Certain sites of the Group present bigger challenges in terms of biodiversity, either due to the proximity of a protected area, or due to the species they host.

(1) GRI indicator: G4 - EU 13.

(2) IFC Guidance Note 6: Performance Standard 6 of the International Finance Corporation (a World Bank organization) dedicated to Biodiversity Conservation and Sustainable Management of Living Natural Resources.

(3) The Business and Biodiversity Programme is an initiative that lasted from 2004 to 2018. It promoted standardised best practices through the coordination of a network and publication of various documents.

(4) Enedis is an independantly managed subsidiary.

(5) Analysis carried out in September 2018 by the WCMC for EDF, EDF Renewables, EDF Energy, Edison, EDF China and the International Division (EDF Luminus, MECO, Nachtigal, EDF Norte Fluminense, NTPC, SLOE, and SINOP).

## Sites situated in or near (less than 5km) a protected area or an area rich in biodiversity

NUMBER OF SITES SITUATED IN OR NEAR A PROTECTED AREA <sup>(1)</sup>

	Protected areas pursuant to international conventions			Protected areas at national level (IUCN categories)						
	Ramsar sites <sup>(a)</sup>	MAB sites <sup>(b)</sup>	World Heritage Sites <sup>(c)</sup>	Category Ia	Category Ib	Category II	Category III	Category IV	Category V	Category VI
Germany									1	
Belgium	1							41	8	19
Spain	1			1	1			1		
United States							1	4	14	
France	20	1	2	10		34	7	266	113	
Greece				1				1		
Guadeloupe*	1	2				2		7	1	
Guyana*	1							3		
India								1		
Israel								7		
Italy	6		2	2		10	7	61	22	
Laos										1
Martinique*				1				3		
The Netherlands	1							1		
Reunion*			15	7		15		13	9	
UK	13						3	46	10	
St Pierre & Miquelon*								1		
Vietnam		1								
TOTAL	44	4	19	22	1	61	18	456	178	20

\* French overseas dept.

(a) The Ramsar Convention, signed in 1971, seeks to conserve wetlands of international importance.

(b) UNESCO's MAB (Man and Biosphere) programme launched in 1970.

(c) List of sites of particular importance to the common heritage of humanity. (updated each year by UNESCO).

## Sites hosting species threatened with extinction

NUMBER OF THREATENED SPECIES IN MUNICIPALITIES WHERE EDF IS LOCATED <sup>(2)</sup>

	IUCN categories of threatened species					
	Global red list			Regional red list		
	CR	EN	VU	CR	EN	VU
Mainland France	5	24	53	32	93	253
Overseas Departments & French Islands	18	23	47	45	102	179

The higher the ecological sensitivity of the sites and the larger the area of land, the greater the responsibility of the Company. Thanks to the evaluation of the ecological value of its land, the Company can integrate biodiversity as one of the decision-making criteria in its industrial choices.

In the Group, land concerns more particularly EDF (41,000ha in metropolitan France), Edison (5,560ha) and EDF Energy (1,617ha):

- in France, EDF assessed the ecological quality of approximately 68% of the land for which the Company is responsible. EDF has developed an Ecological

Potentiality Indicator (EPI) in conjunction with the National Natural History Museum intended to be deployed on a large scale to monitor the ecological state of the Company's land. For example, this method has already been implemented on 22,325 hectares of land for hydropower (i.e. 64% of the land to be analysed). Between 2013 and 2017, EDF voluntarily sent survey data on 20,000ha, i.e. approximately 50,000 occurrence data, to the INPN <sup>(3)</sup>;

- in the UK, EDF Energy has carried out surveys concerning all of its land.

(1) GRI G4 EN 11 - Disclosure 304-1; the protected areas chosen are either domestic or subject to international conventions/agreements

(2) GRI G4-EN14 - Disclosure 304-4; this is EDF's scope of activity for EN 14

(3) National Natural Heritage Inventory (INPN).

At Group level, the level of ecological awareness of the land was 69% [\*] at the end of 2018 (68% at the end of 2017). This is an indicator based on field surveys. In 2018, the scope of this indicator spanned EDF (metropolitan France) and EDF Energy, and will be gradually extended to all the Group entities <sup>(1)</sup>.

### 3.2.6.3.2 Preparing and implementing initiatives depending on the issues as part of a positive approach to biodiversity.

EDF is developing and implementing biodiversity management plans at suitable sites according to their industrial capability. Its plans include reducing the use of plant protection products; developing alternative techniques for their use; increasing knowledge and management of invasive alien species; integrating the issues of ecological continuity under various belts (green, blue, black, etc.); and, implementing actions in favour of the water resource and the conservation of the environment.

#### Regarding biodiversity management plans

In France, a portion of land is managed in partnership with local environmental associations for protecting the environment and promoting natural heritage. In this context, management recommendations make it possible to resort to agro-environmental practices such as late mowing or eco-grazing, two examples of measures deployed at the sites as part of positive biodiversity management.

#### Regarding phytosanitary products

In France, Enedis aims to reach the "zero phytosanitary products" status in 2020 to maintain green spaces adjoining service sites and from 2024 for industrial (source substations) sites. It is also setting-up facilities to promote biodiversity. EDF aims to make its main service sites "zero phytosanitary products" (see section 3.3.2.4.2 "Optimising soil use"). In 2018, Framatome drew up an inventory of the quantities of phytosanitary products used <sup>(2)</sup>.

#### Regarding invasive exotic species

##### In the UK

EDF Energy is attempting to identify the invasive exotic species on all its nuclear sites, to inspect and implement eradication measures whenever possible;

##### France

- Invasive alien species are systematically detected in ecological diagnostics and pre-diagnostics of EDF's land. This makes it possible for EDF to have a global vision of this issue, to integrate this issue into the projects, and to carry out management actions with partners at the local level (local authorities, river contracts, etc.). Thus, on each nuclear and thermal site, an inventory of invasive exotic species has been conducted, with a set of related management recommendations being issued;
- EDF is a partner in the FUI PARIS project, which aims to develop a new process for treating soils containing invasive alien species (the consortium contract was signed in January 2016). In 2017, the first tests started with a prototype on a construction site to fight Japanese Knotweed. The innovative treatment process is compared to a more usual method by sheeting;
- EDF is also a partner of the "Local vegetation" programme organised by the Federation of French Botanical Conservation Bodies. The aim of this programme is to promote the systematic use of local wild plants in development works, the re-naturation of areas, the upkeep of green spaces etc. The use of local species enables a natural barrier to be created which protects these spaces from invasive exotic species and increases the ecological functionalities of the local environment. In 2018, EDF made a promotional video of the "local vegetation" initiative available on Internet.

#### Regarding the blue belt

##### France

- For hydroelectric activities: between 2013 and end-2017, almost 120 fish and/or sediment diagnostic projects were conducted to identify ecological continuity challenges site by site. With regard to fish, between 2013 and 2018, 41 fish passes or ladders were implemented on the sites at risk (classification List 2 <sup>(3)</sup>, Rhine, etc.). 210 fish passes (upstream/downstream migration) are now functional at EDF hydro. On the sediment side, we can mention a national approach to finding ways of recovering sediments stored in the reservoirs, with, among other things, the implementation of a full scale agronomic experiment in connection with the ten-year emptying of Mont-Cenis reservoirs, still underway in 2018. A recovery operation to improve agricultural soils started in 2018;

- in 2018, the Prefect of Haute Loire and EDF Hydro signed the addendum to the concession on the emblematic site of Poutès, after a renewed consultation process. The work execution file is under review to begin emptying the reservoir on 1 May 2019. The optimised project allows for an output equivalent to the initial project while minimising investment and presenting a significant ecological gain.

##### In Belgium

EDF Luminus has started an ambitious programme aiming to measure and reduce the mortality of migratory fish due to hydropower turbines. Supported by the European Life Programme and with an overall budget of €4.2 million, the objective of the programme is to model migratory routes, putting in place repelling systems such as electrical barriers or bubble curtains and specially-adapted systems to make fish passage easier. At the same time, the programme plans to install a new, very low impact turbine for migrating fish, with a test at the Monsin site, which will be renovated in 2019.

#### Regarding the green belt

##### France

- The hydraulic generation sites at Kembs and Romanche-Gavet have undergone major ecological restoration operations that have contributed to the reconstruction and reinforcement of terrestrial ecological continuities, in keeping with nearby natural habitats (e.g.: Alsatian Petite Camargue);
- in order to understand the inclusion of sites in the green networks at the local and regional levels, the business units analysed the SRCE (Regional Schemes for Ecological Coherence) and, in particular, the cartographic atlases, which notably identify the selected Green and Blue belt elements and their related targets. This work makes it possible to identify the potential constraints of the management and planning choices as well as potential opportunities, particularly in the context of restoration and offsetting operations;
- EDF's R&D department, which has been interested in the subject for several years, has tested various tools for numerical modelling of ecological continuities on site. The results were shared with the French Natural History Museum (MNHN). A study of the Ile-de-France region is currently under way in order to develop a territorial approach characterising the integration, in particular, of sites with regard to green belts;
- since 2016-2017, forests on hydropower land have been monitored through the setting-up of a sentinel network of plots across various sites and monitored and integrated into their networks of sites by the partners of RNF and CEN.

#### Regarding the black belt

In Reunion, EDF, in partnership with the SEOR and the National Park, is continuing the night-without-light experiment (25 nights) during the petrel breeding season (modification of the spectra and direction of the lights from the Port East power station and public buildings of the neighbouring municipalities, planned outages at night, etc.).

(1) See section 3.9.3.1 "Group Indicators of the Sustainable Development policy and CSRG".

(2) Regarding the use of phytosanitary products, also see section 3.3.2.4.2 "Optimising soil use".

(3) Classification List 2: Article L. 214-17 of the French Environment Code introduces two lists of watercourses ranked in terms of ecological continuity. List 2 includes all the watercourses in respect of which it is necessary, in terms of all structures impeding continuity, to ensure or re-establish the free movement of migratory fish and the transit of sediment in accordance with an imposed regulatory deadline.

[\*] **IND** Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4).



### Regarding the protection and restoration of the environment <sup>(1)</sup>

Today, the Company manages natural sites in partnership with local associations. EDF puts in place a series of protection measures on numerous sites, with a part of the land owned being allocated to areas dedicated to the protection or reconstitution of biodiversity, through management plans, *i.e.*, multi-year monitoring and action plans in favour of biodiversity and linked to the objectives adapted to the site's challenges.

#### France

- In France, creation of the "Small Rhine", a re-natured area as part of the Kembs environmental project. This is an old agricultural corn monoculture plot (100ha), which has been re-natured into a mosaic of open and wet environments, with some afforestation, and the passage of the "Small Rhine", the course of which has been redesigned to a more natural one that plays a key role in the continuity of fish movements in line with the fish crossing structures installed at the plant. In 2017, the monitoring of nature and management actions, in particular for the limitation of invasive alien species, continue to form part of a management plan that will be managed by the Nature Reserve of Petite Camargue. This operation is already showing success through the return of nesting species such as red-backed shrike, tufted duck, and others;
- As part of the Romanche Gavet project, the temporary rights-of-way for the construction of the dam over 10 hectares have been renovated by ecological engineering techniques using local plants, with support from partners such as CBNA and Irstea. This ecological restoration experiment is set to be rolled out to similar operations;

#### In Belgium

Every year, EDF Luminus publishes the list of sites where measures to protect biodiversity have been implemented (voluntary and mandatory measures).

### 3.2.6.4 Innovating for biodiversity

In an increasingly decentralised and interconnected world, EDF adapts its methods of action to make its commitment to biodiversity successful. The Group relies on a cross-functional mode of operation with agile business lines, which mobilise collective intelligence through dedicated working groups.

Furthermore, for over 30 years, EDF has equipped itself with a dedicated R&D department working on the environment, in partnership with external bodies. The Group is exploring even more emerging and experimental, innovative approaches. Biodiversity is one of the main subject areas with one of the largest R&D budgets. Therefore, over the next four years, approximately €21 million will be allocated to research work to:

- improve scientific knowledge and contribute innovative scientific and technological tools to assess the impacts of EDF's facilities on land and aquatic biodiversity more efficiently;
- improve the practices of environmental mitigation and the consideration of interactions between ecosystem services and the Company's activities;

- offer solutions to control and reduce impacts on the ecosystems, for example by identifying solutions for restoring and re-establishing the ecological continuity (sediment and fish) of watercourses.

This research programme mobilises 25 researchers and technicians and several partners. Their work helps with the continuous improvement of the Company's practices for biodiversity and contributes to scientific knowledge, notably through the publication of theses and articles in international journals.

EDF is working on bio-inspiration and provides bio-inspired solutions internally. A seminar organised in 2018 with the CEEBIOS presented the inventory of bio-inspired solutions already provided internally and the possible areas of application for researchers and engineers.

### 3.2.6.5 Engaging in a participatory and open process

EDF group seeks to understand and meet the expectations of its stakeholders and is involved in local biodiversity governing bodies. In France, this includes River Basin Committees, River Committees and Regional Biodiversity Committees. Meanwhile, EDF has developed a policy of cooperation with scientific and institutional partner associations, with strong regional involvement and expertise in biodiversity:

- EDF has regular discussions and enjoys close relationships with think tanks like OREE, EPE, CILB and the Business & Biodiversity Offsets Programme (BBOP). EDF also participates in the B4B+ working group of CDC Biodiversité for the definition of the global biodiversity score;
- in the UK, for more than 20 years, EDF Energy has worked in partnership with the Suffolk Wildlife Trust at Sizewell and the Natural England Wildlife Trust in Dungeness;
- in France, the Company's historic partners are given priority with major players in the sector: National Natural History Museum (MNHN), League for the Protection of Birds (LPO), Nature Reserves of France (RNF), French Committee of the International Union for Nature Conservation (IUCN), Federation of National Botanical Conservation Bodies (FCBN), Federation of Natural Site Conservation Bodies (FCEN), Coastal Conservation Agency. In total, EDF has forged over 100 partnerships with non-profit organisations or research organisations such as the National Institute for Scientific and Technological Research for the Environment and Agriculture (Irstea) and Ifremer (French Research Institute for Exploitation of the Sea). Locally, numerous partnerships aim to help sites in their approach conducted in favour of biodiversity; The partnership with the National Federation of Fishing in France (FNPF) continues through the financing and management of actions in favour of aquatic environments (one framework agreement and nearly 50 local agreements with departmental federations). In 2018, a new domestic agreement with the Society for the study and protection of mammals (SFEPM) <sup>(2)</sup>. These partners meet regularly in seminars in order to maintain collective momentum in favour of EDF's biodiversity approach. In 2018, the partners participated in drawing up EDF's biodiversity road map during a two-day seminar bringing together around 50 people.

(1) GRI G4 EN 13 - Disclosure 304-4

(2) See section 3.1.3.3.3 "Expertise from sustainable development partnerships".

### 3.2.6.6 Contribute towards the implementation of public policies

The Group also helps with the deployment of public policies, both national and local, in favour of biodiversity.

#### Actions in favour of protected areas and threatened species <sup>(1)</sup>

##### In Europe

Several EDF sites contribute to achieving the preservation objectives in the Natura 2000 areas and to implementing the Natura 2000 contracts. The Group participates in Life+ programmes, in particular EDF for the Pyrenean Desman (2014-2019), EDF Luminus for migratory fish, or Enedis <sup>(2)</sup> with Life Gypconnect.

##### France

- The Group contributes to a number of national action plans for the Bearded Vulture, the Zingel Asper and Bonelli's Eagle, and takes part in the regional variants of these plans, such as the European otter project in the Centre region, Angelica Heterocarpa, or the one for Odonata, which was the topic of a thesis defended in 2018;
- in Réunion, EDF carries out actions for the protection and conservation of the "Papanges" (an endemic endangered species) in partnership with SEOR: acquisition of data on the flight corridors of these birds by fitting transceivers. EDF is involved in the financing of the project and with fitting equipment on our networks (receivers);

- in partnership with the League for the Protection of Birds (LPO), the Cordemais site has constructed a building tailored for bats to mitigate the destruction of existing buildings. Creating this ex nihilo bat's lair as part of the offsetting measures is the first of its kind in France. The LPO is monitoring the use of the roost by bats.

#### For raising awareness among the general public

In France, EDF is involved in the Fête de la nature as the main sponsor of this national festival which attracts considerable media attention. In 2018, 31 EDF sites participated, organising a total of 80 events which attracted 4,800 visitors. On the occasion of this festival, EDF published 20,000 copies of a newspaper dedicated to questions about biodiversity.

The Group is implementing other voluntary action levers, as part of political patronage initiatives such as:

- in Brazil, EDF Norte Fluminense is continuing its work with the Mico Leao Dourado non-profit organisation to preserve an Atlantic rainforest: reforestation of the watershed, *Leontopithecus rosali* habitat (golden lion tamarin). Since the start of the project, nearly 10 hectares of forest and agroforestry systems have been reforested with the direct support of EDF Norte Fluminense;
- EDF supports the "red list" of endangered species in France prepared by UICN France and the French Natural History Museum.

3.

(1) These initiatives are carried out on species identified according to their status and dependence or proximity to our facilities.

(2) Enedis is an independently managed subsidiary.

## 3.3 OTHER AREAS OF THE SUSTAINABLE DEVELOPMENT POLICY

EDF group's Sustainable Development Policy of April 2017 was reviewed in June 2018 notably to include the Group's carbon target<sup>(1)</sup> and to include the Corporate Social Responsibility Goals more explicitly. This new version of the policy visually clarifies that sustainability requirements are complementary to the Group's policies, which themselves include certain dimensions of Corporate Social Responsibility (HR Policies - Purchasing Policies - Ethics and Compliance Policy - Nuclear Safety Policy).

The policy also includes recommendations associated with the anticipation of and preparation for the future, particularly to meet the expectations gathered during the listening phases with our stakeholders (section 3.1.1.2 "Stakeholder dialogue mechanisms"), some of which could eventually become regulatory obligations.

Its implementation is based on the principle of subsidiarity. The Group's performance will consist of the positive contributions reported by the Group's various business lines and subsidiaries in the areas in which they are concerned. The Group Sustainable Development Policy sets out the common principles and the means of achieving consistency.

The requirements of the Sustainable Development Policy meet three priorities: regulatory compliance, the means of implementing the Corporate Social Responsibility Goals, and the control and coverage of other major Sustainable Development issues such as air and water quality. It also includes some recommendations associated with the anticipation of and preparation for the future (for example, the practical integration of the principles of the circular economy).

The requirements of the policy are defined in four broad purposes: responding to the challenges of climate change; optimising the use of natural resources and conserving the environment; paying particular attention to people; and, dialogue with stakeholders and reporting on our activities. These requirements are applicable to all entities and subsidiaries of the Group as well as to projects and investments subject to decision-making bodies. The screening grid established to provide Sustainable Development specific opinion on these projects<sup>(2)</sup> includes the elements described in this section.

### 3.3.1 ADAPTING TO CLIMATE CHANGE



The requirements of this purpose include the implementation of long-term commitments defined in CSRG no. 1 and CSRG no. 4 as well as the requirements or recommendations described in this chapter.

Climate change has direct impacts on the physical conditions for performing the Group's activities, and indirect impacts as well (changes in energy demand, disturbances in the competitive environment). Since 2010<sup>(3)</sup>, the EDF group has been implementing a climate change adaptation strategy which aims to reduce or avoid the harmful effects of these impacts, while preserving their benefits.

This strategy concerns physical and transition risks. It involves:

- assessing the current and future impacts of climate change on existing facilities and business activities;

- adapting the installations concerned to make them less sensitive to climatic conditions and increase their resilience to extreme changes and situations;
- taking into consideration assumptions of changes in weather conditions in the facilities' design;
- adapting the Group's solutions, internal operations and know-how in light of climate change.

EDF's R&D Department has methods and tools to model the impacts of climate change, propose solutions to alleviate these impacts and anticipate the direction in which energy systems might evolve:

- a "Climate Department" was set-up, tasked with producing prospective data that allows identifying the physical risks of climate change;
- a research programme was initiated on the robustness of nuclear and thermal power plant heat sinks in operation. It includes results obtained from assessments of water availability in the French watersheds concerned;
- other research projects aiming to anticipate the developments of the energy systems, and discover the constraints which they will face, the disruptive factors.

Adapting to the physical effects of climate change mainly concerns structures with a long life cycle: nuclear and thermal power plants, hydropower dams, hydrocarbon platforms at sea. As wind and solar power plants are intended to be operated for a shorter period (approximately 20 years), they are relatively unaffected, especially as they are lightweight facilities with easy-to-replace equipment.

### Water

Climate change impacts the availability, quantity, distribution and location of water resources and intensifies competition among different users of water.

Several plants have been reinforced to provide hydropower facilities with stronger protection against extreme weather risks. For example, this is the case of the Record Dam on the river Agout, equipped with "Piano Key Weirs" spillway technology.

EDF has had a permanent system in place for many years for monitoring meteorological phenomena and their impact on the sources from which it collects water (subterranean groundwater, rivers or the sea). Data analysis makes it possible to predict and monitor risky hydro-meteorological phenomena. Monitoring is organised seven days a week, 24 hours a day.

In addition to the Group's adaptation strategy, EDF Energy has reassessed its risks, and particularly those associated with increased air and sea temperatures. Furthermore, assumptions of an increase in the level of the sea and oceans have been factored into the design of the Group's new EPR nuclear power plants.

### Networks

In its climate change adaptation plan, Enedis<sup>(4)</sup> has formalised measures intended to reduce the vulnerability of networks (1.4 million kilometres in length) and shorten the time it takes to reconnect customers in the event of a power cut. This plan also covers risks of flooding and summer heatwaves. It consists of putting high-voltage overhead lines underground to avoid risks of falling trees, wind, snow and frost, beginning with the most exposed facilities. In 2018, Enedis took down 3,800 kilometres of high-voltage overhead lines, including 1,000 for weather risk management.

(1) See section 3.2.1 "Committed to climate action".

(2) See section 3.1.2.2 "Integration of the corporate responsibility goals into the Group's strategic process and project screening".

(3) Being reviewed within the Group.

(4) Enedis is an independently managed subsidiary.

Following the damage caused by Hurricane Irma, customers were reconnected in less than five weeks. The Saint-Martin and Saint-Barthélemy electricity network securing phase has begun, with a budget of €28 million over three years. In the island regions, 95% of the new networks are built underground (HVA and LV).

In 2018, the Electricity Rapid Intervention Force [*Force d'Intervention Rapide Électricité (FIRE)*] intervened in the aftermath of the storms Eleanor, Fionn and Adrian in Corsica, as well as after the tropical storms Berguitta and Fakir. FIRE is capable of mobilising up to 2,000 people, 24 hours a day, seven days a week, both in France and abroad.

### 3.3.2 OPTIMISING THE USE OF NATURAL RESOURCES AND PRESERVING THE ENVIRONMENT

The EDF group applies the principles of the circular economy to preserving natural resources: water, air, soil, and raw materials, as well as to the management of its waste.

#### 3.3.2.1 Circular economy



##### 3.3.2.1.1 Principle and applications

Against the backdrop of the scarcity of natural resources, the circular economy aims to respond to the increase in needs by uncoupling the use of these resources, and by breaking free from the linear industrial model of extraction – output – use – waste. This approach reconciles growth, wellness and comfort with the planet's limits through a number of action levers, such as repairing, re-using, and recycling objects and designing eco-friendly products.

In accordance with the requirements of the energy transition, the Group makes the optimum use of natural resources consumed through its value chain a central element of its corporate responsibility and has included this area in its sustainable development policy. Electricity and heat generation is an industrial activity which requires means of generation that themselves result from a process of transformation of natural resources to build them, operate them and manage their end of life. EDF's integrated industrial model: the design – construction – operation – decommissioning of its generation facilities places the EDF group in a privileged position to contribute to the development of this new form of economy through eco-design, improving the yield and lifespan of its facilities and properly managing the materials and waste generated by their operation. Electricity is also a means of transforming economies through the development of new patterns of use which provide improved comfort while reducing the use of natural resources (electric mobility, new energy services).

The principles of the circular economy guide the Company's management<sup>(1)</sup>. They involve many areas well beyond waste management alone<sup>(2)</sup>, particularly energy, the Group's core business, the necessary raw materials (see section 3.3.2.5 "Raw materials"), soils (see section 3.3.2.4 "Soil"), and water (see section 3.3.2.2 "Water" on the reuse of water).

EDF is carrying out concrete actions in the area of energy recovery within its processes or the processes of its customers, and also by promoting the reuse of its materials and equipment on major construction or decommissioning sites (thermal, nuclear and hydro power plants) and as part of its radioactive waste processing activities like the manufacture of biological protection elements from metallic waste at SOCODEL. Eco-design becomes crucial in the engineering entities as seen in the consideration of the "design phase recommendations to facilitate decommissioning" during the definition of the basic design of future nuclear reactors. A dedicated group has been set-up within the R&D Department which focuses its research on the promotion of resources by optimising the integration of local multi-energy systems, waste and soil management, in a circular economy process.

(1) The circular economy is one of the new requirements of ISO 14001 which is used as the basis for on the ground management action.

(2) Note that with regard to food waste, EDF may be involved through employee canteens. Their management is mainly entrusted to the EDF CWC and at this juncture, EDF does not consider this information as being material. Likewise with respect to its risks and materiality analysis, EDF does not consider information related to the amendments to Article L. 225-102-01 of the French Commercial Code, introduced by law no. 2018-938 of 30 October 2018 on food shortages, respect for animal welfare and a responsible, fair and sustainable food supply as being material.

(3) Enedis is an independently managed subsidiary.

##### 3.3.2.1.2 Radioactive waste

See sections 1.4.1.1.4 "Nuclear fuel cycle and related issues" and 3.9.3.2 "Other indicators" for key indicators.

##### 3.3.2.1.3 Conventional waste

Due its business model spanning design to end-of-life, the EDF group generates conventional waste at different stages in the life cycle of its assets: site development (construction, decommissioning and heavy maintenance), operations (operations waste, such as process sludge), and office waste generated by service activities. As part of its sustainable development policy, the EDF group is committed to limiting the environmental impacts of its facilities and activities. Based on the ISO 14001 certified Environmental Management System (EMS), conventional waste management is carried out within the framework of the regulations in force, complies with the waste management hierarchy and prioritises reduction at source, particularly by repairing, reusing and use of eco-designed and eco-friendly products, sorting and recycling (particularly for site waste which is the most significant in terms of volume).

So-called conventional waste includes waste passed on to a subsidiary during the year. It does not include radioactive waste, which is dealt with separately as it falls under specific regulations and is handled by specific subsidiaries. Process-generated coal and gypsum ash are covered in a specific report, taking into consideration the quantities produced and the corresponding recycling opportunities (mainly the cement subsidiary). The report exclusively covers waste that is removed from sites and excludes waste that is stored on-site, waste awaiting removal, materials reused on-site (e.g. earth and rubble) and equipment that could be reused (sold or gifted). Construction and decommissioning waste is included in this report, if its management falls under the responsibility of the EDF group. On the other hand, waste managed by service providers is not accounted for.

##### 3.3.2.1.4 Measures to reduce conventional waste

The Group's entities and companies are committed to a process of continuous improvement according to the principle that the "best waste" is waste that is not produced. They have action plans aimed at limiting the generation of waste integrated in the management systems' action programmes in place (EDF, ES, Dalkia, EDF Luminus) with associated indicators (quantity of waste prevention, savings made on waste management, quantification of awareness actions, quantities of equipment reused, etc.). A number of levers for action are used: internal procedures (anticipation of construction sites: organisational schemes for waste management (SOGED), now systematically set-up prior to any major construction, decommissioning or maintenance work, sales agreements or donations for reuse), specific rules in the Company specifications (EDF, EDF Renewables), innovative technical solutions (separation of water/oil from hydrocarbon effluent, asbestos stripping, etc.), numerous awareness-raising initiatives for staff and service providers (communication, training, 2016 waste prevention guide incorporating 34 best practices, e-learning), and initiatives to reduce waste hazardousness (and exposure of staff to dangerous substances), particularly by limiting the use of hazardous products (see section 3.1.3.3.2 "Management of environmental risks") and prevention of environmental risks.

Given the importance of site waste and decommissioning waste, specific actions are implemented through dedicated EDF working groups. To assemble a compendium of best practices in this field, a "Waste Prevention Competition" has been in place since 2011 and was extended to the entire Group in 2016. In-house or external reuse activities are developing strongly in connection with the cessation of activity of (thermal) production units and the support tools such as the VEOL intranet with its site dedicated to "Between sites" exchanges. EDF SA has set itself a target of €100 million for cost reduction over three years (2018-2020) by recording the savings related to waste prevention and sales of equipment and materials. EDF and Enedis<sup>(3)</sup> are heavily involved in the inter-company TANGO BLOCKCHAIN project to facilitate the reuse of discarded material, starting with furniture. Through this re-use project platform, Enedis conducted a first experiment in the Loire with more than 16 tons of reused furniture (thus waste prevention) with local players: non-profits, social centres, local authorities and schools.

In broader terms, the design of facilities is increasingly based on eco-design initiatives which take into account the environmental footprint by implementing a

### 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

#### Other areas of the sustainable development policy

life cycle approach. A study has been conducted by EDF Renewables on the impacts of wind and solar power technologies throughout the life cycle, from the extraction of raw materials to decommissioning the facilities with a special focus on the end-of-life of equipment and its recyclability.

#### 3.3.2.1.5 Conventional waste management and recovery

In addition to prevention measures, the Group's environmental policy aims to improve the recovery of waste that is produced. The main actions implemented consist of:

- developing the recycling of parts and materials, particularly in the decommissioning phase (decommissioning of EDF thermal power plants, parts removed and recycled at Aramon and Porcheville or La Coche);

- the efficient sorting of waste so that it may be sent to energy or materials recovery companies in line with specific objectives defined in the environmental policies of the entities and relayed in the management contracts of the dedicated recovery companies and units (ex: EDF Renewables PV Cycle and First Solar agreements which take panels back at the end of their useful life, rental of IT equipment to DSP);
- developing partnerships with recycling players (RECYLUM for Citelum, *Ateliers du Bocage* for printer cartridges);
- implementing on-site pre-treatment of various waste items, in order to limit the volume of hazardous waste and promote the recovery of the remaining portion (e.g.: concentration of hydrocarbons for energy recovery).

The EDF sustainable development policy has set an objective to recover all 90% waste for the entire Group by 2021. The recovery rates for all conventional waste <sup>(1)</sup> remain at high levels.

Results within the Group	2018	2017	2016
Volume of conventional industrial waste recovered or transported for recovery ( <i>in tonnes</i> )	414,627	518,591	607,171
Waste recovery rate (%) – EDF group	87.1	85.0	89.9
Waste recovery rate (%) – EDF	92.4	93.0	95.3
Waste recovery rate (%) – EDF Energy	95.7	96.8	99.1

Year-to-year changes in tonnage are strongly influenced by ongoing investments and decommissioning programmes. The Group's objective is to effectively manage the end of life cycle of its facilities and ensure good waste recovery without a set target for the volume of waste production. In 2018, the total production of conventional waste amounted to 422,000 t in France <sup>(2)</sup>, 20,980 t in the UK, 31,113 t in Italy, 1,124 t in Belgium and 764 t in other parts of the world.

Non-recovered waste (disposal in a landfill), consists mainly of waste that does not benefit from the recovery processes: sludge from flue gas treatment (de-sulphurisation) or effluent treatment and containing hazardous substances (the prefectural by-laws for authorisation require burial of this waste), insulation and mineral insulation (no industrial sector available at this stage but under study), mixed waste similar to household waste, the amount of which is limited by sorting.

#### Impact of decommissioning and maintenance activities

In 2018, construction activities were significantly reduced, mainly due to the completion of major projects: Velaines in the Real Estate Department, back-up diesel (DUS) sites in Chinon, Flamanville, Paluel and Tricastin. Decommissioning activities continue at a sustained level, particularly with the works of Richemont in France, Jarry Nord (Guadeloupe) and Luciana (Corsica). Furthermore, for EDF Hydro, repeated reservoir dredging has increased sediment production (+ 19,000 t).

#### The recovery of combustion products and materials: a circular economy initiative

The Group has been committed to developing the circular economy for some years, with ethical systems in place for the recycling and reuse of thermal plant products and materials used during construction works.

Combustion fly ash and gypsum produced by desulphurisation are recovered in full by all thermal generation plants in Europe (France, United Kingdom) and in China. Overall, several hundred thousand tonnes of ash are used in building roads and in the cement industry (with savings of approximately one tonne of CO<sub>2</sub> avoided per tonne of ash used <sup>(3)</sup>). In France, EDF's fossil-fuel thermal plants produced 127,858 tonnes in 2018 and 157,564 were recycled in the cement and concrete sector (depletion of old inventory <sup>(4)</sup>). In 2018, Dalkia developed the use of waste as fuel, which uses a fraction of biomass waste that has not been used previously (forest cutting residues), and is developing waste-wood projects.

The materials involved in construction works are, to a great extent, reused, as in the following examples: post-Fukushima projects of nuclear sites, burial sites (Enedis <sup>(5)</sup>, ES).

In order to find other levers for recovery of these waste products in France, the Group has undertaken research into better recovery of ash, sediment and sludge and is an active participant in the work of the National Institute for Circular Economy and the RECORD non-profit to develop methods and tools together with industrial groups or universities. With the association OREE, ADEME and the Ministry of Ecological Transition, EDF participated in drawing up the November 2018 decommissioning and waste management guide. Full-scale tests are under way in hydropower generation to develop sediments as soils (Mont-Cenis and Romanche Gavet) which produce scientific theses. Dalkia Wastenergy is actively participating in the research project TERRACOTA for the recovery of SRF supported by ADEME.

(1) Excluding coal and gypsum fly ash, which are fully recycled.

(2) Companies having their registered offices in France and consolidated using the full consolidation method.

(3) EDF calculation based on average greenhouse gas content by country, including life cycle analysis (LCA), determined according to the generation mix per country provided by the International Energy Agency (IEA) 2012 and according to the LCA of generation methods provided by the International Panel on Climate Change 2012.

(4) Independently of this inventory depletion, everything which was produced in 2018 was recycled.

(5) Enedis is an independently managed subsidiary.



### 3.3.2.2 Water



Global demand for energy and water is increasing against a backdrop of climate change, which modifies the pattern of precipitation. The energy sector, from primary energy extraction to electricity generation, is entirely dependent on water. Water is a cooling source for thermal generation, and of course the raw material for hydropower generation. This raises the issue of sharing water between various uses, even if we recover a very large part of it.

Beyond these quantitative aspects, water quality is also an issue identified in the materiality matrix as a major issue. This refers to the management of pollution and contamination risks that are likely to cause biological, physical and chemical changes (and to their effects on health) in land and aquatic environment.

As a manager and major user of water, EDF must protect, manage and share water throughout the regions in which it operates by fully integrating the highly local dimension of water management. The EDF group has included “water” risk in its risk management policy. Each investment decision undergoes a detailed risk analysis, as well as advanced impact assessment studies.

#### 3.3.2.2.1 A resource for energy production

Water is a fundamental element in energy production. Water power is the raw material for hydropower generation. Water is also required for cooling thermal power plants and for the extraction and refinement of oil and gas products.

Hydroelectricity, and therefore water, also plays an important role in electricity systems. Large dams and pumped-storage hydro-power plants provide storage capacity for water which can be quickly transformed into electrical power. As such, large reservoirs still serve as the only form of large-scale electricity storage today (14GW can be made available in around 10 minutes in France), which is indispensable during peak demand periods, for the development of intermittent renewable energy sources, and to cope with emergency situations in order to prevent blackouts. The “Storage Plan” launched by EDF in 2018 includes this technology with 2GW (out of the 6 planned) of new STEP by 2035 (mainly in France).

#### WATER WITHDRAWN AND RETURNED BY THE GROUP

(in billions of cubic metres)

	2018	2017	2016
Cooling water withdrawn <sup>(1)</sup>	47.2	47.6	47.4
of which fresh water	15.4	16.0	16.2
of which brackish (or estuary) water	6.2	6.4	6.1
Cooling water returned	46.7	47.0	46.8
of which fresh water	14.9	15.5	15.7
of which brackish (or estuary) water	6.2	6.4	6.1
Evaporated water <sup>(2)</sup>	0.50	0.54	0.54

(1) Of which 38 billion cubic metres in France and 8 in the UK in 2018

(2) Water consumed, of which 0.48 in France and 0.01 in the UK in 2018

Please note that the quantity of freshwater sourced from groundwater is marginal, about 0.01% of the freshwater surface.

France is witnessing a fall in the temperature sensitivity of its thermal plants as old coal- or oil-fired plants near rivers are shut down (such as the Aramon plant which was closed in 2016). New thermal power stations are now built by the sea (Martigues CCGT plant), or equipped with air cooling (Blénod 5 and industrial commissioning of the high performance Bouchain CCGT plant), which reduces their dependence on water.

Almost 99% of water withdrawn is returned to the environment. In accordance with local intake and discharge regulations, the Group's companies take the necessary measures to comply with water quantity and quality requirements. They have implemented, in tandem with stakeholders, measures tailored to exceptional

In metropolitan France, EDF manages 7.5 billion cubic metres of water stored in its reservoirs (representing approximately 75% of the country's artificial reserves). At Group level, around 50 billion cubic metres of water (including sea water) are used for cooling thermal power facilities, of which 99% is returned virtually instantaneously to the natural environment. As such, EDF is a significant user, but negligible consumer, of water.

#### Controlling the use and consumption of water

The Group is committed to continuing to improve performance in terms of water withdrawal and consumption at existing power plants and to researching the most efficient way to use water across regions and major river basins.

Exposure of the Group's generation resources to water stress has been assessed and is managed. Most of the water withdrawal from its facilities is carried out in France 81% and the UK 17% in areas where there is no permanent water stress; the nuclear and thermal facilities are mainly established in coastal locations (and therefore do not use fresh water). Moreover, in situations where a specific, potential risk has been identified, suitable measures have been taken either during design or operation. Therefore, the Lunax reservoir was constructed from the outset upstream of the Golfech nuclear plant to prevent a possible shortage of water from the Garonne used for cooling in periods of serious drought. Accessibility to water for generation needs is therefore ensured even under special, or even extreme conditions. Particular attention is paid to water stress when screening any new project presented to the Group Executive Committee's Commitments Committee (CECEG).

Worldwide, 67% of the water withdrawn for cooling purposes by the Group comes from marine or estuary environments, where resource availability is not an issue. This percentage is almost 60% in France, over 99% in the United Kingdom and close to 93% in Italy.

Water withdrawals are stable (slightly lower) than in previous years and freshwater withdrawals are down by about 4% mainly due to the sharp drop in coal-fired generation.

weather conditions. EDF monitors the indicator parameters for the quality of the terrestrial and aquatic ecosystems around the sites. The results of this monitoring are provided to local authorities and used in documents or other media available to the public.

The volume of evaporated water in absolute terms (500hm<sup>3</sup>) is down by almost 10%. The bulk of this volume is in France (96.3%) and in the United Kingdom (2.4%).

Specific consumption of evaporated water per kilowatt-hour of electricity generated by the Group's fossil fuel-fired, gas and nuclear power plants was 0.97l/kWh versus 1.03l/kWh in 2017 and 2016. The use of open circuits and the use of seawater in certain power plants means that these values are well below the current average for the sector: from 1.8 to 2.8 l/kWh according to the IAEA <sup>(1)</sup>.

(1) Efficient water management in water cooled reactors, International Atomic Energy Agency, 2012.

### 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

#### Other areas of the sustainable development policy

(in l/kWh)	2018	2017	2016
Water consumed/thermal generation	0.97	1.03	1.03

By integrating renewable energy generation that does not consume any water, the specific ratio can even be reduced to 0.86l/kWh. Taking account of expected changes in the fleet, overall freshwater withdrawals and consumption at Group level will decrease in future years.

#### Optimising water usage

Thermal power plants use water as a cold source to optimise their output.

The EDF group works in a number of ways to optimise its water usage and to reduce pressure on the environment:

- research into the most efficient way to use water across regions and major river basins;
- reducing water consumption by choosing cooling systems adapted to the geographical area and the water resources available on site:
  - open circuit cooling (case of large rivers): major withdrawal of 150 to 180l/kWh, return to the river and negligible water consumption (close to 0.1 to 0.7l/kWh),
  - closed circuit cooling due to less abundant water resources: lower water withdrawal (6 to 8l/kWh) than an open circuit but with higher water consumption through evaporation via an air cooling tower (2 to 3l/kWh),
  - cooling via dry air cooling systems. Cooling now uses air instead of water (with deteriorated efficiency of the facility). In French overseas departments, where EDF is investing in new thermal power stations, R&D teams have designed dry air cooling systems for engine cooling, which reduce water withdrawal by 700,000 cubic metres per year per power plant. Now, EDF PEI's power plants are no longer cooled with saltwater,
  - limiting withdrawals of freshwater by recycling the water as part of the process or by desalinating sea water.

#### Examples of water consumption reduction and withdrawal limitation measures

At Framatome, a programme to detect and repair leaks in its drinking water systems has been launched and is being staggered over several years.

In Belgium, EDF Luminus changed the cooling system of its Seraing CCG power plant in October 2018 by replacing the cooling system with a cooling tower. This action will lead to a decrease in the withdrawal of water from the river, and also to a significant reduction in water taxes paid for this plant.

In China, the implementation of a new river water intake (Yellow River water station) for the Shiheng thermal power plant reduced the consumption of water previously pumped from the water table by 11hm<sup>3</sup> per year.

In France, EDF reduced its consumption of drinking water across its entire real estate portfolio and in its green spaces by c.5% per year until 2017.

#### Reuse and recycle water

The recycling of process and cooling water is growing throughout the Group, where appropriate. In China, the Ultra-supercritical power plant of Fuzhou reuses all its process water sequentially and depending on the quality of water (from cooling to watering ash to gardens). In Dalkia's large biomass combustion facilities, process wastewater is used to cool bottom ash to limit the volume of liquid effluent to be treated. In Brazil, the EDF thermal power plant, Norte Fluminense, installed a system for the recovery and use of rainwater a few years ago, enabling it to reduce its annual withdrawals from rivers by 2%. In France, EDF's thermal power plants in Cordemais and Martigues recover rainwater or recycle their effluents so as to reduce their consumption of tap water, resulting in a saving of 150,000 cubic metres of water out of the 300,000 cubic metres previously consumed. In Guadeloupe, rainwater recovery tanks were installed to reduce water withdrawals.

The new R&D centre in Saclay uses rainwater recovery to supply 50% of toilet water.

In some cases, the supply of part of the water from the heated cooling circuit of certain nuclear power plants for different uses (agricultural, industrial, etc.) is authorised within the framework of specific regulatory requirements.

#### Desalinating water

A desalination unit was installed on the Flamanville 3 EPR site in 2016 to complete the means of producing demineralised water for the process as well as for the other tranches. In southern Corsica, EDF has designed the cold water source for a thermal power plant by installing a sea water inlet, which reduces the consumption of fresh water significantly. In Guadeloupe, the TAC power plant in Jarry Sud also has a sea water desalination facility, which has made it possible to stop using tap water and save around 50,000m<sup>3</sup> of fresh water per year. Since the end of 2016, Edison has had one CCG plant (Simeri Crichi) in Italy with sea water desalination systems to replace freshwater withdrawals.

#### Innovating for sustainable water use

The new Group SD policy includes a water requirement: "Managing water in an integrated, inclusive and sustainable manner" and results in a specific indicator: "Each energy generation site shall plan, evaluate and report the sustainability of its water use using an internal EDF method (pending a recognised international method)". Since existing methodologies for calculating a water footprint are not relevant to the energy sector, as part of the World Water Forum, the EDF group led<sup>(1)</sup> an international project to develop terminology and a methodological framework adapted to the energy sector. Afterwards, to meet its own requirements, the Group mobilised a working group so as to propose a range of indicators on the sustainability of water uses to feed the dialogue with local stakeholders. These indicators, can, depending on the context, reflect the relation to water of a development level or a set of developments in a river basin.

#### 3.3.2.2 Governance and water sharing

The optimisation of water used in EDF's generation activities is vital to ensure management of water resources and, in particular, to honour the group's commitment to guarantee multi-purpose water resources (drinking water, water for irrigation, tourism, etc.) and the needs of local authorities.

#### Governance

Wherever it is present, EDF is part of a water management system for each river basin. In France, EDF is represented at meetings of each of the river basin authorities (the Water Agencies' Reservoir Committees) by the UFE. EDF's actions are fully in line with the new master plans for water development and management (SDAGEs) for the 2016-2021 period. The water activity within the Group is coordinated for each basin by a Basin Coordinating Delegate and at the national level via a specific inter-business function (EDF's Water Coordination), set-up officially in 2007 following several intense weather events. It is led by Group Senior Executive Vice-President, Renewable Energies (member of the Executive Committee). The operational management of water is ensured at the national level by the Water Management Group (GGE) responsible for ensuring the regular, weekly or daily monitoring, if necessary, of water stocks in order to coordinate various production constraints and the management of the multiple uses of water.

#### Water management and sharing

2018 was an unusual year in France, alternating hydro-meteorological extremes. The first half of the year was very wet, leading to exceptional snow cover on all the mountain ranges and strong generalised hydraulicity over the first half (one of the strongest hydropower generation periods in 40 years). A drastic change in weather conditions then occurred with the advent of weather that became dry and very hot during the summer, and even more so in the early fall, with a strong heat wave in the middle of summer but lower in intensity and lasting over a shorter period than those of 2003 and 2006. This deterioration led to severely low water levels in many streams and rivers in the fall, with a return period of 5 to 10 years on the Meuse, Vienne and a large part of the Massif Central, 10 to 20 years on the Jura-Saône region and over 20 years on the Rhone downstream of Lyon, and on the Moselle and the Rhine.

(1) Between 2012 and 2015.

To cope with these unusual and even exceptional climatic conditions on certain rivers like the Rhine, where even navigation was interrupted, various levers were activated within EDF to optimise production <sup>(1)</sup> and meet the expectations of the stakeholders. These included the release of water to preserve the fish population in the lower Ain Valley, for example, with 43hm<sup>3</sup> removed from storage in the Vouglans for environmental purposes in 2018. In 2018, in total 882hm<sup>3</sup> were removed from storage, to meet the various needs of water-users in the context of the specifications of hydropower concessions or agreements to share water.

Due to these particularly dry and hot summer conditions, the loss of production (ratio of lost-to-produced net energy) related to the temperatures and/or river flows, was 0.6%, a level equivalent to that of 2005 and 2006 (also particularly hot years). Nevertheless, EDF met its commitments to stakeholders in terms of low-water replenishment and agricultural support, as well those concerning flow rate restitution and observance of water levels for tourist-related purposes.

### 3.3.2.3.1 Improving air quality by transforming the generation fleet <sup>(2)</sup>

With respect to its generation facilities, the EDF group sold its EDF Polska assets (cogeneration and electricity generation) in December 2017. This resulted in an automatic decrease in NO<sub>x</sub> and SO<sub>2</sub> emissions.

SO <sub>2</sub> and NO <sub>x</sub> emissions due to heat and electricity generation (kt) <sup>(1)</sup>	2018			2017			2016		
	SO <sub>2</sub>	NO <sub>x</sub>	Dust	SO <sub>2</sub>	NO <sub>x</sub>	Dust	SO <sub>2</sub>	NO <sub>x</sub>	Dust
EDF Group	21	45	3	31	63	4	37	60	3
EDF	4	16	0.2	6	18	0.3	5	15	0.3

(1) The EDF Group's SD policy states the target in paragraph 2.3: "Reduce SO<sub>2</sub>, NO<sub>x</sub>, and dust emissions in the air from the Group's thermal fleet by 50% between 2005 and 2020". In 2005, emissions were 236 kt, 209 kt and 14 kt respectively.

EDF group has invested in its plants across the world to reduce air pollution levels. In China, the Ultra-supercritical coal-fired power plants reach emission levels close to those of a gas-fired power plant with 5/10mg/Nm<sup>3</sup> of dust emissions, 35/50mg/Nm<sup>3</sup> of SO<sub>2</sub> emissions, and 35/50mg/Nm<sup>3</sup> of NO<sub>x</sub> emissions.

In Europe, thermal installations have been aligned with the best available techniques defined by the European Union. In Italy, Edison's thermal installed base consists of CCGT power plants offering the most efficient technology with the lowest emissions.

In the island systems, combustion facilities <sup>(3)</sup> are equipped with flue gas de-nitrification systems the most recent of which have a NO<sub>x</sub> reduction rate of 85% <sup>(4)</sup>. In addition, initiatives to reduce NO<sub>x</sub> emissions are implemented and adapted to each facility: combustion optimisation and/or de-nitrification treatment systems, and even reduction of the number of hours of operation for some turbines.

In metropolitan France, the generation fleet is evolving:

- EDF continued the process of phasing out its fossil-fired power plants by shutting down the last 700MW oil-fired unit in Porcheville in April 2018;
- at the same time, since the early 2000s, EDF has committed to an ambitious initiative of modernising and improving the environmental performance of its thermal fleet, reconfigured to better serve the energy transition in mainland France, but also in Corsica and the French overseas departments. Today, environmental performances conform to the best available techniques defined by

### 3.3.2.3 Air



The EDF group commits in favour of improving air quality, by implementing certain measures:

- evolution of its generation fleet (closure, modernisation, transformation);
- provision of its expertise (scientific community, authorities).

3.

the European Union. The end of the use of coal announced in the PPE led EDF to study a combustion solution with biomass pellets, made from recycled wood. The treatment of flue gases from this combustion is one of the important dimensions of the EcoCombust project;

- as a replacement for thermal power stations in particular, EDF group continued with the transformation of its production facilities in France in 2018 by, for example, engaging the Solar Plan and the Storage Plan <sup>(5)</sup>, non-NO<sub>x</sub> and SO<sub>2</sub> emitting technologies. In Corsica and French Guiana, engines will be shut down by the end of 2023 and will be replaced by new, more efficient combustion plants. At the same time, in the island systems, EDF is developing isolated 100% renewable energy systems in addition to the initiatives for controlling Energy Demand and saving energy. At the international level, the MASERA microgrid demonstrator <sup>(6)</sup> set up in Singapore illustrates EDF's desire to propose innovative low-emission solutions in response to local energy issues, and seek alternatives to diesel generators at isolated sites.

### 3.3.2.3.2 Improving air quality by supporting public initiatives in this area

EDF <sup>(7)</sup> has historical know-how on the understanding and modelling of atmospheric emissions and air-conditioning systems of buildings that rely mainly on a "high resolution" modelling tool. With CEREAS <sup>(8)</sup>, EDF R&D participates in the scientific effort in the area of air quality, by developing open source models <sup>(9)</sup>.

(1) These are river-side power plants using fresh water; seaside power plants are not concerned by the issues of temperature rise and flow rates.

(2) Furthermore, and beyond its generation fleet, EDF is gearing up to convert its vehicle fleet to electric as part of the EV programme (see section 3.2.4.5 "Electric mobility"), reducing its NO<sub>x</sub> and dust emissions at the same time.

(3) Combustion turbines and engines.

(4) Case of engines equipped with systems for de nitrification through Selective Catalytic Reduction.

(5) See section 3.2.4.6.1. "EDF Storage Plans".

(6) Microgrid for Affordable and Sustainable Electricity in Remote Areas. The demonstrator is composed of solar, storage, mobility, and generation optimisation management solutions. See section 3.2.4.6.2. "Smart grids".

(7) More specifically, it involves the MFEE Department of EDF R&D.

(8) Atmospheric Environment Education and Research Centre, a joint laboratory at EDF R&D and the École Nationale des Ponts et Chaussées.

(9) Free access to source code.

### 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

#### Other areas of the sustainable development policy

This expertise is provided to the scientific community and local authorities in the form of innovative solutions; for example in 2018:

- the city of Villiers-sur-Marne decided to set up a global benchmark demonstrator of indoor and outdoor air quality. For its deployment, it will rely on EDF's scientific expertise <sup>(1)</sup>. The challenge to be met in the context of building the new Marne-Europe district is to allow as many people as possible to breathe good quality air, at a controlled cost. The innovative character of the demonstrator is based on its global "from the street to the living room" approach, with, in both cases, the desire to use digital modelling <sup>(2)</sup> to create a tool to help with the dimensioning and visualisation of the optimal plan for air circulation. The work carried out as part of the research programme will be used to deploy air treatment services in urban and peri-urban areas;
- in Paris, Lille and the department of Haute Savoie, Enedis' vehicles are equipped with a network of air quality sensors called Pollutrack. This is the first company fleet to contribute to improving air quality by detecting and measuring pollution caused by the finest particles which are the most dangerous for health;
- Citelum is implementing its know-how in terms of smart lighting and connected services to support Airparif in its policy of improving air quality in Ile-de-France. Thus, as part of the creation of AIRLAB, Airparif's laboratory of innovative air quality solutions, Citelum is testing a prototype of connected street furniture to measure mobility flows in real time. Corrective actions and changes in infrastructure and behaviour can be implemented when coupled with Airparif's air quality monitoring data. In future, this system based on urban infrastructure could be an additional connected service for a "smart city";
- in addition, EDF contributes to preventive and research initiatives on the health impact of air pollution through the Association for Prevention of Air Pollution (APPA) and the Inter-professional Technical Centre for Studies on Air Pollution (CITEPA). In 2018, sharing its good practices, EDF contributed to the National Clean Air Day, organised by the Ministry of Ecological and Solidarity Transition.

#### 3.3.2.4 Soil



EDF materiality matrix identifies soil pollution as one of its material issues (issue no. 22 Management of milieu: soil and water pollution). This refers to the management of pollution and contamination risks that are likely to cause biological, physical and chemical changes in land and aquatic milieux, and to their effects on health.

As part of its industrial and tertiary activities, the Group owns, or uses under concession, large land assets. This is why the environmental policies of the various Group entities aim to optimise the use of land and protect soil and groundwater against any impacts. Soil use is monitored as part of the actions related to biodiversity (see section 3.2.6 "Committed to biodiversity")

#### 3.3.2.4.1 Preventing impacts

The prevention of impacts is based on an "in-depth defence" approach. The following protection methods are in place at all industrial sites, specifically:

- maintaining the integrity of means of protection to provide a barrier between circuits containing or carrying radioactive or chemical substances and the environment;
- control of operations, management of effluents, their transfer and storage prior to release;
- maintaining and inspecting ultimate structures such as sumps, retention systems, unloading areas and pipes;
- ensuring that the soil surface remains free from radiological and/or chemical contamination at industrial sites;
- monitoring the physico-chemical and/or radiological properties of groundwater directly beneath sites;
- building retention tanks at storage sites for products and materials that could pollute the soil;
- reinforcing safeguards when transporting and storing fuel (double-walled containers) or waste (suitable containers);
- ensuring the availability of emergency kits in the event of spillages and carrying out the corresponding drills;
- developing operational procedures and high levels of awareness among operators and service providers through suitable training.

These preventive measures are based on facilities hazard studies and are enriched at the time of periodic reviews. The Sustainable Development Policy adopted at Group level stipulates that for each activity presenting a risk of pollution, a soil and groundwater management approach including pollution prevention must be launched before 2019

#### 3.3.2.4.2 Optimising soil use

The Group's industrial activities may entail some localised soil pollution. Action plans are in place to control these situations across all of the Group's sites. They consist of four stages: site surveys; identification of those that are potentially polluted; soil analysis on potentially polluted sites (sensitive areas first); introduction of a monitoring system for sources of pollution and drawing up a management plan and considering possible remediation depending on future use and regulatory requirements.

In 2018, several baseline reports were prepared in response to the European IED Directive: thermal sites of Brennilis, Dirinon, Arrighi, Gennevilliers, Vaires sur Marne, Montereau, Martigues, Blénod, Bouchain, Le Havre and Cordemais as well as the production units of EDF Luminus (Seraing and Angleur) and the island electricity systems. They did not reveal significant contamination. The soil management plans are awaiting approval from the authorities for the sites of Chinon, Blayais and work is in progress on the sites of Flamanville and Hinkley Point, on the sites managed by Dalkia and the sites of the thermal fleet in France and of IES being decommissioned.

To reduce the probability of pollution, the Group uses its considerable synergies to replace hazardous products with products that are less harmful to the environment and public health, where this is technically feasible. With this in mind, EDF, Enedis <sup>(3)</sup> and ES are continuing with their programmes to decontaminate equipment containing PCBs <sup>(4)</sup> and PCTs <sup>(5)</sup> of more than 50 ppm. These action plans continued in 2018 are on target. The 31 December 2019 target of eliminating 50% of the original fleet was already achieved during the year. Complete disposal is set for the end of 2025. The target of eliminating 50% of the original fleet by the end of 2019 was met before the deadline. EDF R&D, EDF IES, EDF PEI, SOCODEI, Dalkia and the thermal and nuclear generation sites no longer have any equipment exceeding the threshold.

(1) EDF R&D as part of a research programme led by CEREa.

(2) CEREa/ENPC/EDF R&D.

(3) Enedis is an independently managed subsidiary.

(4) PCB: Polychlorobiphenyls.

(5) PCT: Polychloroterphenyls.



Furthermore, action plans are under way to limit the use of phytosanitary products. The Real Estate Department has set a target of “zero phytosanitary products” by 2020 for the 115 EDF service sites with green spaces <sup>(1)</sup>. At end-2018, 104 sites had achieved this target in line with the progress envisaged for this plan. Furthermore, other entities no longer use these products <sup>(2)</sup>. These action plans are based on alternatives to the use of chemical herbicides (mechanical, thermal or other), vegetation management protocols for EDF Renewables (non-use of pesticides, differentiated management of vegetation, sheep, etc.) as well as on rules relating to companies in charge of maintaining the green spaces, with the long-term goal of abandoning the use of phytosanitary products altogether. They are accompanied by a training and awareness-raising programme <sup>(3)</sup>.

### 3.3.2.5 Raw materials



The Group uses raw materials for electricity generation and to provide energy services to its customers. A significant portion of these raw materials is comprised of fuels: uranium, coal, gas, fuel-oil and biomass. In line with its sustainable development policy, which aims to preserve natural resources and optimise its consumption of raw materials, while guaranteeing energy supply to its customers, the Group has opted to implement certain measures:

- changing its generation mix with the development of renewables such as solar power, wind power and marine energy; the decommissioning of low-efficiency coal- and fuel-fired plants, the commissioning of high-efficiency CCGTs (world record 61% efficiency for the Bouchain CCGT), the use of biomass in Dalkia's boilers and biogas plants, the modernisation of IES thermal stations (new PEI power stations) and the replacement of old engines at power plants in the French overseas departments and in Corsica;
- the optimisation of existing facilities: improving energy efficiency (IES, Dalkia, EDF Energy) or output (Edison's gas-fired combined cycle plant in Candela, Italy) through maintenance measures, modifications, fuel quality rules and more rigorous monitoring of efficiency levels (loss limitation) or cogeneration;
- the real-time selection of the best performing means of generation depending on the load curve and energy performance. Specifically concerning IES: thermal power plants are listed in order of generation costs, which are evolving in a virtually linear fashion in relation to the consumption of fuel-oil per kWh output. These power plants are started in “merit order”, an economic mechanism that minimises hydrocarbon consumption. These optimisation measures have been further reinforced with the ISO 50001 certification of these thermal sites since 2016. Likewise, Dalkia uses an energy management tool, which optimises the fuel used by the energy facilities that it operates;
- the implementation of a natural uranium savings strategy: EDF's control of each stage of the fuel cycle, the design of high-efficiency fuel and suitable management of that fuel within nuclear units all contribute to optimising natural uranium needs (see section 1.4.1.1.4 “The nuclear fuel cycle and related issues”). Recycling spent fuel enables savings of 10% of natural uranium;
- the Group's business model, based on controlling the full life cycle of its facilities, allows for efficient feedback as well as the implementation of eco-design initiatives developed in the engineering centres and the design of projects such as the EPR 2 New Model project, or the “Grand Carénage” works on the existing nuclear power stations. With the improvement in the production process, PHOTOWATT has increased the proportion of silicon recycled in its photovoltaic panel production and the power of the cells and modules to lengthen the life cycle of these products. As part of its supplier qualification system,

EDF Renewables, whose raw material use is related to equipment manufacture, asks turbine and panel manufacturers to provide life cycle analyses of their products;

- the Group is also developing industrial ecology initiatives among its various entities and initiatives supporting local authorities through a service based on the RECYTER tool, developed by EDF R&D, for the regional diagnosis of material and energy flows. The heating of liquefied gas at the LNG terminal in Dunkirk is carried out with cooling water energy from the nearby Gravelines plant, using a canal several kilometres in length, commissioned in 2015, which sets a strong example in terms of the circular economy.

The consumption of various fossil fuels fell sharply overall in 2018: with coal down 61%, fuel-oil down 18%, and gas down 3%. Coal consumption fell in particular due to the sale of assets in Poland. Fossil fuel consumption was also impacted by the high availability of nuclear facilities and renewable energy production, such as hydraulicity.

In commercial activities, all actions in favour of energy management are also a means of conserving resources (see section 3.2.4 “Committed to helping each customer consume better”)

The use of recycled materials (aggregates, earth, concrete, etc.) is encouraged during major projects related to hydraulic, nuclear and thermal investments and the materials used are recovered (see section 3.3.2.1 “Circular economy”). The Real Estate and Hydraulics Department carried out soil remediation operations using topsoil and sediment.

R&D is currently developing programmes to reduce the use of raw materials, such as ZnR Batteries, the Group's spin-off company which is working on zinc-air batteries, and is now supported by EDF Pulse Expansion. This technology uses easily accessible and non-polluting materials to make batteries.

Regarding tertiary uses, a wide-ranging travel limitation programme has been implemented by many Group entities (EDF, Edison, Citelum, etc.) with extensive use of video-conferencing and teleworking.

The issue of the potential scarcity of certain resources is monitored by R&D for each business line concerned, which implement measures suited to each particular situation. EDF Renewables pays close attention to the technical and technological choices of its strategic turbine suppliers, some of whom have stopped using (rare earth) permanent magnets. The information gathered during monitoring informs prospective studies relating to the Group's future equipment and activities.

### Paper

Since 2012, EDF has implemented a policy to reduce paper consumption.

First and foremost, this policy is applied through the development of electronic invoicing for residential customers. The target for 2015 of 4.2 million customers invoiced electronically (15% of residential customers) was surpassed by a substantial amount and the target for 2016 was raised to 5.5 million. The result surpassed the target: 5.65 million customers signed up for electronic invoicing, representing 21% of residential customers. The target for 2017, set at 6.5 million customers, was achieved, i.e. 25.5% of residential customers. The target was increased to 7.2 million customers for 2018. The target was once again exceeded. As of the end of December 2018, 7.3 million customers had signed up for electronic invoicing, representing 29.9% of residential customers. The 2019 target has been set at 8 million.

The paper consumption policy has also been applied by setting a target for reducing purchases of paper for office use by 3% per year. This target is renewed annually. The annual results have significantly outstripped the target. In 2012, paper consumption per employee was 24kg of CO<sub>2</sub> equivalent for the year, in 2013 it was 20kg of CO<sub>2</sub> equivalent per employee, in 2014 it was 17.6kg of CO<sub>2</sub> equivalent per employee and in 2015 as in 2016, it reached 11kg of CO<sub>2</sub> equivalent per employee, representing a reduction in paper consumption of more than 50% over 3 years

(1) The target was adjusted due to a change in scope of this Department.

(2) For example SOCODEI, Edison, EDF Luminus, Norte Fluminense, Enedis, several hydropower operating units; ÉS has abandoned all glyphosate-based products.

(3) On limiting exposure to phyto-sanitary products, see also 3.2.6.3.2 “Preparing and implementing initiatives depending on the issues as part of a positive approach to biodiversity”.



# 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

## Other areas of the sustainable development policy

The new profit-sharing agreement for 2017-2019 includes a sustainable development and digital criterion based on the reduction in paper consumption. This criterion represents a total of 10%. It involves the reduction in the annual percentage of print jobs on the printers connected to the EDF network (annual target: -15%). A number of measures were implemented to achieve this target and encourage the personnel to reduce paper printing: fewer printers, removal of individual printers, basic double-sided printing on printers in black and white, generalisation of secure print with password and, finally, on some sites, targeted and encrypted campaigns (annual paper consumption displayed) are carried out and displayed at the printing locations. The target was largely exceeded in 2017 (-19%) and again in 2018 (-15.4% at the end of December 2018). In addition, 100% of the paper used is FSC paper (recyclable and carbon neutral) and carries the EU Ecolabel. Every EDF site has implemented paper sorting for the recovery of office paper <sup>(1)</sup>.

### 3.3.3 PAYING CLOSE ATTENTION TO PEOPLE

The EDF group pays close attention to people, specifically those within its map of identified stakeholders (see section 3.1.1.1 "Mapping of the Group's stakeholders") including Group employees and subcontractors, consumers, the communities neighbouring our facilities or projects, and populations who do not yet have access to power.

#### 3.3.3.1 Human rights



The EDF group's commitment, taken to the very highest level and officially set out in its Sustainable Development policy is to "not tolerate any breach of human rights whatsoever, in any of its business activities, or those of its suppliers". Human rights matters are coordinated by the Sustainable Development Department, which reports to the Executive Committee and the Board of Directors' Governance and Corporate Social Responsibility Committee. Nevertheless, this concerns and involves all departments (Legal, HR, Business Lines, Purchasing, etc.).

Due to EDF's and its subsidiaries' industrial activities in France and abroad, in more than 24 countries around the world, the Group is aware of the risk of human rights breaches to which it may be directly or indirectly exposed, in particular through its suppliers, subcontractors and partners.

The EDF group's approach to compliance with human rights is based on the UN's guiding principles relating to business and human rights <sup>(2)</sup>. In 2018, the EDF group stepped up its commitments, specifically by signing a global CSR framework agreement, integrating human rights even further in its impact studies and consultation mechanisms (see section 3.2.5 "Committed to consultation") and when screening new projects before deciding to launch. It also ramped up manager awareness-raising campaigns regarding human rights, and overhauled its whistleblowing system open to all.

#### 3.3.3.1.1 Policies and commitments on human rights

On 19 June 2018, a new global agreement was signed on the EDF group's corporate social responsibility. It was signed by two international trade union federations (IndustriAll and ISP) and the EDF group's own trade unions. It automatically applies to all Group employees. It effectively reflects the EDF group's commitment to "make upholding human rights a prior condition for all business activities, and not to tolerate any breach of these rights whatsoever, whether during the course of its business, or by its suppliers, subcontractors and partners". It confirms that, in the event of conflicting standards with applicable laws in countries in which it operates, the EDF group undertakes to apply the most protective human rights provisions. This agreement also includes its commitment to involve the trade unions in the preparation and implementation of the vigilance plan, as required by the French Law of 27 March 2017 on the duty of care, in particular "to identify risks and prevent any serious breaches of human rights and fundamental freedoms" (see section 3.4.4.5 "High-quality social dialogue"). The EDF group and the signatories to the global agreement are committed to promoting all of the legal texts to which the agreement refers amongst its subcontractors and suppliers <sup>(3)</sup>.

The EDF group joined the United Nations Global Compact in 2001. EDF publishes a Communication on Progress (COP) at the "Advanced" level every year.

#### 3.3.3.1.2 Due diligence measures and monitoring the implementation of commitments

During 2018, consideration for human rights matters was stepped up and due diligence initiatives were developed:

- at the Corporate level, "Human Rights" are systematically taken into account in the screening of projects presented to the Group Commitments Committee (investments of over €50 million), specifically impacts on local communities or matters relating to employee safety;
- for the EDF group, the application of the "Duty of Care" Law of 27 March 2017 gave rise to "Human Rights" risk mapping, as well as the implementation of a due diligence mechanism at all of its entities. In 2018, a mandatory sheet was added to the internal control manual, in order to ensure the main EDF group entities had implemented this mechanism;
- in terms of procurement, 1,700 suppliers with business volumes of over €400,000 received a self-assessment questionnaire. More than 770 of them have already been checked and evaluated. In addition, 53 external audits were carried out, with a specific focus on human rights issues <sup>(4)</sup>;
- fuel supplies take human rights matters into account: the supply of coal is covered by the Bettercoal code of conduct, that of uranium is the subject of mine audits <sup>(5)</sup> and that of gas and oil for plants in France's overseas departments was the subject of human rights risk mapping, as part of the vigilance plan;
- "Human Rights" are also considered in the Company's consultation processes (see section 3.2.5 "Committed to consultation");
- an e-learning course on "human rights at work", developed with the *Entreprises pour les droits de l'homme (EDH)* <sup>(6)</sup> non-profit, of which EDF is a founding member, is available in English and in French on the manager and employee platforms, and particularly for purchasers. This e-learning module was customised by adding the EDF group's commitments; 77 employees completed this training in 2018;

(1) See PAP50 assessment, see to section 3.7 "Non-financial rating".

(2) Texts to which EDF refers: ILO fundamental conventions; Universal Declaration of Human Rights and the International Covenant on Civil and Political Rights (1966); the International Covenant on Economic, Social and Cultural Rights (1966); Declaration on the Elimination of Discrimination against Women (1967); Declaration of the Rights of the Child (1959); OECD Guidelines for Multinational Enterprises (2011); UN Guiding Principles for Business and Human Rights (2011).

(3) Furthermore, a collective bargaining agreement was signed in China in 2012. It was set up in favour of the employees at the Chinese holding company, with the primary goals of continuously improving employees' working and employment conditions and promoting social dialogue. The EDF China Trade Union Committee (seven members elected for a five-year term) represents EDF China's employees with regard to compliance with Chinese laws, as well as with the principles and values of the EDF group.

(4) See section 3.3.3.4 "Responsible purchasing".

(5) Id.

(6) EDH has 17 members, among the major French companies: e-dh.org.

- departments and companies operating abroad have identified specific risks by geographic region, which are now being managed: Citelum in India has created committees responsible for handling matters of sexual harassment and discrimination; EDF Renewables has developed risk maps relating to local communities and/or working conditions in the Group's various operating regions (South America, Asia, Africa and the Middle East, Europe and North America). The International Division has updated, through due diligence carried out at the Shweli 3 hydropower plant in Myanmar, risks relating to the conflict between the army and independence groups. A "Human Rights Risk Impact Assessment and Mitigation" <sup>(1)</sup> is currently being completed to strengthen this initiative;
- Edison has taken human rights risks into account in the selection of its suppliers, in particular those supplying wind turbines, and has included human rights matters in its "Theory to Practice" training programmes; Edison is drawing on an initiative developed within the Italian network of the Global Compact: the "Sustainable supply chain self-assessment platform", which raises supplier awareness on human rights and anti-corruption matters, and requires them to complete a self-assessment questionnaire;
- in June 2018, EDF Energy published a statement in compliance with the UK Modern Slavery Act, while Citelum and Norte Fluminense decided to obtain SA 8000 certification from an independent organisation, which includes a number of human rights-related requirements;

### 3.3.3.1.3 Whistleblowing and reporting mechanism

In September 2018 the EDF group implemented a new whistleblowing system, enabling Group employees and external staff (temporary workers, service provider employees, etc.), those on fixed-term contracts, (apprentices and interns, etc.) and third parties (local residents, consumers, communities, NGOs, etc.) to raise an alert, in accordance with the Sapin II Law of 9 December 2016 on transparency, anti-corruption and modernisation of the economy, and with the "Duty of Care" Law of 27 March 2017 on parent companies' and ordering companies' vigilance.

These alerts relate to serious breaches of human rights and fundamental liberties, health and safety, and the environment, resulting of EDF's and the Group's subsidiaries' business activities. Harassment and discrimination are also identified as a specific category. The Group ethical and compliance whistleblowing system can be accessed in six languages, in France and abroad. The regulated infrastructure subsidiaries have their own systems.

Protection for whistleblowers is a fundamental concern for EDF, which has adopted the secure BKMS® System to carry out and host all exchanges of information relating to the alerts raised. This platform guarantees data encryption and storage on a confidential external server, not connected to the EDF group's information systems.

Forty-four alerts were declared admissible by the ethical alert system, 48% of which related to matters of harassment and discrimination.

Subsidiaries and major projects may also decide to set up specific complaints collection and handling systems.

For example, this is the case for the Nachtigal hydroelectric dam project in Cameroon which has a Request and Complaints Handling procedure <sup>(2)</sup>. All complaints and requests are, in principle, considered admissible. Complaints may be submitted in writing, verbally (face to face, by telephone or by SMS) or via an intermediary, in all local languages spoken where the project is being carried out, as well as in the official languages spoken in the country (French and English). Only complaints relating directly to commitments, business activities, impacts, liability and the project mandate are admissible. An investigation is conducted once the complaint or request has been deemed admissible, in order to determine whether it

is well-founded. Once the complaint is judged to be well-founded, it is dealt with by the Project. The complainant can contact the Mediation Committee, if they are not satisfied with the response provided by the Project. A Board of Appeal can be contacted as a last amicable resort if the complainant is not satisfied with the solution offered by the Mediation Committee.

At the subsidiaries, Citelum in Mexico in particular has set up an internal complaints procedure, handled by the HR department. This procedure was the subject of detailed communication to the employees <sup>(3)</sup>. EDF Energy has been developing the "Confidential Reporting of Serious Concern Procedures" mechanism for several years, enabling everyone to submit complaints.

Finally, as part of the monitoring of the implementation of the global CSR agreement, an assessment of its application is carried out each year, "including actions relating to the compliance plan", in particular regarding compliance with human rights.

### 3.3.3.2 Consumer health and safety



EDF group's low-carbon generation has positive impact on air quality, and the electricity generated offers consumers a comfort that contributes to solving major public health challenges (cold chain, lighting, indoor air, indoor circulation, etc.). Electricity generation sites and electricity use by customers, however, require the implementation of certain precautionary measures. For this reason, EDF has long employed information and awareness raising mechanisms in matters of health and safety, in the areas of generation, the electrical grids and uses. Recently, EDF has intensified its research and action on consumer health and safety. The EDF group is, for example, likely to generate noise pollution that could affect people living close to its facilities. This is a type of impact which EDF has shown an interest in tackling for several years now, in both its generation and construction activities, for activities on-site or in transit.

EDF has a medical studies service that intervenes as an expert in all the Group's activities. EDF's sustainable development policy includes a section on health, in order to take into account the health concerns generated by its activities. The research department has the most leading edge tools and has taken part, for example, in the creation of a laboratory (4EV Lab) whose research focuses on quality of life in urban areas. In 2018, a study conducted by EDF's Medical Research Department, in conjunction with R&D, showed that investment in an adapted energy renovation plan has resulted in savings for the health system, that are all the greater the lower the household income. Health matters are steered by the operational generation and sales and marketing departments. EDF aims to see its electricity offerings recognised as contributing to the comfort, well-being and health of individuals. In 2018, Health matters, explicitly integrated within the EDF group's Sustainable Development policy, are coordinated between departments, in order to more clearly define the Company's communications on the matter. In 2018, EDF also published its 50 commitments for more responsible communication (see section 3.1.3.3.5 "Sustainable development training and awareness-raising"). In this respect, EDF has undertaken to constantly adapt and make all of its communications accessible to those with visual or hearing disabilities, while making all of its public reception areas accessible. Regarding health and safety, EDF also has a medical Board (see section 3.1.1.2.2 "Stakeholder panels").

(1) Method prepared by IFC, International Finance Corporation.

(2) For the complaints system, see: [nachtigal-hpp.com/index.php/gestion-des-requetes-et-des-plaintes.html](http://nachtigal-hpp.com/index.php/gestion-des-requetes-et-des-plaintes.html).

(3) No complaints have been submitted since the system was set up in 2018.

## 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

### Other areas of the sustainable development policy

All of the Group's actions to ensure consumer health and safety fall within three key areas <sup>(1)</sup>:

- risk management;
- stakeholder awareness;
- sales offerings.

#### 3.3.3.2.1 Risk management

Seventeen sites and subsidiaries are OHSAS 18001 certified. The standard describes the implementation method for health and safety management, to ensure better risk management. In 2018, 100% of engineering and generation sites <sup>(2)</sup> (nuclear, thermal and hydropower plants) maintained their OHSAS 18001 certification in 2018, with an audit conducted by the external expert Afnorm, which carried out 17 OHSAS 18001 audits in 2018 on behalf of EDF;

EDF is researching the impact assessments on people and ecosystems done for generation facilities (for example, via chemical or radiological discharges). Replacement processes or products are tested and assessed to reduce health risks to residents and employees.

One of the most sensitive issues is noise pollution. For example:

- in the hydraulic sector, where facilities are often located in residential areas, measures are being taken to limit noise levels for local residents and for suppliers and subcontractors. All of EDF Hydro's facilities have a Single Risk Assessment Document (SRAD) and all work carried out by external companies in relation to risks is the subject of a formal Prevention Plan, in accordance with the law;
- EDF Renewables has an internal team dedicated to acoustics. Acoustic studies are performed for each wind project in order to assess impacts and minimise them at the design stage of project development. The noise levels of turbines are part of the selection criteria for the procurement of machinery. EDF Renewables listens to local residents when there is evidence of noise pollution in the operational phase. The acoustics are monitored at wind farms in operation to check the assumptions of impact studies and take any appropriate corrective measures.

#### 3.3.3.2.2 Awareness-raising

The sales department in France systematically sends a safety instruction booklet to all customers who take out a natural gas subscription with EDF, regardless of the subscription channel of this offering. These instructions can also be accessed on the edf.fr web site. The edf.fr website also has informative content concerning electricity. Moreover, EDF is an active member of the PROMOTELEC association which offers advice to consumers.

For business customers, EDF has experts who conduct audits on the safety of electrical facilities. Aspects relating to Quality of Life at Work are monitored with our service providers during steering Committee meetings.

For gas, EDF specifies in its special terms and conditions of sale, and in the accompanying letter sent to customers, that information relating to natural gas safety can be found on the edfentreprises.fr website.

As part of Dalkia's reinforced health and safety action plan, the subcontractor health and safety charter is still being deployed in line with the roll-out of the subcontractor safety assessment scheme. In 2018, a certain number of actions were set up by entities to ensure greater involvement of subcontractors in these issues, specifically via safety audits of subcontractors.

Électricité de Strasbourg provides its customers with various information relating to their electrical installations and risk prevention. These can be found on the website, on

its blog and also in specific mail-outs, such as customer letters focusing on electrical installations.

Actions taken by distributor Enedis <sup>(3)</sup> concern the safety of third parties in the vicinity of electrical installations. At the national level, Enedis develops partnership agreements with organisations that represent the main populations at risk, for example with the national fishing federation in France (FNPF), in order to raise the awareness of anglers to the risks close to electric lines and advise them, and with the General Directorate of civil security and crisis management (DGSCGC), in order to reinforce their cooperation in the prevention of risks related to fire-fighting close to electrical networks. There are other agreements with partners in the building and civil engineering sectors, farming, aerial sports, etc. In the regions, Enedis also works with associations and professional federations to relay information. There were over 300 agreements in force in 2018, in particular with organisations representing agricultural activities, civil engineering, aerial sports, fishing and fire-fighting. Enedis takes part in national and local events (trade shows, fairs, etc.) where it raises the awareness of visitors to the risks arising from certain activities conducted close to electrical facilities. In 2018, Enedis was at the International Agricultural Show and, as it does every year, took part in a programme broadcast by Campagne TV.

For several years now, Enedis and RTE have joined forces as part of a communication campaign, disseminating safety advice to people working near electrical facilities. This campaign is now based on the slogan: "Caution Electricity: keep your distance" and gives advice that reminds various groups of the different precautions to be taken close to the facilities. These recommendations have their own dedicated website, and safety messages are included in the "Enedis at my side" application. This information covers work near the lines, pruning, drilling and the safe use of generators.

Concerning island territories, EDF carries out specific actions depending on the risks and territorial characteristics, and adapts its awareness-raising campaigns to tourist or cyclone periods. During winter, EDF Energy reaches out to its most vulnerable customers in particular.

#### 3.3.3.2.3 Sales offerings

Health and well-being sales offerings include advice, works, support for facility management and targeted offers.

With regard to advice, the edf.fr website deals extensively with residents' thermal comfort and well-being. This ranges from advice in the form of simulators to the selection of connected objects (thermostats, weather stations, light bulbs), in order to increase comfort. In terms of works, emergency services available in less than three hours, 24/7, are offered in the event of a power outage, or gas or plumbing issues. EDF facilitates work designed to enhance comfort by establishing relations with qualified partners (EDF's Solutions Habitat partners) and helping to finance the work.

In terms of facility management, Sowee offers customer services that impact health: smart heating control, CO<sub>2</sub> and room humidity level sensors, measurement displays and associated alerts, room noise levels, access to outside air pollution indicators in real time (partnership with Plume Labs) and personalised optimisation advice. In Italy, Edison promotes home comfort alongside Assistenza Casa, a company specialising in innovative maintenance and repair services. It employs a network of 1,400 technicians and serves 300,000 customers.

On 15 November 2018, EDF launched a trial intended to help seniors who live alone remain in their homes ("Mon Parent & moi"). For health organisations, Dalkia deploys the Serenis offer (energy quality and availability, regulatory compliance of installations and procedures for managing health risks).

(1) We would remind readers that for high risk customers (people who require respiratory assistance at least 20 hours a day and children with parenteral nutrition), there is a specific information procedure in case of a power cut. For cases of power cuts scheduled in advance for works, the distributor notifies the patients or their representatives one by one so they can organise themselves and avoid the consequences of the interruption of supply. For non-scheduled power cuts, the distributor provides the patients with a phone number that is especially reserved for them as well as the organisations representing them to enable them to call and find out the probable duration of the power cut

(2) 3 nuclear sites (Cattenom, Dampierre, Saint-Alban); 4 thermal sites (Le Havre, Blénod, Martigues, Cordemais); 1 hydraulic site (DTG); 2 engineering centres (CNEPE, CNEN), as well as numerous subsidiaries (ES, SOCODEI, EDF Renewables Services, PEI, Dalkia France, Dalkia Wastenergy).

(3) Enedis is an independently managed subsidiary.

### 3.3.3.3 Communities neighbouring our facilities

The EDF group is present in many countries and contributes to the sustainable development of the regions where it operates. Its activities provide tax revenue to the territories, and contribute to economic development and employment.

#### 3.3.3.3.1 Contribution to economic development

The Group's Procurement Department continues to interact with suppliers – including SMEs, VSEs and start-ups – with the operational implementation of a process adapted for innovative purchasing and to make it easier for SMEs to access EDF's markets.

To facilitate the access of SMEs to its markets, EDF has:

- simplified the general terms and conditions of purchase and created special terms and conditions for "small orders";
- a simplified capacity questionnaire for new suppliers, for tenders with amounts lower than the thresholds of European Directive 2014/25/EU;
- and, for innovative start-ups and SMEs, a tailored purchasing process and standard agreements. Three key figures of innovation procurement: 40 test cases, €45,000 budget on average, 100 potential contracts each year;
- a dedicated space on the edf.fr institutional site (single point of access for SMEs).

Overall, purchases from SMEs represent 25% of purchases made by the Group's Purchasing Department <sup>(1)</sup>.

Share of purchases from SMEs	2018	2017	2016
SMEs	23.7%	23.5%	26.0%
MSEs	23.5%	25.0%	24.8%

The Thermal Expertise and Multi-Sector Industrial Support Division (DTEAM, formerly DPIT) is committed to decommissioning programme to support sites at the end of their operating life with work forecast up to around 2030. This programme is part of consultations with local authorities and is carried out in accordance with Decommissioning Log Books prepared by the DTEAM.

Following the closure of the Aramon thermal power plant, and after a joint regional assessment, a partnership development charter was signed with all stakeholders: Technical And Development Committee meetings were held under the aegis of the prefecture, resulting in the Cleantech Vallée project under joint governance. An ecological transition contract (ETC) was signed on 14 December by the State with the municipalities of the Pont du Gard region and the Agglomération du Gard Rhodanien (one of the four experimental CTEs).

In the Romanche Valley, the Company approached its partner, the Conservatoire Botanique Alpin, to restore banks stripped back by the works. This proactive approach benefits the regional economy, promoting the development of seedling and plant species producers.

In Corsica, SEI has set up a "Smart Pyse" agreement with SITEC university for the Colzanno village. The goal is to provide a set of tools, objects and technological solutions (sensors – communication – optimisation tools) making it possible to implement strategies to promote the ecological and sustainable development of a municipality. Priority is given to environmental monitoring, energy efficiency, water and waste management and the development of digital applications, for citizens and rural activities.

The Customer Division supports rural areas through energy saving programmes in positive energy regions that promote green growth (CEE TEPCV). It develops energy strategy research services, in particular for positive energy regions located in rural areas: the Energy Outline makes it possible to identify ways to decarbonise the region and helps define concrete actions to be implemented.

In Chile, EDF Renewables was awarded third prize in the "good environmental practices" awards by the Electricity Producers Association ("Generadoras"). As part of the Santiago Solar photovoltaic plant project, a community programme has been set up, including a public transport solution to help open up the local community, the installation of solar panels to help save money, and a flagship 150ha reforestation project in cooperation with a nursery that employs women in the community.

EDF Norte Fluminense supports NGOs working to protect the environment (Associação Mico Leão Dourado), promote sport and quality of life in local communities (Fondation Macaé Basquete, Guanabara Rugby et Gol de Letra), and cultural projects (making use of a federal law on tax incentives).

In Vietnam, MECO has CSR programmes in the south of the country, developing concrete actions in favour of local communities: renovating toilet blocks for students and men and women's bathrooms; building a new classroom and library dedicated to ethnic minorities; assisting disadvantaged children from minority backgrounds, people with disabilities, and orphans. These actions aim to eradicate childhood illiteracy within ethnic minorities and help new communities to settle, thrive and grow.

For NTPC, the company that operates the Nam Theun dam, 2018 was marked by the closing of RIP (Resettlement Implementation Period) by the World Bank. This decision brings an end to the relocation of communities and the creation of new economic activities. This enables NTPC to implement its decision to create an \$800 million fund to support local economic development under its corporate responsibility commitment.

#### 3.3.3.3.2 Contribution to local tax revenue

see section 3.5.2.2 "Taxes paid by the Group".

#### 3.3.3.3.3 Contribution to the creation or protection of jobs

Wherever it operates, the EDF group's impact on employment is substantial, whether in relation to direct <sup>(2)</sup> or indirect jobs.

As part of the major "Grand Carénage" industrial programme, EDF has invested €4 billion each year for all of its facilities. Nuclear generation accounts for the most projects contracted with French industrial players, and is the third biggest industrial sector in France, creating over 25,000 direct jobs at EDF and 33,000 indirect jobs, across some 2,500 companies (SMEs, ISEs, start-ups, etc.). According to a third study on the employment impact of energy generation activities, the effect on national employment in terms of the number of jobs by type of impact for nuclear engineering represents 6,349 direct jobs, including 1,470 study-work and vocational training contracts, for a total of 70,070 jobs including tier-one indirect jobs, indirect jobs in the rest of the supply chain, jobs created by household consumption and jobs created by government spending. The economic flows studied and injected into the French economy represented €2,864 million in direct purchases <sup>(3)</sup>. In the United Kingdom, EDF Energy will create 25,000 jobs at the Hinkley Point site during the construction phase.

(1) Purchases made by the Group Procurement Division for EDF and Enedis during the reference period.

(2) See section 3.4 "Further Human Resources considerations".

(3) Nuclear and thermal employment footprint 2017.

### 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

#### Other areas of the sustainable development policy

Concerning its three offshore wind farm projects in Fécamp, Courseulles-sur-Mer and Saint-Nazaire, EDF Renewables is contributing to the creation of a national industrial sector for offshore wind energy, representing an estimated 7,000 direct and indirect jobs <sup>(1)</sup>. Through its activities in the biomass sector, Dalkia generates non-transferable local jobs, up to approximately 2,000 jobs in France; more generally, Dalkia supports around 50,000 jobs in France, whether directly or indirectly <sup>(2)</sup>.

#### 3.3.3.4 Responsible purchasing



##### 3.3.3.4.1 Responsible purchasing practices

In terms of the supply chain, EDF's responsible purchasing approach sits at the heart of the Group's social and environmental responsibility policy.

The Group's new Purchasing Policy, signed in March 2017, states that the Group's values must be complied with by suppliers and that obligations in terms of sustainable development and social responsibility must be systematically included in contracts. This includes the Sustainable Development Charter established in 2006 and updated in 2014, which is an integral element of each contract. Moreover, the purchasing policy promotes regional involvement, support for local development, in particular by giving preference to relationships with SMEs as well as the use of the protected worker sector and structures for integration through economic activity <sup>(3)</sup>.

Under the Group's Purchasing Policy signed in 2017, the EDF group Purchasing Department ensures the consistency between actions carried out within the Group's Purchasing Departments (excluding RTE), sets the overall framework for the policy, and manages the Purchasing division.

Major subsidiaries like Dalkia or EDF Energy have implemented sustainable development charters, as well as sustainable development and social responsibility assessment procedures <sup>(4)</sup>. For example, a specific clause is included in their general terms and conditions of purchase relating to sustainable development (environmental and social clauses). EDF Renewables has set up a sustainable development charter for suppliers and subcontractors, includes environmental and social criteria in the qualification systems and audits of its key equipment suppliers (including turbines and solar panels), and develops corporate partnerships with its strategic suppliers in order to tackle the environmental and social challenges facing the industry.

The Group's Purchasing Department has implemented a Code of "Good Conduct for players in the contract process" for use by all those involved in the contractualisation process. It is backed by the Group's ethical values and combines strict ethical rules, principles of good sense and recommendations of good practices. The mandatory ethical undertaking signed by each buyer lists the principles to be complied with in relationships with current and prospective suppliers.

When implementing purchasing contracts, the Group Purchasing Department ensures that supplier supply chains are controlled, but also that financial balance is maintained with respect to suppliers, in particular through compliance with payment deadlines and pricing actions. The EDF group also offers its suppliers collaborative reverse factoring, granting them the possibility to pre-finance their invoices before the contractual due date, as soon as EDF issues the payment voucher <sup>(5)</sup>.

#### REVERSE FACTORING FIGURES

Collaborative reverse factoring	2018	2017	2016
No. of beneficiary suppliers	623	423	NP*
Amounts (€m)	744	522	148

\* Not provided

##### 3.3.3.4.2 Supplier relations

Listening to feedback at the heart of EDF's relationship with its suppliers. For a number of years, service provider surveys have been conducted by various Group entities to assess the level of satisfaction of service providers with their relationship with EDF.

In 2018, a follow-up audit reaffirmed the "Supplier Relations and Responsible Procurement" Label conferred on EDF in 2015 by the Ministry for the Economy, Médiation des Entreprises and the French Procurement Board (Conseil National des Achats - CNA). It rewards companies that have sustainable and balanced relationships with their suppliers <sup>(6)</sup>.

EDF provides its suppliers with a dedicated space on its corporate website, which:

- helps suppliers promote themselves and access "one-stop shop" spaces, dedicated to nuclear and hydraulic service providers as well as SMEs, where they can publish their product and service offerings;
- provides access to the Group Purchasing platform, a discussion tool for authorised suppliers, and to all reference tools and documents, accessible to all suppliers (such as the general terms and conditions of purchase for "small" and "simplified orders" and the GDPR conditions that apply to EDF).

In addition, the Group Purchasing Department provides suppliers and service providers with a toll-free number (08 00 97 10 79), which they can use to anonymously report any difficulties with their commercial relationship, which cannot be resolved during the usual monitoring of contractual relations.

Finally, EDF organises forums and meetings with suppliers and service providers to reinforce dialogue, promote local sourcing and the upskilling of local companies. Specific measures are also implemented in this respect, such as "CAP ENR" or the "One River, One Territory" workshops, promoting regional support. To further encourage discussion, the Group Purchasing Department organises themed Supplier Days three times a year, organised by the main purchasing divisions (generation and engineering, IT and telecommunications, the tertiary sector and services). In 2018, the topics of the Days were cyber-security and productivity partnerships.

In 2018, the Purchasing Department continued its transformation and launched the Procure to Pay (P2P) plan. By linking internal and external stakeholders, this initiative aims to optimise the supplier relationship, turnaround times and costs; for example, to further simplify the relationship with our suppliers by digitising exchanges.

(1) This refers to the three offshore wind projects confirmed by the President of the French Republic that EDF Renewables is developing with its partners Enbridge Inc. and WPD. Following negotiations, the launch of these three projects will create a national industrial sector for offshore wind energy, creating nearly 7,000 direct and indirect jobs. These projects will produce the equivalent electricity consumption of more than 2,000,000 people.

(2) 2017 information.

(3) See section 3.4 "Further Human Resources considerations".

(4) Sustainable Development and Social Responsibility (SDSR).

(5) EDF enables its suppliers to benefit from interest rates based on its own financial risk and credit standards.

(6) EDF was one of the first signatories of the Responsible Supplier Relations Charter.



In 2018, the Group Purchasing Department continued its proactive programme of “Productivity Partnerships” with suppliers, in a win-win approach. This focuses on improving contract performance through cooperation between EDF and its suppliers, and gives rise to “profit sharing”. Such profits may be financial (direct gains) or

organisational and technical (indirect gains, such as shortened construction times or avoided costs, for example).

Results are up:

	2018	2017	2016
Productivity gains (€m)	96.4	56.8	50.0

In 2017, EDF reinforced its monitoring mechanism for its suppliers, by setting up a conformity undertaking. Bidding on all tenders is conditional on signature of this

undertaking by all tenderers involved. The undertaking covers the following themes: corruption, money laundering, financing of terrorism, absence of conflicts of interest.

### 3.3.3.4.3 Assessment of suppliers

In 2018, the Group Purchasing Department strengthened its supplier ethics and compliance control system, launched in 2017. These Level 1 checks aim to protect EDF against risks of sanctions or reputation risks linked to illegal practices by our suppliers. In 2018, the Group Purchasing Department conducted over 3,100 checks, up from 1,200 in 2017.

Contracts contain clauses requiring suppliers to implement corrective action plans in the event of non-compliance or serious deviations from legal requirements, or from their sustainable development and social responsibility obligations.

Compliance with these commitments is primarily ensured by a mechanism prioritising assessments based on risk mapping covering EDF's 253 purchasing segments. This risk mapping was prepared taking the following criteria into account: societal (impact of the quantity of labour, impact of the qualification of labour, impact of relocation of labour); environmental (risk in the development and use of the product or service, risk of non recycling); economic (risk of corruption). After they have been scored, these segments are classified into four risk categories (16 major risk segments, 33 strong risk segments, 149 average risk segments, 55 low risk segments). At the end of 2017, fewer than 500 suppliers belonged to the major (1/3) and strong (2/3) risk categories, representing purchases of over €400,000.

In 2018, the EDF Group's Purchasing Department carried out 96 new “Sustainable Development – Social Responsibility” assessments divided between 43 questionnaires and 53 audits, based on the CSR risk mapping of the purchasing segmentation.

The Group's Purchasing Department uses Afnor's Acesia internet assessment and dialogue platform to send these questionnaires. The questionnaires completed by the supplier are systematically (and independently) checked by the Afnor teams. For its on-site audits, the Group Purchasing Department appoints external auditors. These tools make it possible for purchasers and suppliers to share an approach of continuous improvement in corporate social responsibility.

At the end of 2018, nearly 1,700 suppliers had been questioned by the ACESIA platform, and 770 had been assessed and controlled. The objective is to send a questionnaire to all suppliers with contracts for an amount of over €400,000, with a major or strong risk level.

The assessments carried out proved to be “satisfactory” or “acceptable with comments” in more than 80% of cases for audits and in nearly 40% of questionnaires.

The Group's Purchasing Department coordinates audits all over the world. In 2018, 60% of audits were carried out at supplier sites located in Europe (of which 72% in France), 25% in Asia and 15% in North Africa – Middle East. These audits have primarily made it possible to identify discrepancies in the following employment-related aspects: non-compliance with minimum wages, irregularities in the monitoring of working time, rest periods and overtime (mainly suppliers based in Asia, and one supplier in Europe); insufficient efforts to reduce gender pay gaps both in Asia and Europe; lack of industrial accident monitoring by subcontractors. For European suppliers, the main areas for improvement include the integration of the “duty of care” mechanism, which is still poorly developed locally, including at major groups. Progress is also expected in staff training content, which is still overly focused on “health and safety at work”, and in certification initiatives (ISO 9001 or

ISO 14001) which could be extended to the health and safety management system. Regarding environmental aspects, in both Europe and Asia, there are still discrepancies in waste sorting and disposal. In Asia, efforts still need to be taken regarding the regular monitoring of atmospheric emissions, effluent discharges, and the identification and storage of chemicals.

All suppliers concerned by “unsatisfactory” or “insufficient” assessments must send EDF an improvement action plan. They corrected major environmental or social gaps as soon as possible. For suppliers in major risk segments, the results of audits considered as “unsatisfactory” or “insufficient” may lead to the termination of the contract. In 2018, the Purchasing Department conducted an audit at a supplier in China, as a follow-up to an audit carried out in 2017, the results of which were insufficient. This second audit, deemed “acceptable, with comments”, made it possible to approve the action plan presented last year, and to clear most of the 30 observations made initially, primarily relating to health and safety, working time and compensation.

These audits also helped identify good practices and habits. For suppliers located in Asia, commitments have been made to improve employee safety and working conditions (free meals and transport, for example). In Europe, most management systems are certified and numerous initiatives have been rolled out to ramp up regional involvement, whether in terms of reducing or re-purposing waste (IT equipment donated to schools), protecting biodiversity, or developing employment areas.

In Group companies that do not use the Acesia platform, various assessment modalities are used. Dalkia periodically assesses suppliers based on an assessment grid including sustainable development issues. The results are shared with suppliers and improvement actions or audits are implemented if required. Edison uses a self-assessment platform that focuses on the ten principles of the Global Compact and is shared with other companies.

### 3.3.3.4.4 Coal and uranium supply chain

With regard to the responsible supply of coal, EDF was a founding member of Bettercoal, an initiative launched in 2011 that brought together energy providers, port institutions and coal-fired terminals. It is a mechanism aiming to promote CSR in the coal supply chain, particularly at mining sites, and to ensure that fundamental rights are respected.

The operational approach (audits and self-assessments) is based on a code that sets out ethical, corporate and environmental principles and provisions relevant to mining companies. This code takes overall performance requirements into account, including management systems, as well as performance in relation to:

- ethical practices and transparency;
- human rights, rights at work, and work-related matters, including health and safety;
- the environment.

The code, as well as a range of resources, are freely accessible on the Bettercoal website. Audit results are shared between members, in compliance with anti-trust principles.

With the coal purchasing contracts being taken over by JERA Trading (JERAT) from 2018, following the acquisition in 2017 of the Coal Trading and Freight business from EDF Trading, JERAT joined Bettercoal as a member. EDF, no longer manages purchasing contracts in direct cooperation with mining companies or the market. Thus, EDF did not renew its membership in 2018, preferring JERAT, now its supplier, to become a member, thus increasing Bettercoal's influence in Asia. EDF's coal supply is therefore still covered by Bettercoal, and EDF is still an active promoter of Bettercoal.

Concerning uranium, most deposits are found in Australia, the United States, Canada, Kazakhstan, South Africa and Russia. EDF obtains supplies over the long term under diversified contracts in terms of origin and suppliers, in the majority of the countries that produce uranium. In order to ensure good working, social and environmental conditions for the extraction and processing of the mineral, in 2011 EDF initiated a system of audits based on a method developed with the WNA (World Nuclear Association) consisting of a standardised framework and recognised by all players in the sector. This guide takes account of issues of human rights and fundamental freedoms: human rights, whistleblowing register, rights of indigenous peoples and freedom of association. The question of safety in the context of mining is given particular emphasis (safety of process, protection from radiation), and the environment is taken into account broadly, notably as regards matters relating to water, biodiversity, waste and the rehabilitation of sites after exploitation.

Every year, EDF carries out mine audits through internal means. The audit reports conclude with the main strengths, recommendations and suggestions (to date, no vulnerable areas have been noted). This information is included in the improvement plans drawn up by the mining companies and monitored by EDF. The most common recommendations and suggestions include but are not limited to health and safety, such as the wearing of personal protective equipment, displaying safety instructions, monitoring work-related accidents, radiological controls ("gloves not systematically worn", "goggles not worn when installing ventilation although there is a sign for this purpose", "service provider accidents are monitored but not included in the site's overall indicators" "contamination of small objects like glasses, etc. not verified", and comments relating to CO<sub>2</sub> monitoring and proposals relating to workplace well-being (cleaning the locker rooms, "daylight" lamps in the underground refuge stations, etc.) EDF conducted two mine audits in 2018.

The clauses authorising the completion of audits and setting out EDF's expectations in terms of enforcement of the fundamental rights and main international standards by suppliers and sub-contractors have progressively been added to contracts signed by EDF.

### 3.3.3.5 EDF actions to support access to energy

Today, a little under one billion people in the world don't have access to electricity, 50% of whom live in sub-Saharan Africa. Access to electricity is a vector for progress development, education and security. This has been clearly reaffirmed in the United Nations sustainable development objectives. EDF is continuing its efforts in this area, and has updated its models beyond the actions carried out for several years by its decentralised service subsidiaries. Technological advances, the cost of equipment and local economic models open up new possibilities for action and mass implementation. EDF is developing new business models that combine its traditional know-how with technological and financial innovation.

EDF and Off Grid Electric are partners in the distribution of off-grid solar power in Africa. They install and maintain solar kits designed for rural and peri-urban households. The joint venture in Côte d'Ivoire, ZECI, aims to secure a 20% market share by 2020. In early 2018, both companies, associated with Ghanaian manufacturing partner CH Group, launched a new off-grid solar kit offering on the Ghanaian market, led by the dedicated joint venture: ZEGHA. This offer confirms off-grid solutions as a major development area for EDF in Africa (see section 1.4.5.3.9 "Off-Grid energy").

Furthermore, most EDF projects, especially those in Africa and Asia, are designed to improve access to electricity on a local, regional and national scale. At the end of 2018, EDF signed binding and final agreements relating to the construction of hydroelectric facilities in Nachtigal in Cameroon. This 420MW hydroelectric power plant is the cornerstone of the Cameroon strategic plan for the development of the electricity sector, and Nachtigal is a national priority for securing Cameroon's electricity system.

In French Guiana, EDF is committed to the electrification programme in Haut-Maroni, with the construction of hybrid generating plants generally combining a photovoltaic system, storage batteries and diesel engines (see section 1.4.4.3 "Island energy systems").

## 3.4 FURTHER HUMAN RESOURCES CONSIDERATIONS

In addition to the second Corporate Social Responsibility goal described above (see section 3.2.2), the human dimension is increasingly at the heart of EDF's strategy, and is key factor in the Group's performance.

To meet its industrial challenges, EDF remains a socially-responsible and engaged employer, a leader in terms of the professionalism and involvement of its employees, by developing their skills and the diversity of their profiles. The Group also sets an example in terms of social innovation by promoting a participative approach and making it easier to share good practices, in order to ensure long-term performance.

Everywhere that the Group operates, the health and safety of its own employees and its sub-contractors' employees is an absolute priority. Both in France and abroad, the EDF group acts in accordance with its values, requiring all of its staff to engage in ethical practices, integrity and respect for fundamental rights.

The new CSR agreement was signed in June 2018 by all Group trade unions, as well as two international federations (IndustriAll and PSI). This is now a framework agreement binding on all Group employees and subcontractors. It defines key principles in relation to:

- respect and integrity;
- employee development;
- dialogue and consultation;
- support for communities and impacts on regions.

### 3.4.1 PROFESSIONAL EXCELLENCE, EMPLOYMENT AND SKILL DEVELOPMENT

#### 3.4.1.1 Group workforce in 2018

The EDF group's consolidated workforce totalled 165,790 employees at 31 December 2018, including five companies with a workforce of over 10,000 employees: EDF (65,368), Enedis (38,691), Framatome (14,545), Dalkia (16,017) and EDF Energy (13,460).

Excluding the effects of consolidation - and in particular the Framatome integration on 1 January 2018 - this figure was up 0.5% from 2017, against a backdrop of energy transition, technological developments and, in France, intensifying competition.

#### The workforce in France

In France, Group companies employed 131,409 people <sup>(1)</sup> at 31 December 2018, stable over the last three years, excluding the impact of changes to rules for the counting of employees at Group companies in each region <sup>(2)</sup>.

This relative stability in workforce numbers actually reflects a contrasting trend among EDF group companies in France, some of which increased substantially in order to support their growth (an increase of 9.9% for EDF Renewables, 4.1% for Framatome, 10.8% for Citelum, and 4% for SOCODEI), and others that needed to reduce their workforce in line with a decline in business, such as EDF (down 2.4%).

With 65,163 employees in France as at 31 December 2018, EDF is continuing the transformation launched in 2016 in order to successfully complete its development projects (New Nuclear builds, renewable energy, international development, energy supply and service offers, etc.) and adapt its business models. These changes are gradually resulting in a decrease in the workforce (down 4.8% since the end of 2016) and primarily target:

- sales, as a result of losses in market share;
- fossil fuel-fired (thermal generation) plants, with the shutdown of the generation units concerned;
- technical incubators, which are in sharp decline after the peak in new hires to cope with retirements;
- the productivity measures undertaken in order to simplify and digitise processes;
- the optimisation of support functions;
- the new management model for real estate activities.

#### International Group workforces (consolidated subsidiaries)

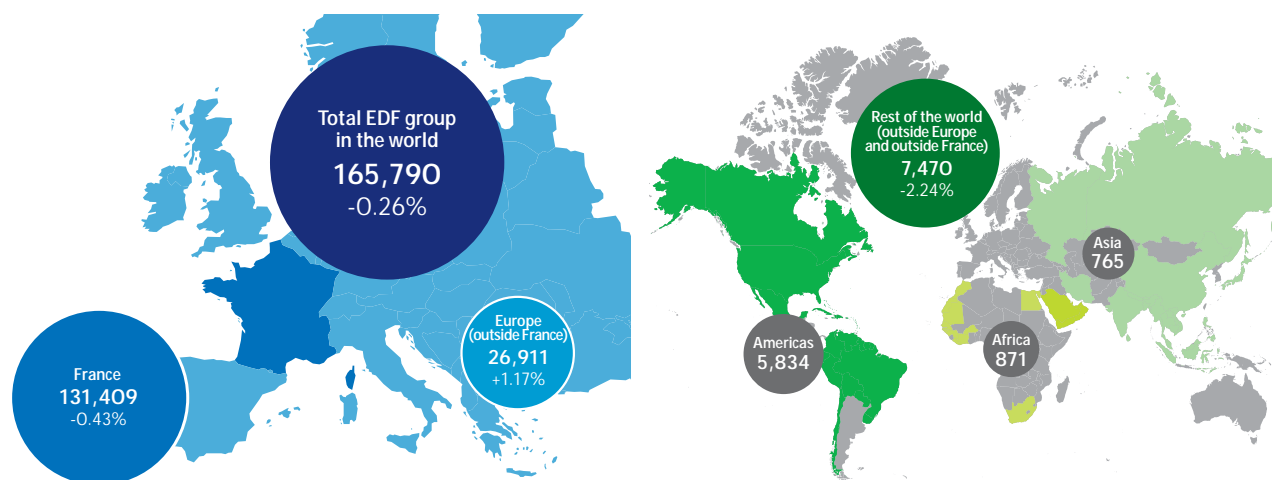
The Group has nearly 34,500 employees worldwide, up 0.6% compared to 2017 year-end, with most people based in Europe (27,000 employees in Europe, excluding France). This increase in the global workforce was mainly driven by the growth of EDF Renewables (particularly in Germany, the United Kingdom, the Americas and China) as well as Edison and EDF Luminus in Europe.

The table below presents a breakdown of the workforce of the international subsidiaries and shareholdings included in the EDF group consolidation scope, as well as the change in headcount since 2017 year-end.

(1) Changes in the EDF group's headcount in France in 2017 and 2018 takes into account Framatome staff numbers known at 31/12/2017, i.e. 8,521 employees.

(2) As from the 2018 Registration Document, a change to the EDIFIS information system has made it possible to count employees in the country in which they operate, rather than the country where the Company's registered office is located. The figures and % change presented in the rest of the sections take into account this new employee counting method.

## Worldwide workforce of the EDF Group at 31 December 2018



## France

EDF SA: 65,163 / -2.43%  
 ENEDIS: 38,691 / -0.51%  
 DALKIA: 13,745 / +5.12%  
 FRAMATOME: 8,872 / +4.12%  
 EDF RENEWABLES: 1,541 / +9.91%  
 ELECTRICITÉ DE STRASBOURG: 1,107 / -0.54%  
 CHAM: 890 / +3.85%  
 CITELUM: 554 / +10.80%  
 GROUPE PEI: 431 / +0.94%  
 SOCODEI: 287 / +3.99%  
 G2S: 58 / -6.45%  
 OTHERS: 70 / +6.06%

**Total: 131,409 / -0.43%**

## Europe (outside France)

EDF ENERGY: 13,440 / -3.70%  
 EDISON: 4,637 / +9.86%  
 FRAMATOME: 3,259 / +1.18%  
 EDF LUMINUS: 2,048 / +5.57%  
 DALKIA: 1,649 / +6.94%  
 EDF RENEWABLES: 842 / +11.97%  
 CITELUM: 572 / +4.00%  
 EDF TRADING: 396 / -4.81%  
 EDF SA: 68 / -

**Total: 26,911 / +1.17%**

## Rest of the world

EDF RENEWABLES: 1,470 / +10.69%  
 CITELUM: 1,348 / -8.98%  
 FRAMATOME: 2,414 / +0.58%  
 EDISON: 735 / -22.06%  
 DALKIA\*: 623 / -25.66%  
 EDF TRADING\*: 423 / +25.89%  
 CHINA HOLDING CO: 140 / +5.26%  
 EDF SA: 137 / -  
 EDF NORTE FLUMINENSE: 101\* / -3.81%  
 MECO: 77\* / -  
 EDF LUMINUS: 2 / -

**Total: 7,470 / -2.24%**

## Asia

EDF RENEWABLES: 104  
 CITELUM: 152  
 FRAMATOME: 102  
 DALKIA: 102  
 EDF TRADING: 9  
 CHINA HOLDING CO: 140  
 EDF SA: 77  
 MECO: 77  
 EDF LUMINUS: 2

**Total: 765**

## Americas

EDF RENEWABLES: 1,268  
 CITELUM: 1,190  
 FRAMATOME: 2,312  
 DALKIA: 521  
 EDF TRADING: 414  
 EDF SA: 28  
 EDF NORTE FLUMINENSE: 101

**Total: 5,834**

## Africa

EDF RENEWABLES: 98  
 CITELUM: 6  
 EDISON: 735  
 EDF SA: 32

**Total: 871**

\* Dalkia: 102 employees in Russia  
 EDF Trading: 414 employees in United States  
 EDF Norte Fluminense: 101 employees in Brazil  
 Mecos: 77 employees in Vietnam

The table below shows the breakdown of the Group's global workforce as at 31 December 2018:

	2018	Change
France	131,409	-0.43%
Europe (excl. France)	26,911	+1.17%
Rest of World	7,470	-2.24%
<b>TOTAL EDF GROUP IN THE WORLD</b>	<b>165,790</b>	<b>-0.26%</b>

### 3.4.1.2 Recruitment levels in 2018

The EDF group has a dynamic recruitment policy, with over 9,800 hires in 2018.

EDF has re-focused its employment policy since 2016 and intends to prioritise internal mobility in order to optimise existing resources and develop the career paths of its employees. Recruitment is now focused first and foremost on technical, hard-to-fill, rare or developing professions. The technical and IT/digital fields account for the bulk of new hires.

#### The EDF group's attractiveness remained at a high level in 2018

Since 2016, the focus for recruitment has been on internal mobility with better-classified internal short lists to manage declines in certain business lines. In 2018, a major shift took place, in order to go further and promote mobility between Group companies. EDF hired over 1,172 people under permanent contracts and 3,400 under new work-study contracts during the year.

Around 40% of all external new hires were for manager positions. One third of all new hires were under work-study contracts, stable over the last three years, reflecting EDF's strong commitment to the work-study system (see section 3.2.2.3.2 "Work-study programmes: a solid history and a commitment for the future").

Today, EDF is facing a global decline in its appeal as an employer (particularly in the nuclear sector). Our competitors are increasingly active, looking for the same profiles as us: those with technical and digital training. EDF remains the leading energy company for engineering students, however, it has a more modest ranking amongst students from management schools.

EDF relies on its employer brand, which is constantly innovating, in order to enhance the EDF group's attractiveness:

- raise the EDF group's digital image in terms of recruitment through new digital projects, an innovative hiring website and a simple and relevant applicant pathway;
- promote our employment, internship and work-study initiatives.

In 2018, EDF structurally overhauled its hiring process, which had previously been 100% outsourced. A team of recruiters has been formed to meet the challenges of the job market and the aspirations of candidates who, for two years, have had a choice between several offers and employers. The re-internalisation of sourcing and the use of agile methods delivered impressive initial results in the second half of 2018: recruitment quality and reduction in candidate search times.

Finally, internal sourcing was once again a resounding success at the entities. Operating as a genuine internal head-hunting firm, this system makes it possible to source candidates from all of the Group's departments in France (EDF and subsidiaries). The establishment of internal sourcing has had the effect of rebuilding expertise in the area of candidate search and recruitment, which had been totally outsourced since 2001.

### 3.4.1.3 Skills development: preparing for the future

EDF relies on the development of its employees' skills to support its industrial project. The professionalism of the Group's men and women is a decisive factor in providing its public service missions, guaranteeing the safety and performance of its facilities, developing customer satisfaction and making EDF a global leader in energy and low-carbon growth.

The Group faces many challenges and EDF must adapt to a complex, fast-moving industrial and technological environment. The CAP 2030 strategy continues to provide guidelines for the Group to transform and take up these challenges, through such means as the extension of nuclear power plant lifespans, successful next-generation nuclear power plants, the growth of renewable energies and the rapid expansion of energy services and digital offers.

The success of these transformations depends, amongst other things, on the Human Ambition that they underlie. This means not only having the right skills in the right

place at the right time, but also improving the effectiveness of investment in training, *via* increasingly diversified teaching methods and by paying greater attention to the impact of the training provided.

In 2018, the Group allocated a budget of €620 million to training its employees.

The percentage of employees having received training by the end of 2018 was 83% [\*].

In this context, 2018 was marked by the implementation of several key transformations in training:

- in 2018, EDF continued to implement the "MyHR" transformation plan, which aims to simplify and standardise HR processes (training, mobility/hiring, interviews, compensation, jobs/skills, talent and managers), by building on an updated HR Information System (HRIS), which will be gradually deployed in each area until the end of 2020.

For each area, a participatory approach focusing on user needs was developed, covering both process redesign aspects and the tool's configuration.

Training and mobility/hiring have been given priority, and are currently in the design and configuration phase. With regard to training, the project's goal is to more effectively anticipate needs, simplify management of "training" investments, and make employees active participants in their professional development. MyHR will also streamline the administrative management of training in order to improve the user experience (employees, managers and HR division), by reducing training request response times and automating repetitive tasks.

The challenges in terms of mobility/recruitment include promoting the fluidity and transparency of the internal job market within the Group in France, by focusing on internal mobility, without side-lining external hiring. The objective is to ensure that the Company's skills requirements and its employees' professional aspirations match up;

- the "interviews" portion covers all face-to-face and digital discussions about employee activities, performance, skills development and careers. The modernisation and efficiency of interviews through the diversification of their management are the primary challenges of this updated process. An overhaul of the interview process began in September;
- skills Academies, which are still responsible for adapting and optimising the training provided by the Group, continue to develop. 2018 marked the first year in the development of the Academies, with the introduction of a new charter setting out the new areas in which the Academies need to ramp up their efforts. On the top of the list: encouraging professional development in the workplace, and adapting training content in order to more efficiently handle those retraining in new professions. A new monitoring and steering system has also been set up this year: new indicators and dashboard, a new method for reporting to the Steering Committee for the overall system. Efforts carried out in previous years to control and optimise the training offer and improve the management of external training were stepped up, as was the number of training hours provided, under the guidance of a project manager. The Academies maintained their commitment to improving training performance;
- digital training continues to be enhanced, with the constant goal of reaching more learners more easily and safely via increasingly modern and shared distance learning courses (virtual and augmented reality, simulators, MOOC, serious games, *e-learning modules*, etc.). In 2018, nearly 33,600 EDF employees completed a self-guided e-learning module on ecampus;
- the quality of training (measure based on the collective agreement of 28 October 2016 for Skills at EDF for 2017-2019) was ramped up in 2018: by better assessing its impact, the diversification of learning methods, in particular through the digitalisation of training, is encouraged: a 15% increase in e-training in 2018 over 2017, 26% more self-guided courses with a final assessment, as well as two MOOCs with a quiz, e-learning, forums, videos and documents, both of which attracted 435 and 730 employees respectively;

[\*] IND Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4).



### 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

#### Further human resources considerations

- the internal training bodies of the various Group entities, in cooperation with the business lines, continue to systematically apply the level 1 assessment (measurement of trainee satisfaction) and have adopted level 3 or 4 assessment methodologies (impact of training on work situation or measurement of its contribution to the improvement of operational performance) in order to meet the target of having 30% of training programmes assessed at level 3 or 4; in addition, at Enedis, Dalkia and EDF, companies are listed in the data dock system, a national quality referencing system for training organisations (the single referencing applies to all of EDF's internal bodies);
- the Saclay Group Campus, opened in August 2016, continued its ramp-up in 2018 with almost 1,500 courses at the Campus in 2018;
- this campus, which seeks to learn from its environment (EDF research teams, prestigious schools and universities, businesses at the cutting edge in energy, environmental issues and new technologies), has shown what a rich place it is for learning and innovation, thanks to the new spaces designed to disrupt habits and encourage the use of new teaching methods. For example, a show-room demonstrates the innovation achieved in training at the Group's various entities and subsidiaries. The Learning Factory offers Group instructors creativity rooms and workshops to explore innovative tools for education design and leadership, welcoming more than 1,800 internal and external visitors in 2018.

The GMU (Université Groupe Management – UGM), created in 2010, is intended to train 29,000 Group managers, executives and talents. It is one of the 19 major global group corporate universities with international CLIP (Corporate Learning Improvement Process) accreditation, which places it among the best corporate universities.

The GMU contributes to the EDF group's integration and internationalisation. It helps to develop the Group's managers' skills in terms of *leadership*, management, strategy and energy market fundamentals using proven training courses, and modern teaching tools (e-learning, multi-modal *coaching*, *joint* development). Today, the GMU provides professional training for *managers* in practically all the geographical areas where the Group operates: Asia-Pacific, United Kingdom, Italy, France, Central Europe and America.

In 2017, the GMU started to expand its scope of intervention. An inter-company benchmark was produced with Thales and Renault on the topic of "Supporting the improvement of project management skills", and Project Management Institute (PMI) certification tests were carried out.

This was continued in 2018 with interviews of the Saclay project management team which brought together over 200 project managers and directors from EDF and other companies (Thalès, Orange, Renault), and the certification of over 40 project managers. The project management training offer has been expanded, with the launch of new offers for junior and senior project managers.

"La Chocolaterie", an internal incubator, has welcomed over 10,000 people since its creation in 2016. It has contributed to the deployment of over 100 projects thanks to innovative methods such as Design Thinking and the development of business projects.

One of the priorities for the years to come is to support EDF's managerial transformation. To this end, the GMU has launched several pilot projects with entities in order to support the Unit Director and the Management Committee in assessing their management situation and establishing the managerial dimension of their transformation plan, and to provide them with a support system. Eight projects were supported by the GMU in 2018, of which, six for operational entities. Training was also put in place for entity directors and members of Executive Management. The GMU's know-how will thus be able to support the transformation of the entire management line.

The GMU also expanded its training offer for Group executives, by developing a training programme for new Unit Directors and by restructuring its "learning expedition" offer for executives.

The Group's training programme in the field of energy and strategy was renewed in 2018 and will be expanded in 2019 with the implementation of training in European, national and local stakeholder issues for the Group's executives.

For managers, the GMU has built up a reference training offer with the Group's business lines for around fifty training courses, more than half of which are delivered digitally. The digitalisation of training continues: all new training courses developed by the GMU now include an essential digital component.

The GMU offers fifty or so courses and trains more than 1,000 managers on site annually. The GMU also offers programmes aimed at Group talent and executives.

In 2018, approximately 1,000 executive and talents took GMU courses.

#### 3.4.1.4 Appropriate career management

##### Management of talent and executives

The EDF group has developed a flagship talent-spotting system. The "Talents" policy of the Group is being reviewed by its subsidiaries and the management of manager career paths is getting special attention. "People reviews" by line of business and by geographical area are organised in order to ensure the development of executives' careers and their appointment to appropriate positions.

Since 2018, new talent identification systems based on individual initiative are also being trialled, in a digital and highly-inclusive approach.

##### Employee career path management

The EDF group is continuing the roll-out of its employee career support policy:

- the employee career support offer (described in the EDF 2016-2019 skills agreement) is accessible to all Group employees on the "Vivre EDF online" intranet, and more precisely via a "My career, my training" ("Mon parcours Ma formation") space including:
  - access to digital services, access to a professional career consultant, tools and advice to prepare for annual reviews and dates of job fairs. In fact, employees looking for a change are invited to fairs organised in the regions, where they meet recruiters from all of the Group's business lines and career advisors who prepare them for the next stage in their professional journey (CVs, interviews, pitches, mobility tools, external careers, etc.). In 2018, an e-mobility forum in the Occitanie region took a fresh look at how these fairs are run, which was met with great success;
  - in 2018, career prospects were extended with, firstly, a memorandum on mobility in the France group <sup>(1)</sup> which sets out the contractual terms of mobility between companies with different statuses within the Group and secondly, the MyJob project, which has made it possible to match employees, whose business activity is in decline or being eliminated, with positions in call-related departments. The MyJob project also gave rise to the IT pilot project, which made it possible to create two work-study training programmes for employees wishing to become data scientists or data analysts;
  - finally, a trial has been launched to promote skills sponsorship at the end of employees' careers: they have the option to work with a non-profit in their last position prior to retirement.

2018 was marked by significant changes at EDF. A project based on employees' cross-functional skills has been developed, enabling redeployed employees to find a job that suits them (MyJob project). During the year, 1,266 inter-departmental transfers took place, compared to 1,169 a year earlier. Of which 67.6% included a change in professional category.

(1) Memorandum of the Group Human Resources Director dated 16 July 2018.

### 3.4.2 PROVIDING THE CONDITIONS FOR WELL-BEING: ORGANISATION AND QUALITY OF WORKING LIFE

#### Quality of working life

As part of its CAP 2030 strategy, the EDF group is pursuing its plan to transform and improve work organisation, setting the following goals: encouraging accountability, simplifying operating methods, and promoting innovation and the use of digital technology, with a focus on employee health and safety. Various initiatives have been developed within the Group, all of which help improve organisation, working conditions and quality of life at work.

A number of Group companies have set up remote working arrangements. In 2018, EDF Renewables signed a teleworking agreement, while Enedis signed an agreement on remote work: the EDF Renewables agreement covers both regular and occasional telework from home, with 90% of positions being eligible for this working arrangement. The Enedis agreement covers regular and occasional telework at home or in an external co-working space, and remote work at an off-site Enedis location. At the end of 2018, EDF had 6,000 teleworkers regularly working from home, and 20,000 employees with the option to occasionally work outside their usual workplace.

Furthermore, a range of initiatives was rolled out in 2018 to develop more autonomous working arrangements:

- trials were launched at EDF and Enedis with several dozen pilot teams, who are changing their organisation and operations by placing employee trust and autonomy at the heart of their work.
- an approach aimed at developing more collaborative and empowering ways of managing business activities has been launched at some EDF entities (with the use of visual management, collective performance reviews, etc.)
- the practice of Team Projects co-developed with team members continues at EDF under the "Work organisation and Quality of life at work" agreement.

Changes in working arrangements and methods are based on the existence of different practices within networks and communities. In 2018, two new communities were formed: an online community with the hashtag #TousNumériques, a veritable forum for discussion and sharing information on the EDF group's digital transformation, as well as a collective called "Transformation", aiming to support the transformation efforts carried out at Group entities.

The practice of connecting to digital tools, and in particular the implementation of the "right to disconnect", have resulted in a series of initiatives designed to help preserve employees' health, ensure work-life balance, comply with rest period requirements and improve efficiency at work. In 2018, Enedis signed a specific agreement in this area, developing a well-equipped, pedagogical approach. At EDF, a series of communications have helped promote healthy use of digital tools by avoiding over-use, digital overloading and "infobesity" (information overload) (see section 3.4.1.3 "Skills development: preparing for the future").

More generally, in relation to the prevention of Psychosocial Risks (PSRs), (also see "Guaranteeing the best health & safety conditions at work for all" in section 3.2.2.1.1) EDF takes primary preventative measures (study of the socio-organisational and human impact of reorganisation, collective projects on teamwork, reduced travel, right to disconnect, etc.) and the multi-disciplinary groups (MDGs) created in 2010 constitute a local resource. In addition, support, training and digital resources are made available to all members of management. Enedis has also set up an MDG system and is developing specific transformation support tools. The assessment of PSRs, which is based on the cross-referencing of several types of data, will also be based on some of the MY EDF questions, from 2019 (24 out of 50 now adopted), which will make it possible to cover all Group employees, and prioritise actions when difficulties arise. Furthermore, the main risk factors applied are those generally used by specialised agencies to improve working conditions (INRS, ANACT). This new approach has helped raise awareness within the Management Committees.

As regards secondary and tertiary prevention, a number of mechanisms can be used: an anonymous toll-free "life at work" hotline, support for teams under stress and assistance with change management.

#### Organisation and working hours

In order to meet the needs relating to each company's business and particularly to ensure continuous operation, personnel may be required to provide a continuous service 365 days-a-year or be on call outside of regular working hours.

These arrangements are adapted over time according to the changing circumstances at each company, legislation and new authorised work organisation practices, particularly communications technology developments.

For companies based in France, the duration of the working week in France is 35 hours, with services available for a minimum of five days.

A category-wide agreement regarding the organisation of managers' working time at EDF was signed in 2016. This agreement introduces fixed numbers of working days, with a standard number of 209 days. It accordingly aims to develop the autonomy of managers in the organisation of their working time, to increase the overall time worked by managers, to support simplification and accountability measures, and to meet their expectations in terms of changes to working methods, flexible organisation and quality of life.

At the end of 2018, over 80% of managers had opted for a fixed number of working days and the number of days worked has increased markedly.

In more general terms, in 2017, through the overwhelming selection of the fixed number of working days option, and the constantly increasing number of employees who opt for teleworking and the introduction of team projects, EDF's desire for more effective and innovative team-working and management methods has been demonstrated, with benefits for both company performance and employee autonomy and work-life balance.

With regard to the negotiation of agreements on working time, following on the PEI in 2016, 2017 has seen several subsidiaries in France negotiate an agreement to introduce the fixed number of working days option, including G2S, DKLNG and SOWEE.

At EDF, 2 Business Departments have re-negotiated their local working time agreements (the Shared Services Department and the Customer Department), to adapt the organisation of work to their new priorities.

At Enedis, there were also renegotiations of local agreements to make the necessary adaptations to the organisation project of the company.

### 3.4.3 COMPENSATION AND SOCIAL WELFARE: AN ATTRACTIVE EMPLOYER

Total compensation is a key component in recognising the contribution of every staff member to the Group's performance. It contributes to employee engagement, increases the loyalty of talent and adds to the Group's attractiveness.

Accordingly, the Group is committed to offering its employees fair and competitive compensation, while paying great attention to the quality and level of social welfare it proposes, particularly in terms of cover against the major risks of life. The Group accordingly formally introduced a total compensation and fringe benefits policy in 2013. It covers all employees of the main companies controlled by the Group.

Since 2014, the Group's main foreign companies' compensation and social welfare systems have been reviewed based on this policy. Following each review carried out by the Group Human Resources Division, an action plan is jointly drawn up with the subsidiary and its implementation is monitored during subsequent reviews.

At the same time, a network of Compensation and Fringe Benefits managers was set up to back up the scheme, particularly in order to present the policy and share good practices.

# 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

## Further human resources considerations

### 3.4.3.1 A fair and competitive global compensation policy

Total compensation policy is guided by four principles that are reviewed by the Group Human Resources Division:

- competitiveness with the external market;
- consistency and internal equity;
- financial sustainability;
- communication.

It is based on fixed compensation and individual and/or collective variable compensation which serves to recognise the achievement of objectives, connected to the companies' economic results. There is a direct and visible link between the employee's contribution and the related compensation.

The Group's companies guarantee the meeting of the minimum legal or professional requirements in each country and the absence of discrimination.

In the "communication" section, each employee receives information on the compensation rules and arrangements with the utmost transparency in accordance with the principles detailed above. Each EDF group employee must have visibility on their total compensation. Accordingly, in France, EDF, Dalkia and Enedis have offered each of their employees a full individual review of their annual compensation and its components.

#### Variable compensation plans to boost performance

Within the Group, most employees have individual or collective performance-based variable compensation. The terms and conditions of this variable compensation differ from one Group company to another, based on historical agreements and the applicable regulations.

At EDF Energy (in the United Kingdom), variable compensation for individual performance applies to 20% of employees, however more than half of EDF Energy's employees receive a bonus for their collective performance.

At Dalkia (France) performance-based variable compensation was reviewed and recognises individual and collective performance for managers.

At Edison (Italy), all employees, excluding executives, benefit from collective performance-based compensation schemes, based on profitability and productivity criteria (*Premio di Risultato & Premio di Produttività*).

At EDF Luminus (Belgium), managers and most non-managers are eligible for individual and collective performance-based compensation schemes.

The China Division also introduced performance-based individual variable compensation for employees based in Beijing, designed to stimulate and recognise performance.

At EDF, all employees may receive performance-related variable compensation.

For projects and their management, compensation is based on collective performance alone. In 2017, the variable share represented 2% of average basic pay.

For managers the average figure is 8% of the annual salary, so the Company is on a par with other major French companies.

For managers, the variable share is based on both individual and collective targets whose weighting increases with the position within the Company.

EDF and Enedis pay special attention to the professional training of their managers on issues of compensation.

In France, EDF and Enedis employees benefit from a profit-sharing scheme, introduced more than 20 years ago in the case of EDF and for Enedis when it became a subsidiary. Most of the Group's European subsidiaries have similar schemes. EDF and Enedis employees can choose either to receive payment and/or to invest it into either the Group Corporate Savings Plan or the Group Collective Retirement Saving Plan (see below). In a restrictive economic environment, the policy of an employer contribution for sums invested has been maintained

The EDF and Enedis profit-sharing agreements are three-yearly and require the profit-sharing amount payable to be set based on the meeting of national objectives

reflecting the different components of the companies' performances (economic, business lines, social and environmental).

The most recent EDF three-year agreement (signed in 2016 for the 2017-2019 period) aims to better link profit sharing to EDF performance. It includes the following five national performance criteria: development of Group cash flow, which is more directly linked to employee activity than EBITDA, electricity generation, customer satisfaction, *online -health* and safety training of employees and a sustainable development/digital criterion (reduction of printed paper and increase in teleconferencing).

#### A comprehensive employee savings policy

##### The Group corporate savings plan

It is open to employees of EDF and of the Group's French companies in which EDF owns directly or indirectly at least 40% of the share capital and which have signed up for the Group Corporate Savings Plan.

Five varied mutual funds, including a socially-responsible investment fund, a solidarity mutual fund and the "EDF Share" fund, are open to subscriptions.

The EDF group Corporate Savings Plan totalled €4.7 billion at the end of 2018.

Profit-sharing, as well as individual payments and transfers from the Time Savings Accounts that employees make to the Group Corporate Savings Plan, are matched by the Company under conditions negotiated within each company.

##### Collective Retirement Savings Plan

The EDF group Collective Retirement Savings Plan is open to employees of EDF and of the Group's French companies in which EDF owns directly or indirectly at least 40% of the share capital which have signed up for the Collective Retirement Savings Plan.

Two mutual investment funds are offered to employees: a solidarity mutual fund and the "Cap Horizons" umbrella fund, offering targeted management of the savings invested depending on retirement age.

The EDF group's Collective Retirement Savings Plan totalled approximately €819 million at the end of 2018. Profit-sharing, as well as individual payments and transfers from the Time Savings Account that employees make to the Collective Retirement Savings Plan, are matched by the Company under conditions negotiated within each company.

##### Time Savings Account

Time Savings Account agreements have been signed within the Group's principal French subsidiaries, specifically EDF and Enedis.

As at 31 December 2018, the total number of hours saved in the time savings account by EDF employees was valued at €754.8 million, and at €209 million for Enedis employees. This negotiated scheme enables employees who want to take leave to receive compensation corresponding to the saved time. It is also possible to monetise the time saved based on the current Time Savings Account agreement or make transfers to the Group Corporate Savings Account and the Collective Retirement Savings Plan.

#### Employee shareholding

On 31 December 2018, current and former employees of the EDF group held a total of 34,679,546 EDF shares, *i.e.*, 1.15% of the share capital, rounded up to 1.2%. This number includes 30,453,101 shares (representing 1.01% of the capital) based on the definition of employee shareholdings under Article L. 225-102 of the French Commercial Code (shares held by EDF's or EDF group's employees and former employees through the "Actions EDF" FCPE). This number includes, secondly, nearly 4,226,445 shares, *i.e.* 0.14% of capital, held directly or indirectly, without a non-transferability period or after the non-transferability periods, by current or former employee shareholders. Most of the shares held by employees are held via the Group Corporate Savings Plan.

In accordance with the law, the dilution of the State's stake in the EDF capital triggers the obligation to carry out an offer of EDF shares reserved for employees (ORS), and, under certain conditions, for retired and former employees.

### 3.4.3.2 Social welfare policy

The Group fringe benefits policy is guided by three principles:

- a principle of responsibility, which covers three requirements:
  - guaranteed social cover, in terms of health, welfare and pensions;
  - non-discrimination (access to health coverage must not be dependent on the employee's state of health);
  - regulatory compliance;
- a principle of balance between competitiveness and sustainability:
  - the combined level of compensation and fringe benefits meets the need for the Group's companies to be attractive on their local markets;
  - fringe benefits must be able to be maintained over time and accordingly be financially sustainable in the long-term both for employees and the employer;
- a principle of appropriation by beneficiaries:
  - employees are informed of the content of the fringe benefits in order to make it easier for them to understand and actually receive them.

### Status of employees in the Electricity & Gas Industries (EGI): a specific social welfare plan

In France, the vast majority of the Group's workforce are employed by companies descended from "historic operators" (EDF, Enedis, PEI) which have electricity and gas industry or "EGI" status. Fringe benefits at these "historic operators" were mainly introduced via the Law of 8 April 1946 organising the monopoly on electrical generation and distribution electricity and via the maintaining of a special social security plan linked to the professional status of employees in the EGI branch (Decree of 22 June 1946). Today still, the main fringe benefits that set EDF apart from other major groups are based on these legislative or regulatory texts: special pension plan, special health plan for, firstly, incapacity for work and, secondly, healthcare costs, including an additional mandatory part also covering retired employees, centralised social activities in the professional branch, financed by companies in the Sector and managed independently by the unions.

In addition to these schemes, which have remained very stable over the last few decades, is a benefit in kind historically based on a company decision which covers gas and electricity supplied by historic operators to employees and is maintained for retired employees.

Significant changes have been made over the last decade:

- EDF's IPO and the application of international accounting standards required the valuation and provisioning of commitments to retired employees. The maintaining of the industry's special pension and healthcare cost plans faced with this requirement was made possible by the overhaul of their financing: affiliation with standard mandatory plans for pensions and strengthening of affiliation between current and retired employee plans for complementary health insurance cover;
- the special pension plan has also, like other public sector special pension plans, been increasingly affected by efforts to reform mandatory pension plans launched by successive governments. Except for the pension calculation method (specific rate, applied to a salary at the end of career, with a reduced base), the main parameters (retirement age, required contribution period, etc.) are currently being brought into line with the standard compulsory plan; a number of other less wide-ranging rules remain specific. The definition of active service, enabling earlier retirements, has also been revised and how it is taken into account significantly overhauled for newly-hired employees, via the creation of a Retirement Days Savings Account.

Finally, unlike other historic benefits, the level of employee health, disability and life cover appeared significantly less generous than that offered by other major groups, which led from 2008 to the introduction, in agreement with the professional branch, of complementary cover in these three areas.

### Other Group employees' social welfare

The Group's other employees in France are covered by several collective bargaining agreements and can have fringe benefits provided by their own employer. Each employer must therefore ensure that the benefits provided are consistent with the Group policy presented above. This matter is regularly discussed with the Group's Human Resources Department.

The same applies to Group companies based outside France, for which the regulatory context specific to each country should also be taken into account. In particular, all entities must ensure that pension contracts cover at least one year's salary.

Some of the Group's subsidiaries have set up a "flexible benefits" policy, enabling each employee to adjust the level of social security coverage to their current requirements. This policy has been rolled out in Italy, Belgium and the United Kingdom. At EDF Energy, for example, employees have a range of choices: they may choose between receiving cash bonuses or allocating them to special insurance schemes (in the event of serious illness, the family receives a cash amount); or they may take out supplementary dental cover, or take advantage of discount cards for sports clubs, or purchase vouchers for children.

In all three countries, employees can use a web application to make their choices, and change them throughout their time at the company.

## 3.4.4 AN EMPLOYER ENGAGED ALONGSIDE ITS STAKEHOLDERS

The EDF group acts responsibly to promote diversity and respect for human rights alongside its stakeholders: employees, sub-contractors and employee representatives. Its work also affects the general population as a contributor to the development of the regions in which it operates.

### 3.4.4.1 Responsible sub-contracting: a reality

EDF's sub-contracting policy focuses on three major themes:

- providing service providers with visibility and having long-term supply partners;
- helping the Group improve its sub-contracting practices by defining criteria to support decision-making in terms of strategy, economics, skills and social impact;
- developing socially-responsible sub-contracting practices, particularly via the new EDF group CSR agreement signed on 19 June 2018, as well as the agreement signed on 19 October 2006 on "Socially-Responsible Sub-Contracting" at EDF.

### Group CSR agreement commitments:

#### Article 4: Ensure socially responsible relations with suppliers and subcontractors

"The EDF group is committed to sending and promoting this agreement amongst its suppliers and subcontractors.

The Group's requirements specifically relate to:

- compliance with the domestic laws of the country where the contract is being performed;
- compliance with international labour standards;
- employee health and safety, including any applicable international standards;
- respect for the environment;
- compliance with the EDF group's Ethics and Compliance policy.

Group companies set up appropriate selection and evaluation procedures for their subcontractors and suppliers, to ensure that they meet these requirements.

These requirements are in addition to the Sustainable Development Charter, first prepared in 2006 and updated in 2014, between EDF and its suppliers.

Group companies must promote these principles to any bidders.



### 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

#### Further human resources considerations

In the countries and regions where it operates, the EDF group focuses on boosting its relations and business volumes with local small and medium-sized enterprises (SMEs). As such, it identifies and includes regional development challenges in its expression of needs, in accordance with applicable regulations.

The Group may be required to use subcontractors with employees under contracts drawn up in a country other than the one in which it operates. In this case, particular attention is paid to human rights, working conditions, housing conditions and employee health and safety.

The signatories consider the health and safety of employees at subcontracting companies to be just as important as that of the Group's own employees. This is covered in Article 5.

The EDF group monitors supplier and subcontractor compliance with their obligations. It therefore implements a compliance plan, including a map of the risks identified in relation to its suppliers and subcontractors, a risk assessment, and the risk mitigation measures taken (see Article 1 of this agreement).

In case of an ongoing breach, which remains unresolved after the issue is raised, of any provisions in this agreement, of legislation, of employee health and safety rules, of principles governing relations with clients, or of current environmental regulations, relations with the supplier or subcontractor may be suspended in accordance with the contractual obligations.

Should the trade unions in the Group report a supplier for practices that differ from the commitments set out above, the EDF group will conduct an analysis and draw up the relevant report.

#### Areas of sub-contracting at EDF

At EDF, sub-contracting is mainly used for industrial and commercial activities, and for information systems. 2018 was consistent with the trends seen in 2017 in terms of the types of business activities that were outsourced, with the exception of real estate management activities, for which the Company has adapted its business model. It now uses Property Managers for tertiary sites and Pilot Facility Management for tertiary buildings on industrial sites, through its new subsidiary, Dalkia PMiG.

#### In the industrial field

The improvement measures launched in 2015, reflected in the Progress Charter signed in June 2016 between EDF and the Professional Organisations representing the Group's subcontractors, continued in 2018. Specifically, support for subcontractors, in place since 2017, will continue at the Flamanville 3 work site, with a view to reducing the workload.

#### In the field of Information Systems

In 2018, the Company continued to implement its industrial strategy in the IT field which determines the sub-contracted share. This is particularly demonstrated by the proactive decision in favour of "Open Source" – unrestricted and free – software as well as the implementation of a fast-track contractualisation procedure with start-ups, which are vectors for innovation. Vigilance regarding training conditions and service provider turnover has been maintained, particularly as the total number of suppliers in the IT field continued to increase.

#### In the commercial field

In an increasingly competitive context, the sales division continued to use outsourcing to deal with variations in workload and cover extended hours, with value-creating tasks being directed towards internal consultants. All of EDF's customer relations centres, both internal and external, are located in mainland France.

#### 3.4.4.2 A significant contribution to local development via occupational integration

##### The Group's commitment to occupational integration

The Group maintains an ambitious work-study scheme (see section 3.2.2.3.2 "Work-study programmes: a solid history and a commitment for the future") whose contribution to social mobility is continuously renewed (see section 3.4.1.3 "Skills development: preparing for the future").

Work-study programmes are considered a key tool in developing the occupational integration of young or long-term unemployed people, and to enable them to acquire or finish a qualification.

Certain work-study offers are specifically proposed to young people in major social difficulty, in conjunction with occupational integration organisations. These offers prepare them to obtain a qualification corresponding to at least the first level of occupational qualification.

Partnerships are formed with local and regional employment and training organisations (Mission Locale, École de la deuxième chance, AFPA, Compagnons du Devoir, etc.) in order to encourage young people, particularly from deprived areas, to train for promising professions. An agreement was signed between EDF, Enedis and Energie Jeunes in 2017 to encourage young people in low-income areas to stay in education.

Via its apprenticeship tax award policy or via contributions, the EDF group provides financial support for organisations that work for occupational integration (Écoles de la deuxième chance, Compagnons du Devoir, Association Jeunesse et Entreprise, C Génial, etc.).

##### Contribution to occupational integration

##### Introduction of social clauses in contracts

EDF includes, in some of its contracts for which it launches calls for bids, the application of integration clauses, which provide in concrete terms for reserving a certain number of working hours to hiring people who are having difficulty in finding work.

The Group works in partnership with local employment organisations (Pôle Emploi, Maisons de l'Emploi et de la Formation, Chambers of Commerce and Industry, etc.), particularly for major projects. The principal beneficiaries are young people under 26 with a low level of training, long-term jobseekers, young people who have never worked, beneficiaries of minimum social benefits or persons to whom the 2005 law on disability applies.

##### Purchasing from companies that employ only disabled people and provide them with special facilities and support and integration enterprises

##### Purchasing from companies that employ only disabled people and provide them with special facilities and support

In 2018, the Group Purchasing Division continued its efforts to make purchases from companies that employ only disabled people and provide them with special facilities and support in accordance with the provisions of the EDF 2016-2018 agreement for "equal opportunities and occupational integration of disabled persons". The national policy to encourage purchases from companies that employ only disabled people was reaffirmed in 2017, and an experiment is being carried out with such a company and a department in order to quantify what units will benefit.

##### Purchasing from integration organisations

EDF continues purchasing from organisations supporting integration via economic activity, particularly integration enterprises. Therefore, in 2018, purchases amounted to €4,937,000 from companies who employ disabled people only ("Secteur du Travail Protégé et Adapté" or STPA) and €767,000 from integration organisations ("Secteur de l'Insertion par l'Activité Economique" or SIAE).



### 3.4.4.3 Promotion of and respect for all forms of diversity

The EDF group is committed to promoting diversity in order to:

- better understand the diversity of its clients and meet their expectations as best as possible;
- better reflect the society in which it operates;
- allow women and men to express their talents to the best of their ability.

The new global Corporate Social Responsibility agreement, signed in June 2018, devotes several articles to combating all forms of discrimination, respect for diversity, the promotion of equal opportunities and in particular gender equality at work, as well as the fight against all forms of workplace harassment and violence.

With the Group code of ethics, this agreement constitutes the main frame of reference for the Group's companies. The challenges of all the strategic objectives in terms of diversity are managed by Group HR.

Diversity, in all of its forms, is coordinated in three main areas: at Group level, a "Diversity & Inclusion" network has been in place since 2011 and involves the diversity officers at the main international subsidiaries; in France, with a "France Diversity" network, consisting of the EDF business line divisions; and, Group entities in France.

Each Group company has a specific level of commitment, adapted to its business model and the current legislative framework and context. For example, Dalkia has the "Diversity" label, while EDF, EDF Energy and EDF Fenice have the GEEIS (Gender Equality European & International Standard) label.

In terms of vocational training and awareness-raising, EDF's "Diversity" commitments have led to the creation of several training programmes for managers, HR staff, employee representatives and employees. Approximately 10,000 people have attended such courses since 2007.

In addition, *tools* such as serious games have been developed and disseminated with a focus on managing diversity, professional equality and intergenerational issues. One such tool, "Experiencing Diversity Together", is used to certify the skills acquired. In 2018, an online communication campaign was rolled out during "Diversity Spring".

In terms of diversity, the measures taken by French companies are most often based on collective agreements or action plans on equal access to employment for women and men, disability and age management.

In 2018, Enedis published its guide, "Decide without discrimination" in order to prevent and eliminate all discrimination in all HR processes.

To prevent all risk of discrimination, EDF regularly conducts surveys and tests of its HR processes (for example at EDF, since 2008 there have been five tests of its main HR processes such as recruitment, work-study schemes or access to internships).

In 2017, EDF released a qualitative study on stereotypes in business, a quantitative study on sexism in business and a survey on parenting. The qualitative study showed that the stereotypes found throughout French society are also present at EDF but that employees are aware of and positively appreciate the actions taken by the Company, particularly in terms of equal access to employment between women and men and the integration of disabled persons. In 2018, EDF prepared a Reference Document on respect for gender identity, in order to support employees in transition.

#### 3.4.4.3.1 Support for employee network initiatives

Promoting diversity also involves supporting schemes organised by employee networks. These networks (ethnic minorities, women, working parents, disability, LGBT) are now active in certain Group companies and concern several thousand employees.

Internal networks	Company	Launch date	Number of members on 31/12/2018
Women	EDF	2004 Interp'Elles, which became Énergies de Femmes in 2015	2,900
	EDF Energy	2009	791
LGBT	EDF	2011 Energy	91+806 "allies"
	EDF Energy	2010 LGBT Supporters	368
Disabled	EDF Energy	2010 Disability and Carers	
Ethnic minorities	EDF Energy	2010 (Black Asian Multicultural-Ethnics)	392
Parents	EDF Energy	2014	430
EDF Energy Forces Support ex-military personnel	EDF Energy	2015	180
EDF Energy Young professionals (length of service < 10 years)	EDF Energy	2016	500

These networks develop schemes to allow discussion, increase awareness and sometimes provide mentoring. For example, in 2018, the Group had over 370 "Elles Bougent" godmothers in France who worked within their regions, to increase awareness among young women of the attractiveness of the Group's technical business lines.

In France, the women's network "Énergies de Femmes" and "Energy" (the LGBT association for EDF and the Electricity & Gas Industries) have received financial and logistical support from EDF since 2012. Furthermore, EDF and its partner the "L'Autre Cercle" association, which fights against discrimination based on sexual orientation and homophobia at work signed on 21 December 2015, an LGBT (Lesbian, Gay, Bisexual or Transgender) commitment charter. Finally, in 2016 and 2017, EDF endorsed UN projects and created and distributed a code of conduct related to them to prevent discrimination against LGBTI people.

The work carried out in conjunction with these non-profits enabled the Company to publish, in June 2015, a Reference Document on respect for different sexual orientations, intended to be used by *managers* and members of HR, plus an additional guide released in 2018 on respect for gender identities, in order to help *managers* and HR support employees in transition.

The "guidelines" document on religion targeted at managers and HR, the first of its kind in 2010, was updated in July 2016 and distributed amongst Group Business Departments and companies in France. In addition, a survey was carried out in 2017 of the main entities worldwide in order to draw up the first international "Religion & Beliefs" overview study in the Group.

#### 3.4.4.3.2 Measures taken to promote the occupational integration of disabled people

The Group's goal in this area is supported by the new global Corporate Social Responsibility agreement signed in 2018, which addresses the matter of disability. Furthermore, in 2017 the EDF group Chairman signed the International Labour Organisation's "Business & Disability" Charter, in order to implement and share the actions of the Charter's 10 principles with all of the Group's entities, and demonstrate the Group's commitment to the issue since 1989. In France, a number of Group companies have decided to sign a disability agreement: EDF, Enedis, Électricité de Strasbourg and EDF Renewables

## 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

### Further human resources considerations

Just like EDF Renewables and Enedis, which signed a Disability agreement in 2017, on 13 December 2018 EDF signed its eleventh agreement to support the integration and careers of disabled people.

Under its previous agreement, EDF's 2016–2018 agreement, the target employment rate the Company set for itself was 5% by the end of 2018. It reached 4.89% by 2017 year-end, with a total of 162 new hires and 94 new work-study contracts for disabled people being signed over the agreement's three-year term. In addition, throughout this agreement, a working group was set up to improve the digital accessibility of applications essential to employees' daily lives. EDF supported the development of an e-learning platform for the development of accessible web projects, as part of an inter-company partnership. This is now offered to Company employees on the campus internet.

On 2 July 2018, Enedis sign a tripartite UNEA-Enedis-Région Nouvelle-Aquitaine agreement for the creation of an inclusive learning segment for disabled adults and young people, to be launched in the second half of 2018. The aim is to train a dozen apprentices with disabilities in the electronics, electrical and electro-technical sectors. On-the-job training will be carried out in companies that employ disabled persons in the region and at Enedis entities. A first in France.

#### 3.4.4.4 Controlled and proactive management of reorganisation and restructuring

Aware of the need for organisations to adapt to changes in the social and economic context, both in France and abroad, the Group has prepared an Article dedicated to "socially responsible transformations" in its Group Corporate Social Responsibility agreement. *Management's* involvement and the focus it places on dialogue with employees and employee representatives are major drivers of change in this respect.

As part of its transformation, the EDF group applies the principles of transparency, responsibility and dialogue with respect to its employees, their representatives and local authorities.

These principles with regard to staff representatives must be assured, in compliance with domestic regulations, labour relations and collective bargaining agreements. Information must be provided in good time, and must result in consultation, in an effort to transform the Group's activities: new investments, mergers, acquisitions, disposals, reorganisation, facilities shutdowns or cessation of activities.

The information and consultation cover economic issues, the consequences of decisions taken and the appropriate adaptation of individual and collective support measures, as well as ensuring they have been applied without exceptions.

In order to successfully combine economic and social performance, Group companies are committed to developing forward-looking approaches to business development. This information is also shared with employees and their representatives.

The principle of responsibility with respect to employees and local authorities aims to limit the social consequences for the employees concerned, and the consequences for the socio-economic balance of the regions.

Measures to avoid redundancies, such as the reassignment of employees within their company or to another Group entity, must therefore be systematically reviewed. If redundancies cannot be avoided, more favourable provisions than the legal minimum required by laws in the country concerned are sought. In case of job losses, specific support may be offered to the employees concerned in order to assist them in their search for a new job, whether internally or externally. Consultation with employee representatives is prioritised in order to implement these measures.

#### 3.4.4.5 High-quality social dialogue

EDF relies on high-quality social dialogue to manage the Company's industrial changes and contribute to the development of its employees.

##### France

Throughout EDF, there are currently 56 works councils, one Central Works Council (CWC), a France Group Committee and 97 employee representative councils and 205 Health, Safety & Working Conditions Committees (CHSCT). The chairs of these bodies meet regularly for discussions and sharing of best practices.

##### Central Works Council

2018 was marked by transformation at the Company, including, for the first time, an examination of the shutdown of a nuclear power plant. Twelve sessions were held, two of which took place over a day and a half.

The council expressed its views on the three recurring consultations, known as "Rebsamen": The Company's social policy, economic and financial situation and, in December, the strategic guidance document and its impacts on employment, by calling on the support of an expert firm for each of them. Changes made to the content of these reports, launched in 2017, continued in 2018 alongside employee representatives in the CWC, the Chairs of the CWC committees, the Group HR Departments and the Business Line Departments, in order to facilitate better understanding of the Company's policies and strategy.

The CWC was also consulted regarding a number of business line and company transformation projects: declaration of the shutdown of the FESSENHEIM power plant, a nuclear project relating to the operation of the "Teams in Extreme Situations", the planned sale of the Dunkerque LNG subsidiary, the Paris real estate project (PGO), the planned renovation of the SIRH "My HR" project, the deployment of the Group Whistleblowing and Compliance System, the creation of a new division (DTEAM) to bring thermal energy and industrial support closer together – the Thermal Expertise and Multi-Sector Industrial Support Division, progress reports on major industrial projects such as Flamanville 3, Hinkley Point C, the EPR 2 project, the "Cap Hydro" EDF Hydro transformation project, a presentation of the Ecocombust experiment in thermal energy, and the Group's new Health and Safety Policy, etc.

##### 2018 social agenda

In 2018, collective bargaining continued, particularly with the launch in May 2018 of the "2020 Social Dialogue" plan, involving a complete overhaul of labour relations at EDF. The project covers multiple dimensions: new employee representative bodies; the place held by collective bargaining, establishment/professional branch; informal and contractual social dialogue; professional training and skills management of labour relations players; trade union laws and social relations as set out in the bylaws.

In 2018, five agreements and supplemental agreements were signed in the following areas of HR:

- France Group Committee agreement: relating to the renewal of the Group's works council and determining the powers and operating procedures, this agreement sets up regional social dialogue bodies on employment and mobility within the Group;
- methodological agreement on the 2020 Social Dialogue plan, which sets out the themes and schedule for the plan's negotiations;
- on compensation: the collective agreement on EDF contributions to the Collective Retirement Savings Plan (PERCO) and Corporate Savings Plan (PEG) in 2019, supplemental agreement No. 1 relating to the EDF 2017-2019 profit-sharing agreement, the collective agreement relating to equal rights and opportunities and professional integration of people with disabilities.

##### France Group Committee

This year was devoted to negotiations on the renewal of the French Group Committee (agreement signed 7 May 2018 by the CFDT, CFE-CGC and FO trade unions). The first session was held on 24 May, during which new members were welcomed, including a number of Framatome representatives, following its recent integration within the Group.

The France Group Committee, a forum for discussion at France-level comprising 28 elected representatives of the Group's main subsidiaries (EDF, Dalkia, EDF Renewables, Framatome, Enedis CHAM, RTE etc.), met three times in 2018, with a visit to the Framatome industrial site in Saint Marcel in Chalons sur Saone in July.

In addition to the recurring themes relating to the Group's strategy, such as the economic/financial and employment situations, 2018 provided the opportunity to present the Framatome subsidiary and its industrial project, to discuss the Group's ongoing matters, in particular the Group's new Health and Safety policy, redeployment measures for employees within the Group, and the Solar Plan driven by EDF Renewables.

## International

### European Works Council

At the end of 2001, the Group created a European Works Council (EWC), presented the Group's major policies and held consultations during changes to the Group's scope in Europe, with an impact on employees. Through its working groups, the EWC has launched numerous discussions on human resources policies at European level, notably concerning health and safety, diversity, collective guarantees, particularly guarantees during production site closures this year, and consolidated financial statements. In this context, a working group for Energy Transition and the "Winter Package" were set up in 2017.

In February 2018, the EWC met to discuss the Group's strategy in France and abroad and the council's operations, and met two times for plenary sessions in June and November. These meetings led to discussions with members of the Executive Committee on the European strategy of Group companies, health and safety, employment, Group results and work done by working groups. Visibility and preparation for asset disposals and their potential impact on employment was one of the EWC's concerns; the November session also served to inform them about activities in development.

### CSR agreement and governance

The CSR framework agreement signed on 19 June 2018, defines a set of shared commitments to social responsibility, and is characterised by its modern and innovative spirit. In practical terms, it provides major advances in terms of social security for employees in developing countries, combating violence and harassment at work, subcontractor and supplier vigilance, fair transition, transparency of the internal labour market, gender equality, combating discrimination relating to sexual orientation, tax transparency, whistleblower protections, and the fight against corruption and fraud.

This framework agreement, signed by all employee representatives and union organisations of the main Group companies, and by the international federations for the industry, are monitored biannually at the meeting of the Dialogue Committee on the Group's Social Responsibility (DCSR).

This agreement governs social dialogue on the issue of CSR. It has enabled the Group to put in place a set of basic shared commitments and common objectives that contribute to the renewal and extension of social dialogue issues.

The agreement is currently enforced at all Group subsidiaries through shared communications (OS, Department), and presentations to the HR Management Committees and Executive Committee.

Signatories undertake to monitor the agreement at both local and global levels, in order to guarantee compliance with the commitments contained therein: commitments in terms of communication, accessibility and awareness-raising, at global and country/entity level.

This monitoring is also designed to:

- check the conditions for implementing the agreement;
- assess the Group's performance in terms of implementation, particularly with regard to the results of monitoring indicators, including actions relating to the compliance plan;
- identify any discrepancies and areas for improvement, and establish one or more action plans to ensure constant progress;
- jointly develop an annual summary of the implementation and evaluation of results;
- identify good practices and suggest measures to promote them.

### 3.4.4.6 Employees' view: My EDF group engagement survey

At the end of the first "My EDF group" internal engagement survey conducted in November 2012 involving all Group employees, a plan to report results to employees was implemented. The companies drew up action plans to increase or introduce improvement measures based on the results observed within their scope. This process has been repeated every year since.

The 7<sup>th</sup> edition of the survey was taken in October 2018. A major internal communication campaign was organised to encourage employees to express their opinion (videos, posters and communication kit).

Confidence in the future of the Group remains stable (53%) after the decline registered in 2016. Employee engagement remains at 65% at the Group level, with a slight 1-point decline compared to 2017. 68% of employees would recommend EDF as an employer to a friend or relative, a decrease of 3 points compared to 2017, however this score remains 5 points above the external benchmark. The survey demonstrates that confidence in local management remains a real strong point (72% confidence in management's decisions, i.e. 9 points above the benchmark) as does employee involvement (72%).

Content of work remains at a satisfactory level of 65% despite a 2 point decrease. However, the perception of the effectiveness of collective operations fell 4 points to 49%. Expectations are still high in terms of recognition (59% consider that their remuneration does not reflect their involvement) and careers (43% satisfaction rate). They will be the subject of specific action plans.

Finally, for 84% of employees (stable) safety is a concern shared by everyone.

Employee participation (73% and nearly 101,000 respondents), a marked increase from the first year (63%), demonstrates the interest of Group employees in this survey and guarantees reliable results.

## 3.5 ETHICS, COMPLIANCE, TAX TRANSPARENCY



### 3.5.1 ETHICS AND COMPLIANCE

In order to protect its reputation throughout the world, the EDF group promotes a culture of integrity and applies a zero tolerance policy towards fraud and corruption. Ethical conduct in accordance with the law is the absolute rule for all Group employees, at all levels of the organisation, and without exception.

#### 3.5.1.1 The EDF group's commitment to ethics and compliance

##### A Group ethics and compliance programme and a dedicated governance body

The Group Ethics and Compliance Division (DECG) director reports to the General Secretary, who is a member of the Group Executive Committee. The DECG manages and coordinates, in liaison with the divisions concerned, the implementation of the Group's ethics and compliance programme, signed by the Chairman and CEO of EDF, in France and abroad. This programme is created to meet the requirements of national and international regulatory authorities and local practices. The programme places all EDF executive directors and, more generally, all employees at the heart of the compliance system.

In 2016 the DECG set up a network of around 50 Ethics and Compliance Officer (ECOs) at the French entities and internationally. The Ethics and Compliance Officer report directly to the directors of the entities and take part in Management Committee meetings on ethics and compliance matters and on the associated action plans. They have the means and powers necessary to implement and ensure compliance with the requirements of the programme and related policies.

The Group Ethics and Compliance Division has provided the Ethics and Compliance Officer with an "Ethics and Compliance" area on the VEOL Group intranet and information on [www.edf.fr](http://www.edf.fr) website, including Reference Documents and programme materials to enable all subsidiaries of the Group to access teaching content to support the roll-out of the programme. In addition to this information, the Ethics and Compliance Officer may also be provided periodic press reviews, depending on current events, thematic face-to-face meetings and a number of seminars throughout the year. Deployment via the ECO network drives skills development and the sharing of best practices.

The Group Executive Committee, chaired by the EDF Chairman, is responsible for determining the orientations and priorities of the ethics and compliance programme, allocating the necessary resources and ensuring the monitoring and control of its implementation. The Group Ethics and Compliance Division speaks in the Group Executive Committee, in order to report on achievements via an annual business report and approve the action plan.

The Board of Directors of EDF, through its Corporate Governance and Social Responsibility Committee, oversees the Company's incorporation of ethical and compliance considerations into its works and management. An annual business report is also presented by the Group Ethics and Compliance Division (DECG).

EDF is a member of several anti-corruption groups and non-profits. In 2016, it joined Transparency International France, in which it participates in the Forum of Engaged Companies ("Forum des Entreprises Engagées" or FEE), which gathers companies looking to adopt the highest standards of transparency and integrity.

##### A Group ethics and compliance policy in place since 2016

In 2016, the EDF group Executive Committee adopted the Group Ethics & Compliance Policy (PECG), which comprises the Company's compliance programmes as well as the main rules that executive directors must know, observe and enforce within their entities, which are strictly aligned with the risks of these entities.

This is a single document forming the overarching reference for the Group ethic Charter (launched in 2013) and code of conduct, Ethics and Compliance (published in 2017), updated as new applicable rules are published and subjected to audit.

The PECG currently include nine compliance programmes:

- preventing the risk of corruption with a specific focus on integrity checks on business relations, and limitations on gifts and entertainment;
- financial ethics (including prevention of the risk of money laundering and the financing of terrorism, prevention of market abuse, and compliance with EMIR rules);
- preventing breaches of competition law;
- preventing conflicts of interest;
- protection of the security of personal data;
- the fight against fraud;
- the fight against harassment and discrimination;
- compliance with sector regulations (including REMIT and dual-use goods);
- and compliance with international sanctions programmes.

##### A Group Ethics Charter

The Group Ethics Charter, based on the Group's three values (respect, solidarity and responsibility) was first rolled out at the end of 2013. It sets out the rules and principles which must guide the actions and behaviour of Group employees on a daily basis. It includes the "United Nations Global Compact" component, which EDF joined in 2001. It is accessible in French and English on EDF's website, and has been translated into ten other languages. It covers EDF's human rights obligations.

Work to update the Group Ethics Charter began in the second half of 2018, in order to take into account the Company's strategy, new Group policies and any changes in the regulatory environment. The EDF Executive Committee meeting in December 2018 approved the document's content and the implementation procedures, including communication to be carried out in the first half of 2019.

### 3.5.1.2 The anti-corruption compliance programme

The French law of 9 December 2016 on transparency, the fight against corruption and the modernisation of the economy, known as the "Sapin II" Law, brought France's legislative arsenal in line with the best international standards regarding the prevention and elimination of corruption and other ethical breaches. Companies like EDF, having met size and revenue criteria, must set up an anti-corruption compliance programme comprising eight requirements: a code of conduct included with the internal rules, an internal whistleblowing system, a risk map, third-party evaluation procedures, accounting audit procedures, a training system, a disciplinary mechanism and a control and internal evaluation system for the measures put in place.

In 2017, the Group Ethics and Compliance Division (DECG) and its network of Ethics and Compliance Officer (ECOs) drew up and deployed an anti-corruption programme within the EDF group, in order to meet the eight requirements set out in Article 17 of the Sapin II Law. In 2018, EDF was not the subject of any sanctions or convictions, penalties or fines by French or foreign authorities for acts of corruption.

#### The code of conduct Ethics and Compliance

In the second half of 2017, EDF published its code of conduct Ethics and Compliance following social dialogue launched in late 2016, as well as an opinion issued by the Central Works Council (CWS-"Comité central d'entreprise" (CCE) in French) on 1 June 2017, the date on which the law came into force.

In accordance with the law's requirements and the recommendations of the French Anti-Corruption Agency (AFA) this code of conduct, which is binding on all employees, defines and illustrates, through practical cases, the different types of behaviour employees are likely to face as a result of the Company's business activities and organisation, and which should be prohibited given that they may constitute acts of corruption or influence peddling. It defines rules for all the themes identified during the risk mapping process: prevention of corruption; integrity checks on business relations; gifts and entertainment; prevention of conflicts of interest; combating fraud; prevention of market abuse; prevention of the risk of money laundering and financing of terrorism; prevention of breaches of antitrust laws; respect for international sanctions and monitoring of international trade.

In order to prevent the risk of corruption and to provide employees with a framework and guidelines for assessing what does and doesn't constitute misconduct, EDF's code of conduct identifies, for each of the nine themes mentioned above, appropriate behaviours under a paragraph entitled "we must", and prohibited behaviours under a paragraph entitled "we must not". For educational purposes, it also illustrates "high-risk situations" and the "right reflexes" to adopt.

The code of conduct was applied at the subsidiaries by adopting the rules of the EDF code.

The code of conduct, Ethics and Compliance has benefited from the serious commitment made by top management, both in terms of its drafting and deployment. It was distributed to all employees in an email from the Chairman in summer 2017, and a print version was then sent to employees' homes in November 2017. The Code can be viewed by third parties in French and English on [www.edf.fr](http://www.edf.fr).

In addition to the code of Ethics and Compliance, managers receive a deployment kit, and employees undergo an awareness programme, including the publication of dedicated articles and an educational video, available on the VEOL ethics and compliance community and the EDF website.

A *serious game* was developed by the Group Ethics and Compliance Division (DECG) in 2018, enabling employees to take the content of the code of conduct on Board in a fun and interactive way, and to assess employees' understanding of its provisions. The game will be available in 2019.

In 2018, the code of conduct was integrated within most of the internal rules at EDF establishments and subsidiaries.

Given that the Group Ethics & Compliance Policy (PECG) has deemed preventing risks of corruption a priority, the DECG has strengthened its framework for gifts and entertainment, the rules of which are set out in the code of conduct. In 2017, the DECG published a practical guide for monitoring gifts and entertainment, as well as a support video to assist entities and subsidiaries in deploying this guide within their remit. In 2018, the Company developed and deployed an application (DECI) enabling employees to register any gifts and entertainment received, offered or refused.

The code of conduct prohibits the payment of incentives and expressly states that donations made to a foundation or non-profit must not be used for corrupt purposes.

It will be regularly updated in accordance with changes in the Company's risk mapping.

#### Whistleblowing system

Since 2016, the whistleblowing system has included compliance-related themes.

In December 2017, the EDF Executive Committee decided to upgrade its system in order to strengthen data security and maintain whistleblowers' anonymity. It decided to set up a single alert system for all alerts under the Sapin II Law and the law on "duty of care" ("devoir de vigilance"). The DECG is the system's contact for the Group. This system benefits all Group entities, including subsidiaries that already have an alert system. Subsidiaries in the regulated sector, Enedis and RTE <sup>(1)</sup>, have indicated that they are setting up their own whistleblowing system. Alerts in relation to these regulated infrastructure subsidiaries will therefore be referred on to their own systems.

The upgrade plan was presented to the EDF CWC (Central Work Council) for the first time on 18 January 2018, and the CWC's opinion was received on 2 March 2018. The new system went live on 10 September 2018. The DECG assesses the admissibility of alerts, then handles those deemed admissible together with the Ethics and Compliance Officer and other experts, if required.

EDF has decided, following a call for tenders, to purchase a tool to store alerts within a completely secure framework (Sapin II and GDPR compliant), in order to ensure that all employees and third parties can process their data internally and confidentially, with a system that is completely disconnected from the Company's information systems.

The interface of the Group's ethics and compliance whistleblowing system is available in several languages (French, English, Italian, Portuguese, Dutch and Mandarin) in France and abroad, and the whistleblower can submit their alert in the language of their choosing. This tool complies with local regulations everywhere the EDF group operates. The external alert system is ISO 27001 certified and has the *European Privacy Seal*. It was audited by the EDF IT departments prior to being deployed. The system undergoes regular intrusion tests. It is also possible to contact DECG direct by postal service.

The Group Ethics and Compliance Division has published two bilingual guides, in French and English: "The whistleblower's guide", intended for all employees, in order to assist them should they wish to submit a report; and, "The processing guide" for all Responsibles for Treatment, in order to show them the methods for processing alerts, from receipt to the completion of their analysis, as well as any resulting actions or procedures.

The EDF group ethics and compliance whistleblowing system allows Group employees and external staff (temporary workers, service provider employees, etc.) or occasional employees (fixed-term contracts, apprentices, trainees, etc.), as well as third parties, to report actions of which group EDF or its employees are the culprits or victims, in accordance with the "Sapin II" and "Duty of Care" laws.

(1) Distribution network operator Enedis and transmission operator RTE are managed independently.



### 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

#### Ethics, compliance, tax transparency

The scope of application for whistleblowing is as follows:

- a crime or tort;
- a serious and clear breach of a legally ratified international commitment approved by France, or of a unilateral act of an international organisation taken on the basis of such a commitment;
- a breach of a law or regulation;
- a threat or serious harm to the general interest;
- a breach of the Group code of conduct, Ethics and Compliance;
- a serious breach of human rights and fundamental liberties, health and safety, or harm to the environment, as a result of EDF's and the Group's subsidiaries' business activities.

To facilitate understanding, EDF has defined ten areas in the whistleblowing system that fall within its remit: corruption, conflicts of interest, fraud, financial crime, breaches of antitrust laws, international sanctions and controls on international trade, harassment and discrimination, individuals' rights and protections, serious environmental breaches and the data privacy. Employees can also ask the Group Ethics and Compliance Division for advice in a secure manner, and exercise their rights over their personal data.

The admissibility of an alert is assessed with regard to this scope of application and the whistleblower's relationship with the Company. This admissibility is independent of whether the alleged facts are well-founded or not, which can only be determined through an alert handling process.

Alerts are submitted via a web page of the EDF website<sup>(1)</sup>. The whistleblowing system is accessible 7 days a week, 24 hours a day, and whistleblowers receive an acknowledgement of receipt, notifying them that their alert is being analysed. In line with the zero tolerance policy, each admissible alert is processed in a secure dedicated tool. Whistleblowers have the option to submit an alert anonymously, as long as the severity of the reported facts is established and the factual elements are provided in precise and sufficient detail, so as to provide evidence for the reality of the reported facts. The Group Ethics and Compliance Division issues a regular report.

In 2018, this division recorded 12 requests for advice and 64 alerts, 44 of which were considered whistleblowing, as they were deemed admissible, in the Group whistleblowing system (excluding RTE and Enedis). Whistleblowing alerts are handled by the Group Ethics and Compliance Division (DECG) or its network of experts, in order to determine whether or not the alleged facts are well-founded. Most whistleblowing (48%) relates to harassment/discrimination.

Of these 44 alerts:

- 11 were anonymous;
- 80% came from Group employees;
- 40 alerts concerned facts and events occurring in France and 4 abroad (2 in Europe outside France, 1 in North America and 1 in South America);
- 27 related to EDF and 17 to Group subsidiaries.

The consolidated results are included in the annual ethics and compliance report submitted to the Executive Committee and presented to the Governance and Corporate Responsibility Committee of the EDF Board of Directors.

#### Risk mapping

In 2016, the Group Ethics and Compliance Division began developing a tool for the ECOs, enabling Group entities and subsidiaries to identify the risks associated with their activities and then view them on a map of ethics and compliance risks. Based on this, the entities draw up action plans appropriate to their operational contexts to prevent and mitigate these risks.

For the purpose of simplification under the Cap 2030 strategy, and in order to take feedback from the previous year into account, this tool was modified at the beginning of 2017, becoming part of the annual internal control self-assessment process carried out by the Group Risk Department.

In 2018, a specific "corruption" risk map was prepared, which identifies and prioritises, by business sector and country, risks of exposure to corruption.

In the event of any significant changes in this risk map, the themes included in the code of conduct, Ethics and Compliance will be updated.

#### Integrity checks on business relations

Integrity checks on business relations are the subject of a memorandum of instructions which defines the third-party evaluation procedures to be implemented by the Heads of Ethics and Compliance of the entities before any commitment and throughout the course of the relationship. The scope of the checks depends on the third party's risk level. An educational outreach programme on the subject is available on the intranet, which can be accessed by all employees.

Risks of corruption are identified in relation to EDF's departments and subsidiaries when third parties are assessed by the ECOs and their contacts during integrity checks on business relations. For EDF divisions that require enhanced vigilance, these controls systematically take into account information provided by business relationship managers and in-house legal experts specialising in the sector.

Feedback is scheduled for 2019, two years after initial implementation, in order to ensure that entities are controlling risks relating to the integrity of partners, and in order to amend the content if necessary, specifically in light of AFA recommendations (Sapin II Law requirement).

#### Accounting controls

The control procedures defined in EDF are presented in its supporting guide to the fight against fraud accompanying the memorandum of instructions on the fight against fraud of 18 April 2017. The control procedures defined for the various processes (procurement, sales, treasury, personnel, fixed assets-stock, accounting) meet the objective of the "Sapin II" law. These procedures involve 70 random or automatic tests, including 23 performed on the accounting process.

Following a technical analysis between the accounting department and the finance management teams of the operational departments concerned, any anomalies likely to be characterised as fraud are, where applicable, forwarded to the entity's Ethics and Compliance Officer. In the context of the implementation of the Sapin II law, the Accounting & Consulting Shared Services Center (CSP-2C) has implemented a fraud detection escalation procedure in order to handle situations in which potentially fraudulent anomalies are identified in the implementation of accounting controls. The accounting department has not detected any fraud linked to corruption in recent years, through audits carried out or, where applicable, following *spontaneous statements or reports*.

#### Anti-corruption training

The Group Ethics and Compliance Division is developing prevention and training actions and provides deployment tools for all employees. It coordinates a network of professionals in the various entities and has a dedicated forum on the Group intranet. The Group Ethics and Compliance Division has set up a training course on the "Prevention of the Risk of Corruption", thus meeting the requirements of the "Sapin II" law. It was defined in detail from mid-2016 for managers, and was then deployed in 2017 and 2018 with regard to managers and staff exposed to such risks.

The Group Ethics and Compliance Division has produced awareness-raising videos on the nine subject areas of the Group Ethics & Compliance Policy (PECG) and made them available on the ethics and compliance intranet. The nine subject areas are: insider information; international sanctions; harassment and discrimination; the fight against corruption; the fight against fraud; sector regulations; security of personal data; competition law; and, conflicts of interest. Internal tools have also been developed to raise awareness amongst all employees about conflicts of interest (information document, video and chapter of the code of conduct, Ethics and Compliance to identify high-risk situations, reflexes to adopt and good practices).

The Group Ethics and Compliance Division provides generic face-to-face training to certain risk-exposed staff, such as subsidiaries directors or *contract managers*, as well as more specific training, such as training provided by its ethics and compliance network on the new whistleblowing system and the way in which alerts are handled. The Ethics and Compliance Officers add to certain training courses through their networks of contacts.

In addition to the Group Ethics and Compliance Division's training initiatives, the Group Legal Division and Group HR Division offer an e-learning module called "Preventing corruption" designed for all employees: this programme deals operationally with the right conduct to adopt in situations involving business relations, conflicts of interest and gifts.

(1) <https://www.edf.fr/en/the-edf-group/our-commitments/ethics-compliance/whistleblowing-system>

At the end of 2018, 8,556 employees had completed anti-corruption certification training.

### Disciplinary sanctions

In accordance with the Sapin II Law, any breach of the rules set out in chapter 3 of the code of conduct, Ethics and Compliance, may expose employees to disciplinary sanctions. A paragraph has been included in the code of conduct to inform employees of the disciplinary sanctions applied.

The sanctions concerned are those set out in Article 6 of the Electricity and Gas Industry agreement (EGI status) and those in the French Labour Code. Depending on the circumstances and situations, the penalty may range from a warning to dismissal, including different stages (with or without an entry in the file, with or without suspension, with or without demotion).

To its knowledge, EDF did not face (neither as victim nor culprit) proven acts of corruption in 2018.

### The internal control and evaluation system

In order to make sure of the appropriateness and effectiveness of the measures for preventing and detecting any breach of ethics or failure of compliance, in 2016 the Group Ethics and Compliance Division put in place a dashboard enabling entities to evaluate the degree of deployment of each key requirement. The exercise meets the internal control requirements defined by the Group Ethics and Compliance Policy by allowing the implementation of the measures to be controlled, breaches to be identified and corrective measures established. This assessment of the level of control in terms of ethics and compliance has been carried out since 2017 as part of the annual internal control self-assessment initiative led by the Group Risk Division (DRG). The analysis and consolidation of escalated information is carried out by the Group Ethics and Compliance Division at the beginning of the following year. In 2018, several indicators were added to the self-assessment sheet on corruption risks.

The control system is strengthened by regular internal audits at the entities and subsidiaries, ensuring that the system is continuously improved.

The Group Ethics and Compliance Division works closely with the Internal Audit Division. Salient points from the audits in the area of ethics and compliance are shared regularly.

### Conflicts of interest

The Group Ethics and Compliance Policy obliges Group senior executives to implement a system to prevent conflicts of interest and raise employee awareness of high-risk situations, provide a system for employees to declare their links to bodies in which they have a personal interest (elective mandates, corporate mandates, etc.), and an obligation to withdraw from an activity in the event of a potential conflict of interest.

The Group Ethics and Compliance Division has developed internal tools to raise awareness amongst all employees about conflicts of interest (educational information document, e-learning modules, video, etc.) and a chapter of the code of conduct, Ethics and Compliance is devoted to the matter, in order to identify high-risk situations, reflexes to adopt and good practices.

### Interest representatives

In a general sense, the EDF group complies with applicable international agreements, does not seek or attempt to obtain information or decisions in a dishonest manner, makes sure that it does not mislead or deceive stakeholders, decision-makers or public authorities, and ensures that the information it provides is honest, up-to-date and comprehensive.

In France, EDF is an interest representative within the meaning of Articles 25 *et seq.* of the Sapin II law (Articles 18 *et seq.*). In this respect, EDF is registered on the list of interest representatives maintained by the High Authority for transparency in public life - HATVP<sup>(1)</sup>. The network managers RTE, Enedis and Dalkia are also registered.

The list of persons in charge of an interest representation identified in the register will be updated regularly.

Pursuant to this same law, in March 2018 EDF sent HATVP, its first declaration, relating to interest representation actions carried out between 1 July and 31 December 2017. As provided for by law, the declaration covers actions taken by the Company aimed at influencing a public decision, with national public officials identified by the legislator. By 31 March 2019, EDF and the registered subsidiaries will send HATVP their annual declaration on interest representation actions carried out during 2018.

At European level, EDF is listed on the Transparency Register of the European Parliament and the European Commission, and applies the related code of conduct. The estimated annual costs for the activities covered by the European Transparency Register in 2016, 2017 and 2018 around €2 million.

The main actions taken in 2018 include:

- legislative discussions on the Clean Energy Package. On this occasion, many meetings and events were held to raise awareness and inform stakeholders of the Group's priority challenges. Among these, the Group had the opportunity to reaffirm the importance it attaches to improving the coordination of European policies (renewable energy, energy efficiency and combating global warming), to long term solutions for confirming the security of supply in Europe and to raising the profile of its decarbonised investments and to the setting of a fair price for CO<sub>2</sub>;
- preparation by the European Commission of its long-term strategy for reducing greenhouse gas emissions. The Group has stated the need to continue a proactive approach to reducing CO<sub>2</sub> emissions. It is also committed to taking advantage of the opportunity presented by the development of electric transport, in order to more efficiently combat air pollution and reduce the transport sector's carbon footprint, in addition to the actions already undertaken by the energy sector;
- the work carried out by the European Commission on sustainable finance has led EDF, believing that long-term investors should contribute to achieving the objectives of the Paris Agreement, to promote greater transparency on sustainability criteria in asset managers' portfolios. Lastly, the foreign direct investment (FDI) screening regulation has been closely monitored in order to uphold legal guarantees, proportionality of screening, complementarity and European added value.

### Non-financing of political parties

The EDF group complies with the laws and regulations in force concerning the financing of political parties. Such financing may take place only in countries that allow it, and only with due regard to the principle of neutrality. In accordance with the legislation in force in France, EDF makes no payments to political parties. The Group's Italian and UK subsidiaries have written directly into their codes of conduct the prohibition of financing political parties. In Belgium, EDF Luminus has made no contribution to political parties. No payments were made in Latin America or Asia. In countries where it is allowed (such as the United States), EDF group companies may determine whether they wish to provide financial support. Every year, the Group companies concerned must report any financing to their parent company (statement of beneficiaries and relevant amounts). In 2018, the amounts paid by EDF Renewables in the United States amounted to USD 39,000 to a *Political Action Committee* and USD 26,500 in *political contributions*.

#### 3.5.1.3 Other compliance programmes

The EDF group's Ethics & Compliance Policy covers other compliance subjects and programmes, the operational implementation of which is carried out by expert divisions within the Group. Some of these subjects were completed in 2017 by memoranda of instructions designed to underpin their roll out in the Group's entities.

### Prevention of harassment and discrimination

As part of its policy of respect for persons, the Group does not tolerate any form of discrimination, harassment or violence in the workplace. This commitment is part of the regulatory and judicial context which, in many countries, incriminates not only the actions and behaviours themselves, but also employers who fail to implement sufficient preventative measures. Respect for people is one of the key commitments of the Group Ethics Charter. It is upheld by every Group employee, irrespective of his or her position within the Group.

More specifically, directors take all necessary measures to prevent discrimination, harassment and physical and emotional violence in their entities by striving to make

(1) [hatvp.fr/fiche-organisation/?organisation=552081317](http://hatvp.fr/fiche-organisation/?organisation=552081317)

### 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

#### Ethics, compliance, tax transparency

employees aware of the risks of harassment and discrimination, raise awareness among managers on ways of preventing and fighting harassment and discrimination, communicate regularly on the ethics and compliance whistleblowing system and apply the appropriate sanctions in the event of proven wrongdoings. All admissible alerts reported via the whistleblowing system are processed in accordance with the Group's zero tolerance policy.

Two awareness-raising videos (one on harassment, the other on discrimination) were rolled out within the Group, and two Reference guides to prevent and handle bullying and sexual harassment have been prepared, and will be published in the first half of 2019. They are intended for management and the HR department, as well as for entities' Ethics and Compliance Managers.

#### Fight against fraud

The fight against fraud has been a major concern since the end of 2010, when a "zero tolerance" policy was introduced. Within the framework of the internal control system, managers have drawn up and adopted anti-fraud measures locally.

The Group's Ethics & Compliance Policy has strengthened its anti-fraud mechanisms. In mid-2017, following approval by the Group's Executive Committee, a memorandum of instructions was distributed to senior executives. It sets out a definition of fraud at Group level and sets out the applicable requirements for preventing, detecting and handling suspected fraud. It is supplemented by an operational support guide entitled "Combating fraud", the aim of which is to explain to managers and the entity Ethics and Compliance Officer, the main checks to be carried out in order to contribute to keeping the risk of fraud under control. This guide will be updated regularly. Finally, an awareness-raising video on the subject is available on the intranet, which can be accessed by all employees.

#### Financial ethics

The Ethics and Compliance Policy sets out the requirements to be followed to prevent market abuse, the risk of money laundering and the financing of terrorism, and those concerning compliance with the European EMIR regulation. An Ethical Code for Trading in Securities, updated in February 2017, complements this Policy.

Actions to raise awareness of stock market rules are conducted with Group employees, concerning particularly the precautions and obligations for holders of inside information.

A mapping of money laundering and terrorist financing risks by country is prepared each quarter by the Group Ethics and Compliance Division.

The prevention of market abuse, money laundering and terrorist financing is explored in more detail in the code of conduct, Ethics and Compliance.

#### Preventing breaches of competition law

EDF group is making awareness of and adherence to competition law an absolute priority for its employees. With this in mind, the Group has implemented a Competition Law Compliance Programme since 2010. The programme aims to ensure that all operations of subsidiaries and entities of the Group in France and worldwide comply with competition law. It applies to all Group employees, particularly as regards their relations with customers, competitors, partners and suppliers.

The Compliance Programme covers all aspects of competition law: abuse of dominant position, anti-competitive agreements, concentrations and state aid. The programme involves many training sessions, either online or face-to-face, as well as outreach initiatives.

At the same time, a best practice guide, as well as regular notes and publications on developments in competition law are circulated widely.

The Ethics and Compliance Policy also requires the Group's managers to set up employee training at their entities, covering the rules of competition law, a system to monitor employee compliance with the rules of competition law, and a mechanism for integrating competition law rules into the entity's strategy approach.

After rolling out an e-learning module between 2010 and 2015 which trained over 5,400 employees, in France and overseas, the Legal Department's Competition Law Unit devised a new general e-learning competition module with a more interactive

format. Launched at the end of 2016, this *Serious Game*, known as: "Antitrust - Serious Game in Competition Law", is accessible to all Group employees on the Group's internal training portal, in multiple languages (French, English and Italian). As at 31 December 2018, it had been completed by more than 1,400 employees. Meanwhile, a specific module for French sales teams relating to long-term contracts was launched in 2015.

This online offering is completed by tailored face-to-face training for some Group subsidiaries and entities. In 2018, 319 employees were trained in 16 face-to-face courses, representing around 58 training hours provided.

#### Personal data protection

The protection of personal data (data privacy) is now governed in France by French Data Protection Law no. 78-17 of 6 January 1978, as amended, and EU Regulation 2016/679 of 27 April 2016, known as the General Data Protection Regulation (GDPR), which entered into force on 25 May 2018. EDF, which in 2006 appointed a Personal Data Officer (PDO), appointed its Data Protection Officer (DPO) on 25 May. They are the Lead Manager for the Group. The DPO is responsible for ensuring compliance with regulations relating to the protection of personal data within the Company, whether with regard to the personal data of its customers, employees, service providers or partners.

The work carried out to bring the Group in line with the requirements of the GDPR notably led to the appointment of around twenty DPOs at subsidiaries across France and Europe, under the leadership and coordination of EDF's DPO Lead Manager. The Group Data Protection Network has been strengthened at the subsidiaries, as well as within the Company's management departments, which have Data Protection Contacts, acting as the DPO's representatives at their entity. Employees and service providers have been trained in personal data protection, in particular via a video course available on the Company's intranet.

#### Compliance with industry regulations

Pursuant to the Ethics and Compliance Policy (PECG), the entities concerned must implement a system to ensure compliance with the European REMIT Directive, the purpose of which is to ensure the transparency and integrity of the wholesale energy market, in particular by requiring market participants to declare any inside information they hold, to declare transactions and orders placed on the markets to energy regulators, and by formalising the ban on market abuse.

A "REMIT Group Compliance Officer" was appointed in September 2017, tasked with preventing risks of non-compliance with regulations, by developing an appropriate control environment. In this context, the Ethics and Compliance policy was supplemented by a Group memorandum of instructions and a memorandum of application for the regulation on the French energy market. Intended to formalise a common understanding of the key issues and the principles to be implemented, these guidelines meet the expectations of ACER (non-binding recommendations) and CRE (decision dated 25/03/2018) which stress the responsibility of market players in defining the rules for implementing the Regulation, according to their respective situations. Training programmes for the employees concerned are in place or under development at the main Group entities (EDF, EDF Energy and Edison).

The PECG also requires entities involved in exporting products on the list of dual-use products appended to EC regulation no. 428/2009 of 5 May 2009 (including exports within the EU) to implement a compliance procedure.

#### Compliance with international sanctions programmes

The Group Ethics and Compliance Policy requires the executive directors of Group entities concerned to implement a system to prevent the risk of international sanctions within their entities. The system involves a clause being inserted into each contract entitling EDF to terminate a business relationship with immediate effect in the event of failure to adhere to an international sanctions programme.

EDF has set up a procedure for checking on the integrity of business relations and, in support of this, has made tools available for the Ethics and Compliance Officer to verify that there is no risk of international sanctions. The mapping of sanctions drawn up by the European Union is posted online on the ethics and compliance intranet.

### 3.5.2 TAX TRANSPARENCY

EDF has implemented a Group tax policy to define the applicable principles, in terms of taxation, to all of the Group's relations with its financial or business partners and the government or tax authorities. The tax policy is applied by the Group Executive Director responsible for the Group's Financial Management. It was approved in 2017 by the Executive Committee.

At the end of 2018, as in 2017, the Group uploaded its country-by-country report (of data for financial year 2017) to the French tax authorities, in accordance with the provisions of Article 223 <sup>(5)</sup> c) of the French General Tax Code which follows the OECD's recommendations.

#### 3.5.2.1 Group tax policy

##### A wide scope

The policy covers all the Group's taxes: direct and indirect taxes, duties, contributions, any tax or customs deductions which are ultimately the responsibility of the Company or its customers (when EDF merely acts as a collector on behalf of third parties).

This policy must be applied throughout the Group, by all controlled entities regardless of their nature or geographical location, with the exception of regulated infrastructure managers, for whom it constitutes a guide. All Group staff must comply with this policy which aims to protect the Group's reputation and to reduce any tax risks to which it may be exposed through its activities.

Clear directions:

- strengthen the tax performance of the Group in strict compliance with national and international tax laws and regulations;
- control tax risks through continued, systematic improvement, in all Group entities, of the identification and management of fiscal risks;
- implement the tools, reporting and *actions* necessary for the continued, optimum, forward-looking management of tax cash flows, <sup>(1)</sup> as well as attentive and proactive monitoring of the Group's effective tax rate;
- ensure the conditions necessary for obtaining constructive relations with the tax and government authorities of all kinds by maintaining a transparent, professional relationship with them.

##### Ethical principles

In the context of the allocation between countries of operating margins internal to the Group, EDF strives to apply a transfer price policy in accordance with the principles of the OECD to justify the resulting revenues. EDF has no legal implantation (company, branch or office of representation) in a territory listed as a non-cooperative state or territory as defined by French and international legislation which is not determined by economic activity reasons and under no circumstances purely by tax reasons. Similarly, cash flow via these countries is prohibited where it is for tax reasons only.

##### Presence in Luxembourg and Ireland

Like all major French and international groups, EDF relies on captive and mutual insurance companies to supplement the cover provided by traditional insurance markets. The captive and mutual insurance companies enable EDF to reduce the cost of its insurance schemes and the total sum of premiums paid. EDF has three captive insurance companies, based in Ireland and Luxembourg:

- Wagram Insurance Company DAC. (wholly owned by EDF), an insurance company founded in 2003 in Dublin which is involved in the majority of the Group's insurance schemes;
- Océane Ré (EDF 99.98%), a reinsurance company founded in 2003 in Luxembourg to reinsure EDF's nuclear civil liability risk;
- Tereco (Framatome 100%), a reinsurance company within the Framatome consolidation scope located in Luxembourg, to reinsure a portfolio of risks including that of Framatome's nuclear civil liability.

#### 3.5.2.2 Taxes paid by the Group

In 2018, the EDF group's tax expense <sup>(2)</sup> was €3,697 million, a 4.4% increase (€156 million) compared to 2017 (up 3.3% in organic terms).

The EDF group thus contributes to the development of the French regions through an annual payment of more than €1.8 billion in local taxes to local authorities.

Regarding income tax, the effective tax rate of -31.54% in 2018 <sup>(3)</sup> is mainly related to the pre-tax income of consolidated companies and to non-recurring items.

### RECONCILIATION OF THEORETICAL TAX EXPENSE TO ACTUAL TAX EXPENSE (TAX RECONCILIATION)

(in €m)	2018
<b>Pre-tax income of consolidated companies</b>	<b>473</b>
Income tax rate applicable to the parent company	34.43%
<b>Theoretical tax expense</b>	<b>(163)</b>
Differences in tax rates	(90)
Permanent differences (a)	30
Taxes not based on the company's net income (b)	239
Unrecognised deferred tax assets	132
Others	1
<b>ACTUAL TAX EXPENSE</b>	<b>149</b>
<b>EFFECTIVE TAX RATE</b>	<b>-31.54%</b>

As a result, the difference between the theoretical tax expense and the effective rate is mainly due to the:

- (a) favourable impact of disposals of equity investments and assets subject to a reduced tax rate for €199 million;
- (b) favorable impact of deducting remuneration paid to holders of undated subordinated notes for €203 million.

Adjusted for these non-recurring items, the effective tax rate in 2018 was 25.7%, up from 18% in 2017.

Income taxes paid by the Group amounted to €389 million in 2018 (€771 million in 2017): the €382 million decrease in corporation tax paid was essentially due to the significant decrease in taxable profits in France.

(1) Tax cash: tax actually paid or recovered.

(2) See note 11 Taxes and Duties in the notes to the Consolidated Financial Statements.

(3) See note 16.2 Taxes on Income in the notes to the Consolidated Financial Statements.

## DETAILS OF INCOME TAX PAID IN ALL THE COUNTRIES WHERE THE GROUP HAS SUBSIDIARIES

Country <i>(in millions of euros)</i>	2018	2017	2016
France	162	488	445
Belgium	87	84	70
Egypt	73	76	46
Italy	45	13	117
Brazil	41	62	31
Greece	8	6	3
Canada	5	(2)	-5
Mexico	2	13	0
Ireland	2	n.s.	n.s.
US	1	9	(4)
Chile	1	(2)	7
Vietnam	1	1	1
Poland	1	18	8
Germany	1	1	3
South Africa	n.s.	(1)	0
Spain	n.s.	8	0
Turkey	n.s.	n.s.	n.s.
Russia	n.s.	n.s.	n.s.
Luxembourg	n.s.	(1)	(1)
Slovakia	n.s.	0	0
Portugal	0	0	(1)
Hungary	0	0	20
Israel	0	0	0
The Netherlands	0	0	5
Austria	0	0	0
Switzerland	0	n.s.	0
Denmark	0	n.s.	0
Singapore	0	0	2
Japan	0	0	0
Bulgaria	0	0	n.s.
UK	(12)	29	151
China	(14)	2	0
Norway	(16)	(34)	(62)
<b>TOTAL</b>	<b>389</b>	<b>771</b>	<b>838</b>
Laos (entity accounted for using the equity method)	7	6	2
<b>TOTAL</b>	<b>396</b>	<b>778</b>	<b>840</b>



### 3.6 SPONSORSHIP



For more than 30 years, EDF group, through its sponsorship, has shown its commitment to promoting actions driven by civil society <sup>(1)</sup>. The Foundation supports almost 150 social innovation drivers each year.

Since 1 January 2016, the EDF group Foundation has worked with several Group subsidiaries represented on its Board of Directors to promote a Group approach to corporate sponsorship.

Endowed with a budget of €40 million over four years, the EDF group Foundation has focused its actions on solidarity and progress.

#### Commitment

Solidarity is the basis for the EDF group Foundation's action. In 2018, it supported 35 new initiatives in the fight against precarious work, the social integration of young people and education.

Given that scientific and technological progress ultimately contributes to human progress, the EDF group Foundation is committed to:

- supporting access to knowledge and know-how in order to develop an understanding of technology, promoting science and innovation amongst young people, and encouraging careers in science, especially amongst young girls;
- medical research seeking to improve quality of life and the life expectancy of the greatest number of people, through technical and therapeutic innovations;
- digital progress, using the digital revolution as a lever for renewing social cohesion.

In 2018, the Foundation dedicated almost €3.5 million to financing initiatives directly relating to solidarity and progress in France.

The Foundation runs a cultural space that offers a free programme of exhibitions and meetings. In 2018, it exhibitions "La Belle Vie Numérique!" and "1, 2, 3 Data" had 70,839 visitors.

With 43% of employees personally involved alongside associations throughout the country (according to an internal survey), the Corporate Foundation expresses strong attachment to the Group's values of solidarity, respect and responsibility.

For the past four years, it has set up a call for proposals from employees involved in non-profits. This initiative, which is becoming increasingly popular, has made it possible to set up a network of more than 550 employees identified in non-profits of public interest.

#### Partnerships

Through the various partnerships it has formed, the Foundation is striving to gradually involve its employees in support for general interest causes. For example, with regard to disabilities, employees participated in solidarity challenges consisting in providing information on places accessible to people with disabilities, on behalf of the Jaccede non-profit.

Similarly, EDF R&D research engineers offer their technological expertise to institutes that work for the public interest. More precisely, they offer medical research and cultural expertise, through skills-based sponsorship.

The EDF group Foundation is a long-standing Télérthon partner. In addition to the financing provided by the Foundation for genetic disease research, hundreds of EDF group employees are taking action through various initiatives (donating their time, events, bike rides, etc.).

The Foundation also contributes to the social and solidarity economy through the Fonds Agir Pour l'Emploi <sup>(2)</sup> ("Act for Employment") as part of a unique grant matching scheme. In 2018, there were 12,289 donors among the Group's current and retired employees. The amount of financial assistance provided amounted to €2,243,880 which created or consolidated 3,473 jobs.

Each year since 2010, through the Trophées des Associations, the Foundation has rewarded around 50 exemplary actions in favour of youth by small non-profits. In 2018, for the first time, these related to future projects rather than actions carried out. Certain prizes are now also awarded by region.

#### The Foundation abroad

Internationally, the Foundation supports projects run by non-profits for which electricity aids in access to water, health, education and development, by providing them with a combination of funding and technical expertise. In 2018, it supported about 40 projects that resulted in 56 technical assignments by 35 employees in 13 different countries. It also supports the voluntary commitment of employees who are engaged in international solidarity non-profits by providing solidarity leave: 45 employees benefited from this support in 2018.

In the UK, EDF Energy focuses its corporate sponsorship policy on sustainable development and support for local communities. The educational programme Pod, recognised by EDF Energy, was launched in 2008 in order to teach 2.5 million children about the principles of sustainable energy use. EDF Energy also grants employees two days per year to volunteer within their local communities, and to support schools and charitable or non-profit organisations. Employees are also encouraged to raise funds for partner charity Breast Cancer Now, which contributes to breast cancer research, raising the awareness about prevention of the disease and support for employees who suffer from it.

In Italy, Edison's sponsorship activities are part of a corporate responsibility strategy to involve employees in volunteering actions. Edison has chosen to focus particularly on the younger generation to promote a sustainable development culture through schools, thanks to projects with major environmental, musical and cinema associations.

(1) See also: [fondation.edf.com/fr](http://fondation.edf.com/fr).

(2) FAPE: [fape-edf.fr](http://fape-edf.fr).

### 3.7 NON-FINANCIAL RATING

Evaluations by specialised rating agencies and managers of ethical funds indicate the Group's CSR performance, in its benchmark sector. Assessments and rewards underscore external recognition of the Group's sustainable development performance. In 2018, EDF's excellent results improved even further: placement in the DJSI World index was maintained, the group was included again in the CDP Climate Change "A list", was confirmed in the STOXX ESG Leaders as well as all Euronext VigéoEiris indices.

#### Ethical market indices and evaluations by non-financial rating agencies

##### Dow Jones Sustainability Indexes (DJSI)

In 2018, EDF obtained an excellent score of 79/100, while the Electric Utilities sector average sits at 46/100. For the third year in a row, EDF has been a member of the prestigious DJSI World index, which it first joined in 2016. EDF is one of 478 "Sustainability Leaders" amongst the 2,479 companies evaluated by RobecoSam in 2018, and is ranked 8<sup>th</sup> out of 91 Electric Utilities companies (5<sup>th</sup> out of 98 in 2017, 6<sup>th</sup> out of 92 in 2016). In its 2018 annual report (Sustainability Yearbook), RobecoSam once again put the EDF group into the "Bronze Class", which means it is in the top 10% of the best performing companies in its sector of activity.

##### CDP Climate Change

In 2018 EDF was once again included in the highly selective "A List", which it first joined in 2016. In 2017, EDF was awarded an A- rating and Leadership Level. In 2015, EDF obtained an A- rating (B in 2014 and in 2013, on a ratings scale ranging from A to F). EDF's response is published on CDP's site. EDF belongs to the Climate Disclosure Leadership Index (CDLI) for France and Benelux region.

##### CDP Water Security

EDF obtained a C rating in 2018 (B in 2017, Management level, the same as in 2016 and 2015, on a ratings scale ranging from D- to A). EDF's response is published on CDP's site.

##### CDP Supply Chain

Every year, EDF makes CDP Supply Chain disclosures, in its capacity as a supplier to its French and foreign corporate accounts who request this information. It also makes disclosures in the Climate Change and Water Security parts of the Supply Chain questionnaire.

##### FTSE4Good Index

In March 2012, the EDF group was admitted to the FTSE4Good Index. This admission is reviewed every six months, and EDF's acceptability has been confirmed at every review since it first joined the index. The EDF group was once again included in the index in July 2018. In 2018, the overall rating was 4.4/5 and the EDF group was ranked 3<sup>rd</sup> in the Utilities sector amongst all of the companies evaluated, obtaining a relative performance of 95/100.

##### Euronext VigéoEiris Indexes

In November 2012, Euronext and Vigéo jointly launched a range of indices identifying listed companies demonstrating the best performance in Social Responsibility. The indices are updated twice annually, in May and November.

At the end of November 2018, EDF was present in all the indices it can apply for: Euronext VigéoEiris World 120, Europe 120, Eurozone 120 and France 20. In 2018, EDF obtained a score of 66 out of 100, an increase of 6 points compared to the previous score (60/100 in 2016 and 58/100 at the end of 2014), and achieved Advanced Level for the second time. It is ranked 5<sup>th</sup> out of 62 companies in the Electric & Gas Utilities sector.

#### Sustainalytics

In 2018, EDF obtained an excellent score of 83/100, up 1 point compared to 2017 (82/100), up 5 points compared to 2015 (78/100) and up 7 points compared to 2014. It ranked 6<sup>th</sup> out of the 193 companies in the Utilities sector. It is among the best 4% in the sector. For the second year running, the EDF group is the leader among its peers, i.e. companies of a comparable size in its sector of activity. EDF is a member of the STOXX ESG Leaders Index.

#### ISS-OEKOM

In 2018, EDF obtained the overall rating of C+ and, for the second year in a row, obtained the rating of B- in the "Social and Governance" section. The overall rating has been stable for five years (C+ in 2017, 2016, 2015 and 2014, and C in 2013, on a scale from D- to A+). Of the 104 companies in the Electric Utilities sector assessed by ISS-OEKOM in 2018, EDF ranked in the top 20% and was one of the few companies in the sector to be awarded B- for "Social and Governance".

#### Morgan Stanley Capital International (MSCI)

In 2018, EDF obtained Advanced Level, with an A rating (on a scale from CCC to AAA), the same as in 2017, 2016 and 2015.

#### EcoVadis

In November 2017, EDF achieved the excellent score of 75/100 and Advanced Level, up 3 points compared with 2016 (72/100) and up 8 points on 2015. EDF group is ranked among the best 3% in its sector of activity and the best 1% in all sectors. It was awarded the "Gold Recognition Level" reserved for companies with a score of more than 60/100. The 2018 score will be released in the first quarter of 2019, after this document has been prepared. The results will be published in the "2018 Performance booklet", which can be viewed on the edf.fr website.

#### Afnor Acesia Solutions Achats (Purchasing Solutions)

In 2018, as in 2017, EDF obtained a score of 98/100, an improvement of 7 points compared with 2016 (91/100) and 13 points compared with 2015 (85/100).

#### PAP 50 Entreprises

In this study conducted every three years by WWF France evaluating the paper policy of the 50 largest French companies, EDF obtained a score of 74 out of 100 in 2016 and rose to 7<sup>th</sup> place in the overall ranking (up 22 points compared to the previous survey conducted in 2013 at 20<sup>th</sup> overall). The next evaluation will take place in mid-2019.

#### French Centre of Corporate Information (CFIE)

For the past 16 years, the CFIE has published a study on the quality of labour and environmental information in the annual reports of large French companies, with quality being assessed on the basis of the completeness and accuracy of the information provided. In 2018, for the second year in a row, the Group was ranked 1<sup>st</sup> amongst the 22 large companies assessed, with a rating of 74.4/100 (77.3/100 and 1<sup>st</sup> out of 22 in 2017, 75/100 and 2<sup>nd</sup> out of 36 in 2016, 74/100 and 2<sup>nd</sup> out of 36 in 2015).

## 3.8 APPENDICES AND CORRESPONDENCE TABLES

### 3.8.1 VIGILANCE PLAN



In accordance with French law no. 2017-399 of 27 March 2017 relating to the duty of care of parent companies and ordering companies, the EDF group published an initial version of its vigilance plan in its 2017 Reference Document. For the sake of continuous improvement, the system in place to prepare the second vigilance plan, aimed to raise awareness among all players concerned and deepen and enhance the steps taken, including monitoring the measures implemented and assessing their effectiveness. This second version of the EDF group vigilance plan states how the plan has been implemented and reports on progress achieved by the entities with regard to different parts of the plan. In 2018, the vigilance plan was presented to the Governance and Corporate Social Responsibility Committee of the Board of Directors.

#### 3.8.1.1 Main characteristics of EDF as regards the law

The EDF group is an integrated energy company active in all electricity businesses: nuclear, renewable and traditional thermal generation, transmission, distribution, sales and marketing, efficiency and energy services, and energy trading. It is the primary player on the French market and has a strong foothold in Europe (specifically in the United Kingdom, Italy and Belgium). It is involved in the design and manufacture of equipment and fuels for nuclear reactors, with the integration of Framatome in 2018.

As regards human rights and fundamental freedoms, the EDF group primarily operates in OECD countries. However, it has assets and projects in countries that can be qualified, in terms of human rights and fundamental freedoms, as “high-risk countries” (for example in Southeast Asia, and Latin America) thus require specific attention, including in relations with our partners. As for the supply chain, although over 95% of its tier-one suppliers dealt with by the Group Procurement Department are located in France or elsewhere in the European Union, suppliers to certain subsidiaries or those involved in international projects are given greater attention.

In the area of personal health and safety, and due to its industrial nature, risk analysis covers both employee health and safety (employees, service providers, etc.) and the potential impacts on nearby residents, local communities and customers. Health issues in the supply chain are the subject of close scrutiny (e.g. the use of chemical products).

Environmental impacts relate in particular to the construction and operation of energy generation facilities, and are assessed within the framework of a management system. Suppliers’ environmental performances are the subject of contractual clauses and are regularly evaluated.

#### 3.8.1.2 Governance and scope

##### Reporting plan

The scope of the vigilance plan covers the EDF Group and its audited subsidiaries <sup>(1)</sup>.

As regards suppliers, the plan covers those with which the Group maintains established commercial relations. This mainly concerns the tier-one suppliers handled by the Group Procurement Department and the fuel suppliers dealt with by the Nuclear Fuels Division or EDF Trading Logistics on behalf of the Upstream/Downstream Optimisation & Trading Division (DOAAT in the French abbreviation).

The law on the duty of care provides that French subsidiaries exceeding certain thresholds be covered by the parent company’s vigilance plan. As in 2017, the Dalkia subsidiary has been included in the plan. Framatome was also included for the first time, having joined the Group in 2018. RTE and Enedis, transmission and distribution system operators and independently managed subsidiaries, prepare and publish their own vigilance plans.

(1) Subsidiaries integrated into the scope of consolidation using the full consolidation method pursuant to Article L. 233-16 of the French Commercial Code (in France and abroad).

(2) e-dh.org.

#### Methodology for developing the plan

The preparation of the plan involves all parties in the EDF group.

The following were involved in preparing the plan:

- the Corporate departments: Sustainable Development (coordination), Legal, Group Risk Control and Group Procurement;
- departments or entities with international projects: International, EDF Renewables, etc.;
- the other business lines and Group companies, including their subsidiaries and suppliers;
- the trade union organisations within the framework of the global agreement on the EDF group’s social responsibility.

The plan is based on the existing corpus as regards:

- Group Policies: risk management and internal control, governance of subsidiaries and associates, project management, ethics and compliance, sustainable development, health and safety, procurement. These policies apply to all companies controlled by the EDF group;
- internal commitments: code of conduct, ethical charter, supplier sustainable development charter;
- external commitments: United Nations Global Compact, OECD Guidelines, Global CSR Agreement, Supplier Relations and Sustainable Procurement Label.

#### 3.8.1.3 Stakeholder association

On 19 June 2018, a new corporate social responsibility agreement was entered into with the Group trade unions and two international trade union federations (IndustriAll and ISP). For the first time, an agreement explicitly refers to the implementation of the law on the duty of care (“devoir de vigilance”) throughout the Group. It states that “the vigilance plan shall be drawn up and implemented in conjunction with the Company’s stakeholders, including employee representative organisations”. The annual vigilance plan report will be presented at the next Global Agreement Monitoring Committee meeting.

Several meetings were held with the Monitoring Committee in order to share methodologies and involve EDF and subsidiary employee representatives in the detection of risks at their entities.

Furthermore, EDF participated in discussions with other companies and NGOs, within the framework of the “Entreprises pour les droits de l’homme” (EDH <sup>(2)</sup>) non-profit, in order to compare corporate practices and improve vigilance plan preparation processes.

#### 3.8.1.4 Content of the EDF group’s vigilance plan

##### Salient risk mapping

Every year, the entities produce a risk map based on a methodology implemented by the entire Group, with a focus on : management responsibility, the broadest possible identification of internal and external risks, a shared methodology for assessing the impact and control of risks, a description of risk management action plans and an assessment of their effectiveness. The risks covered by the duty of care obligation (although focused on the risks that the Company, its subsidiaries or suppliers may generate amongst their stakeholders) are intended to be assessed and monitored in a similar way.

Environmental risks are clearly identified and incorporated into the Group’s environmental management system (EMS) and internal control system. More specifically, they relate to the Group’s industrial activities, and mainly concern GHG emissions, impacts on water, air and soil and the production of conventional and radioactive waste. Particular attention is given to the conservation of biodiversity, the services rendered by the ecosystems and the management of water resources. As such, a study was completed in 2018 with the help of the WCMC (World Conservation Monitoring Center), which prioritises sites most sensitive to biodiversity, generally bordering a high-profile protected area. The 2018 risk mapping update did not highlight any new environmental risks.

Risks associated with human rights and fundamental freedoms are assessed by reference to the countries in which the Company, its subsidiaries and its suppliers operate, with specific focus paid to high-risk countries<sup>(1)</sup>. For example, the risk of forced labour linked to fuel transport conditions or the risk of infringements of the rights of indigenous peoples during industrial projects in Latin America, have been identified. As part of the Shweli3 project in Myanmar, the International Department identified a risk related to the conflict between the army and separatists. Furthermore, EDF Energy provided a report on forced labour risks in its statement required by the UK Modern Slavery Act of 2015.

Personal health and safety risks relate to risks affecting our employees, service providers (industrial accidents, occupational illnesses – asbestos, ionising radiation) and our suppliers' employees, as well as risks relating to our industrial installations that may affect local residents and communities (e.g. water releases into hydraulic dams that may impact walkers. These risks are the subject of information and guidance campaigns). EDF also deploys information systems on electricity use to improve consumer health and safety.

### Risk prevention and mitigation initiatives

The Group's policies have been completely revised since 2015, and set out the requirements all entities must comply with.

Clear and binding objectives have been defined for the areas covered by the vigilance plan (environment, individual health and safety, human rights and fundamental freedoms).

The EDF group 2018 Sustainable Development policy states that it "shall not tolerate any human rights violations in any of its activities and among its suppliers". This statement is also included in the global CSR agreement, which even makes human rights "a prerequisite for all the EDF group's activities". With regard to the environment, the EDF group maintains its ISO 14001 certification, first obtained in 2002. The processes implemented as part of this certification help curb environmental risks further.

The EDF group's 2018 Health and Safety Policy states that "the health of employees and service providers is the EDF group's most valuable asset", with the number one priority being the elimination of fatal accidents (see section 3.2.2.1). All Group companies perform a self-assessment according to ten vital rules and the *BEST* requirements, and They implement improvement plans targeting this level of excellence. Executives, managers, employees and service providers are all committed to this initiative. The EDF group also promotes the concept of global health, which includes risk management and prevention measures, (including of addiction) as well and promotes public health campaigns.

The Group Procurement policy for 2017 applies to all purchases made within the Group. It states that "compliance with contractual commitments and the rigorous Sustainable Development policy, in terms of respect for people and the environment, is the foundation of the Group's relationship with its suppliers". Serious discrepancies identified amongst our suppliers may compromise the contractual relationship, until it is terminated.

For new French and international projects of more than €50 million, risks are identified using a screening grid adapted in 2018 to include all "duty of care" risks, and which is discussed by the CECEG (Group Executive Committee's Commitments Committee). Projects financed by green bonds or development banks are the subject of reporting to financiers on social and environmental matters.

### The whistleblowing and alert system

In September 2018, the EDF group set up a new whistleblowing system that allows Group employees, external employees and third parties to report serious breaches in relation to human rights and fundamental freedoms, individual health and safety, and the environment. This system is available in six languages and guarantees whistleblower protection. At the end of 2018, no "duty of care" alerts had been recorded.

### The system for monitoring the measures implemented and evaluating their effectiveness

For 2018, the monitoring system was ramped up, by introducing a vigilance plan sheet in the internal control guide applicable to the entities concerned. The purpose of this sheet is to assess and justify the assessment of the risks identified (analysis of results, facts, causes and consequences), evaluate the entity's control and performance, and set out the objectives of their 2019 action plan. It is asked that specific attention be paid to supplier evaluations (implementation of the responsible purchasing section of the Group procurement policy, including for new suppliers).

Although not exhaustive, it is worth noting the measures taken by the Group entities that are most concerned:

#### EDF

- International Department (ID): in 2018, set up an Environment and Social Department in order to integrate a vigilance approach within all of its major projects (particularly regarding human rights risks). Particular attention will be required of controlled subsidiaries, and consideration is being given to non-controlled subsidiaries;
- Group Procurement Department (GPD): on the basis of sustainable development/social responsibility risk mapping, the Group Procurement Department implements monitoring systems for Tier 1 suppliers. For certain high-risk sectors (workwear, chemicals, etc.), external audits are carried out throughout the entire supply chain. In 2019, a review of the sustainable development and social responsibility risks was carried out, so as to better integrate the duty of care provisions. The control system questionnaire will be reviewed in order to improve the quality of responses. The sustainable development and social responsibility risk assessment for new calls for tenders will be gradually rolled out in 2019;
- Nuclear Generation Division (NGD): it qualifies its service providers in the areas of safety and environment. Prevention plans (1992 decree) are prepared and implemented with service providers in order to address safety and radiation protection risks. Checks are carried out at existing suppliers' factories and qualification audits are carried out for new suppliers. Monitoring programmes and on-site assessment sheets cover the safety and environmental aspects. A toll-free number<sup>(2)</sup> is made available to report possible non-compliant practices;
- Nuclear Fuels Division: since 2011, EDF has conducted mine audits (2-3 a year) based on a method drawn up collaboration with the World Nuclear Association (WNA). This constitutes a standardised framework recognised by all stakeholders in the sector. It takes account of issues of human rights and fundamental freedoms: such as human rights, register of warnings, rights of indigenous peoples and freedom of association. The question of safety in the context of mining is given particular emphasis (safety of process, protection from radiation). The environment is taken widely into account, notably as regards matters relating to water, biodiversity, waste and the rehabilitation of sites after exploitation. Recommendations may be made, together with an improvement plan if necessary. The principles defined by the WNA are based on those of the International Council on Mining and Metals, for the extraction and sustainable use of uranium. The clauses listing EDF's expectations in terms of enforcement of the fundamental rights and main international standards by suppliers and sub-contractors have progressively been inserted in contracts signed by EDF;
- Upstream/Downstream Optimisation & Trading Division (DOAAT): the coal contract was amended to include a "duty of care" clause when transferring the coal trading activity from EDF Trading to JERA (which has also committed to continue using audits conducted by Bettercoal). The fuel oil contract with EDF Trading Logistics was amended with the same requirements. A similar clause will gradually be included in non-fuel purchases.

(1) Based on a country risk analysis.

(2) There is a monitoring body at each EDF nuclear site which service providers are welcome to contact for verifiable facts relating to difficulties in terms of risk prevention, dosimetry, training, working conditions and conditions of on-site stays. Anonymity is guaranteed, if desired. The monitoring body does not get involved in the employee negotiation process at service provider companies. However, it plays a whistleblowing and information role with regard to EDF's management.

### Subsidiaries France

- Dalkia: health and safety and environmental risks are identified and covered by specific plans. "Human rights" risks are subject to a new dedicated analysis which will continue in 2019 given Dalkia's international expansion. Work is planned in 2019 for the suppliers and subcontractors component, in line with the approach taken by the Group procurement department;
- Citelum: driving international projects, this subsidiary has committed to defining an action plan in 2019 for the areas of human rights, environmental risks and health and safety;
- Framatome: Framatome joined the EDF group in 2018, and launched a "duty of care" approach. Most of Framatome's activities are carried out in OECD countries (France, Germany, the United States, etc.); some high-risk suppliers in terms of human rights compliance have been identified in China, Russia and Brazil. Risk mapping is currently underway. With regard to its results, an action plan including monitoring indicators will be prepared and rolled out in 2019;
- EDF Renewables: in 2018, environmental, health and safety risk maps were updated and human rights risk maps specific to each of the company's major operating regions were developed (Europe and North America, Asia, Africa and the Middle East, and South America). A review of environmental and social contractual provisions and a review of the processes for controlling environmental and social risks were carried out. An awareness-raising campaign on environmental, human rights and health and safety issues in renewable


energy businesses was also organised amongst the teams in the industrial procurement department. A formal vigilance plan is currently being prepared.

### Foreign subsidiaries

- EDF Energy: as is the case with EDF Trading, this British subsidiary is subject to the *UK Modern Slavery Act* of 2015 and released a *statement*. The supply chain was assessed on the basis of all the risks covered by the duty of care, and did not uncover any significant risks. Under the *BetterPlan*, in 2019 EDF Energy set itself the target of ensuring that its 150 biggest suppliers obtain "CIPS Sustainability index" accreditation, or equivalent. All new suppliers are subject to a qualification process;
- EDF Luminus has a health and safety management system (OHSAS 18001) that covers 80% of all of its employees. EcoVadis rated EDF Luminus' performance in "responsible purchasing" and "fair practices" as *advanced*, and rated its performance in "the environment" and "working conditions" as *outstanding*. This assessment did not include the subsidiaries. All new suppliers undergo a risk analysis. No "human rights" and "environmental" risks were identified for gas suppliers.
- EDF China: in 2018, EDF China's suppliers signed contracts including provisions relating to employee health and safety. In 2019, suppliers will be asked to supply their ISO 14001 or OHSAS 18001 certificates. For contracts worth more than €20,000, EDF China's suppliers must sign a "sustainable development" charter.

3.

## 3.8.2 UN SUSTAINABLE DEVELOPMENT GOALS

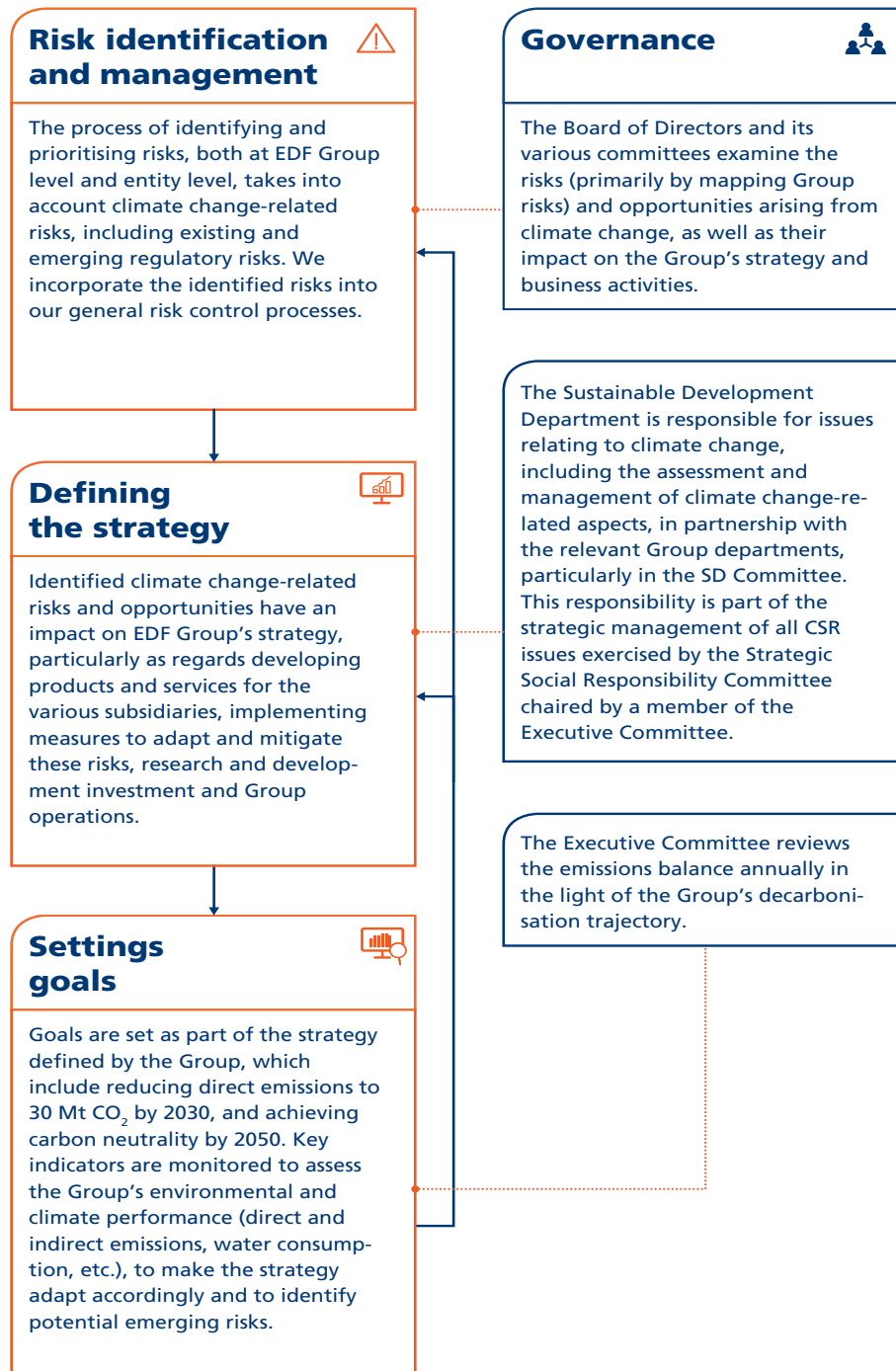
		CSRG	Section
	Goal 1: Eradicate poverty	3	section 3.2.3
	Goal 2: Food security and sustainable farming		
	Goal 3: Health and well-being	3, 6	section 3.2.3 - section 3.3.2.3 - section 3.3.3.2 - section 3.6
	Goal 4: Quality education	5, 6	section 3.1.1.3.5 / section 3.2.5 - section 3.6
	Goal 5: Gender equality	2	section 3.2.2
	Goal 6: Sustainable water management for all		section 3.3.2.2
	Goal 7: Affordable and clean energy	1	section 3.2.1 - section 3.3.2.2 - section 3.3.2.5



		CSRG	Section
	Goal 8: Decent work and economic growth	4, 5	section 3.2.4 - section 3.2.5 - section 3.3.1 - section 3.5.2.1 - section 3.3.2.2 - section 3.3.2.5
	Goal 9: Industry, Innovation and Infrastructure	4, 5	section 3.2.4, section 3.2.5
	Goal 10: Reduced inequalities	3	section 3.2.3 - section 3.6
	Goal 11: Sustainable cities and communities		section 3.3.1
	Goal 12: Responsible Production and Consumption	3, 5	section 3.1.3.3.5 - section 3.2.3 - section 3.2.5 - section 3.3.1 - section 3.3.2.1 - section 3.3.3.1 - section 3.3.3.2 - section 3.3.3.4 - section 3.5 - section 3.8.1
	Goal 13: Climate action	1	section 3.2.1 - section 3.3.2.2
	Goal 14: Life below water	6	section 3.2.6 - section 3.3.2.2
	Goal 15: Life on land	6	section 3.2.6 - section 3.3.2.3 - section 3.3.2.4
	Goal 16: Peace, justice and strong institutions	5	section 3.2.5 - section 3.3.2.1 - section 3.3.2.5
	Goal 17: Partnerships for the Goals		

### 3.8.3 TCFD RECOMMENDATIONS

In addition to section 3.2.1 "Committed to climate action", this section summarises climate change governance and presents a concordance table between the different sections of this Reference Document and TCFD recommendations.



### 3. ENVIRONMENTAL AND SOCIETAL INFORMATION – HUMAN RESOURCES

Appendices and correspondence tables

Concordance table with TCFD recommendations	Corresponding Reference Document sections
1. Governance	
1.1. Board of Directors' approach to climate-related risks and opportunities	Section 3.1.3, section 3.2.1.2.3, section 4.2.2.3, section 4.2.2.8, section 4.2.3.1 and section 4.2.3.4
1.2. Description of management's role in understanding and managing climate-related risks and opportunities	Section 2.2.1.4.5, section 3.1.2.3, section 3.1.3 and section 3.2.1.2.3
2. Strategy	
2.1. Description of climate-related risks and opportunities in the short, medium and long term	Section 2.1 and section 2.2.2.1.1
2.2. Description of the potential impact of climate scenarios (i.e. 2 degrees) on the economic model and strategy (including financial)	Section 3.2.1.2.1 and section 3.2.1.2.2
2.3. Description of the strategy's resilience, taking into account the various climate scenarios, including a scenario of 2°C or less	Section 3.2.1.2.2
3. Risk management	
3.1. Description of the process for identifying, assessing and managing climate risks	Section 2.1 and section 2.2
3.2. Description of processes for managing climate risks	Section 2.2 and section 3.2.1.2.1
3.3. Description of how these processes are integrated into a more global risk management strategy	Section 2.2
4. Indicators and goals	
4.1. Publication of indicators to assess climate risks and opportunities, in accordance with the Company's strategy and risk management	Section 1.3.2.2, section 1.4.1.5.3, section 1.4.4.2.4, section 3.2.1.2.2, section 3.2.1.2.4, section 3.2.1.2.5, section 3.3.2.1.5, section 3.3.2.2.1, section 3.7 and section 6.8
4.2. Publication of scopes 1 and 2 and, if appropriate, scope 3 and related risks	Section 3.2.1.2.2 and section 3.2.1.2.4
4.3. Description of objectives set by the Company to manage risks, opportunities and performance in relation to the Goals	Section 1.3.2, section 3.2.1.1, section 3.2.1.2.4 and section 3.2.1.2.5

### 3.8.4 MATERIALITY MATRIX

A materiality analysis consists of defining what may have a significant impact on a company, its activities and its ability to create value for itself and its stakeholders. The analysis identifies the important and pertinent issues likely to have an impact on the Company's performance, and ranks them according to their potential impact on the Company and its environment. The methodology governing the materiality analysis are the AA1000 standard regarding the involvement of stakeholders in identifying, understanding and responding to problems and concerns relating to sustainable development, and the GRI 101 standard which covers the quality and content of reporting, in order to respond to stakeholders' expectations <sup>(1)</sup>.

The 2017 analysis, used again in 2018, was carried out with the support of a specialist firm and underpinned by these international standards on the basis of documentary studies, interviews and workshops conducted with about one hundred people forming a representative cross-section of the Group's

stakeholders. The list of issues analysed was defined so as to cover all the subjects reflecting the current and future risks and opportunities for the Group's business. However, the materiality matrix is not intended to include all the issues that came to light during the process of preparation, but only the most material ones, resulting from the highest and most commonly held expectations between the Group and its stakeholders.

The project was carried out in three phases: identification of issues, prioritisation of issues and validation of results. External stakeholders included internationally recognised qualified individuals as well as representatives of the Group's main stakeholders (authorities, shareholders, banks, customers, partners, subcontractors, suppliers, NGOs, etc.); internally, members of the Executive Committee participated in the development process, as did managers from the Group's main departments and subsidiaries. The matrix was examined in a meeting of the EDF stakeholders' panel and the Sustainable Development Board <sup>(2)</sup>, then validated by the Executive Director, Innovation, Corporate Responsibility and Strategy.

The most material issues for stakeholders		<ul style="list-style-type: none"><li>• Quality and continuity of service</li><li>• Energy efficiency</li></ul>	<ul style="list-style-type: none"><li>• Development of renewable energies</li></ul>	<ul style="list-style-type: none"><li>• Innovation and new customer offers</li><li>• Decentralisation of production and self-consumption</li><li>• Performance and competitiveness of the nuclear power sector</li><li>• Security of existing and new nuclear power stations</li></ul>
	<ul style="list-style-type: none"><li>• Access to electricity in developing countries</li></ul>	<ul style="list-style-type: none"><li>• Ability of governance to integrate missions of public interest</li><li>• Responsible processing of data</li><li>• Adaptation of infrastructure and activity to the consequences of climate change</li></ul>	<ul style="list-style-type: none"><li>• Safety of facilities and connected infrastructure</li><li>• Production and management of radioactive waste and spent fuel</li><li>• Energy poverty of private individual customers</li></ul>	<ul style="list-style-type: none"><li>• Ability of governance to provide value creation and ensure the company's long term durability</li><li>• Changes to functions and skill sets</li><li>• Attracting and managing talent</li><li>• The place of nuclear in the energy mix</li><li>• Consultation with stakeholders</li><li>• Listening, transparency and open dialogue on nuclear power</li></ul>
	<ul style="list-style-type: none"><li>• Management and securing of the use of suppliers and subcontractors</li></ul>	<ul style="list-style-type: none"><li>• Business ethics</li><li>• Dismantling of power stations</li><li>• Duty of vigilance and responsible procurement</li></ul>	<ul style="list-style-type: none"><li>• Management of biodiversity and protection of environmental capital</li><li>• Quality of social dialogue</li></ul>	<ul style="list-style-type: none"><li>• Reduction and optimisation of energy from fossil sources in the production mix</li><li>• Replacement of fossil fuels by electricity and development of the uses of electricity</li></ul>
	<ul style="list-style-type: none"><li>• Management and securing of strategic supplies</li></ul>	<ul style="list-style-type: none"><li>• Regions and local communities: partnership and economic development</li><li>• Equal opportunities</li></ul>	<ul style="list-style-type: none"><li>• Management of milieux: ground and water pollution</li><li>• Air quality</li><li>• Accompanying social and cultural transformations of the Company</li></ul>	<ul style="list-style-type: none"><li>• Health and safety at work</li></ul>
		The most material issues for EDF		

(1) ISO 26000 and the work of the International Reporting Council (IRC) follow the same lines.

(2) This concerns the panel of external EDF stakeholders which contributes to challenging Group issues submitted to it (see section 3.1.1.2.2 Stakeholder panels).

#		Priorities	Sections
1	Governance	Ability of governance to provide value creation and ensure the Company's long term durability	section1, section4, section3.1.3
2		Ability of governance to integrate missions of public interest	section1, section4, section3.1.3
3		Business ethics	section3.5
4	Business models	New customer offers	section3.2.4
5		Decentralisation of production and self-consumption	section3.2.4
6		Management and securing of strategic supplies	section2
7		Development of renewable energies	section1
8		The place of nuclear in the energy mix	section1
9	Decarbonisation by production and its uses	Reduction and optimisation of energy from fossil sources in the production mix	section3.2.1.1
10		Energy efficiency	section3.2.4
11		Replacement of fossil fuels by electricity and development of the uses of electricity	section3.2.1, section3.2.4
12	Nuclear	Security of existing and New Nuclear power stations	section1
13		Performance and competitiveness of the nuclear power sector	section1
14		Listening, transparency and open dialogue on nuclear power	section1, section3.2.5
15		Management and securing of suppliers and subcontractors	section1, section3.3, section3.4
16		Production and management of radioactive waste and spent fuel	section1.4.1.1.4
17		Dismantling of power stations	section1.4.1.1.6
18	Infrastructure and continuity of service	Quality of service and supply continuity	section3.2.1
19		Adaptation of infrastructure and activities to the consequences of climate change	section3.3
20		Safety of facilities and connected infrastructure	section3.2.2
21	Environment	Management of biodiversity and protection of environmental capital	section3.2.6
22		Management of milieux: ground and water pollution	section3.3
23		Air quality	section3.3
24	Responsible employer	Changes to functions and skill sets	section3.2.2, section3.4
25		Accompaniment of the Company's social and cultural transformation	section1, section3.4
26		Health and safety at work	section3.2.2
27		Attracting and managing talent	section3.4.1.4
28		Quality of social dialogue	section3.4
29		Equal opportunities	section3.4
30	Responsible partner	Responsible processing of data	section3.2.2, section3.2.4, section3.5
31		Access to electricity in developing countries	section3.3
32		Energy poverty of private individual customers	section3.2.3
33		Consultation with stakeholders	section3.2.5
34		Duty of vigilance and responsible procurement	section3.3.3.4, section3.8.1
35		Regions and local communities: partnership and economic development	section3.2.4, section3.2.5, section3.3



## 3.9 REPORTING SYSTEM AND METHODOLOGY

### 3.9.1 REPORTING SYSTEM

The reporting system complies with the obligations of French law, in particular the Order dated 19 July 2017 on the publication of non-financial information by certain large companies and groups of companies, and its implementing decree of 9 August 2017; Article 173 of the Law of 15 August 2015 on Energy Transition for Green Growth; and the Law of 27 March 2017 on the duty of care of parent companies and ordering companies.

Even before the obligation to have financial statements audited by an Independent Third Party Organisation under Article L. 225-102-1 of the French Commercial Code in 2013, the Group had already made a voluntary commitment to do so in 2007. The sustainable development information published by the Group forms the basis for evaluations by ratings agencies or non-financial analysis departments on behalf of investors.

### 3.9.2 METHODOLOGY FOR SOCIAL AND ENVIRONMENTAL DATA

#### 3.9.2.1 Reporting scope

##### Principles

The scope covered by the *reporting process* (economic, environmental and social indicators) includes the entire EDF group as defined by the financial consolidation. More precisely, this scope includes EDF and the comprehensively integrated subsidiaries (integration of 100% of the value of the social and environmental indicators). Subsidiaries accounted for using the equity method are excluded from the reporting scope.

The social and environmental data are consolidated according to financial standards (IAS-IFRS) <sup>(1)</sup>. The entities acquired during the fiscal year are included in the scope of

consolidation on the year following the date of acquisition for environmental data, and the year of acquisition for social data if the acquisition was made more than six months from the reporting date. Workforce data for staff registered at 31 December and the data relating to the capacities of entities sold during the fiscal year is not included in the scope of consolidation.

The reporting indicators are used on the following basis:

- the scope of consolidation established by the Financial Department;
- the aforementioned rules in terms of variation of scope;
- the criteria linked to relevance of the subsidiaries' activities in terms of environmental and social impact:
  - for the environmental data, data from industrial activities that are significant in terms of environmental impact is reported, therefore, some subsidiaries included in the financial scope may not appear in the report due to their activity or their small size with respect to the environmental challenges,
  - concerning social data, the selection criterion is the entity's workforce (greater than 50).

For 2018, given the criteria presented above, the differences between the reporting scopes for the social and environmental indicators are as follows:

- subsidiaries taken into account in the reporting of environmental indicators and not in the reporting of social indicators: EDF Belgium (Belgium), EES (USA);
- subsidiaries taken into account in the reporting of social indicators and not in the reporting of environmental indicators: Citelum, G2S, CHAM, EDF Trading and China Holding.

Given the collection difficulties, the reporting scope may vary depending on the indicators. It is specified in the table of indicators for each indicator provided.

List of main entities included in the consolidation scope of the social and environmental data as of 31/12/2018		Scope of environmental indicators	Scope of social indicators
EDF Prod. & Commerce	Électricité de France (parent company)	X	X
EDF Regulated activities	Enedis (France)	X	X
	SEI (parent company)	X	X
	EDF PEI (France)	X	X
	Électricité de Strasbourg (France)	X	X
EDF Renewables (France)		X	X
Dalkia (France)		X	X
Framatome (France)		X	X
Other activities	SOCODEI (France)	X	X
	EES (USA)	X	
	Citelum (France)		X
	G2S (France)		X
	CHAM (France)		X
	EDF Trading (United Kingdom)		X
UK	EDF Energy	X	X
Italy	Edison	X	X
Other international	EDF Luminus (Belgium)	X	X
	EDF Belgium (Belgium)	X	
	EDF Norte Fluminense (Brazil)	X	X
	MECO (Vietnam)	X	X
	China Holding (China)		X

(1) Group reporting guidelines, chapter 6.

### Changes in scopes

The Group Polish companies were sold on 13 November 2017. The impact of this sale on non-financial figures is thus complete in 2018. Framatome joined the Group on 1 January 2018.

### 3.9.2.2 Further details on the environmental data

The environmental data in this document are based on methodological sheets. This is the Group's standard for reporting in force in 2018. All of the indicators relating to consumption and emissions are linked to the electricity and heat generation and marketing data, and to other processes related to these activities.

If data are missing, particularly during the last days of the year, estimates are made on the basis of the best information available at that date.

Dalkia's environmental indicators in relation to energy are consolidated over a sliding year, from 1 December N-1 to 30 November N. Other indicators are reported over year N.

### Further details on the indicators relating to water withdrawn and water returned

Indicators on cooling water include water withdrawn and water returned to rivers, the sea and water tables. For nuclear power electricity plants located on coastlines and for thermal power plants, the amounts of cooling water withdrawn and water returned are calculated on the basis of the operating time and nominal debit of pumps.

The CCGT cooling circuit is open for MECO. All water is thus returned, and no significant consumption is to be reported. On this basis, no amounts have been reported by MECO from 2018 onwards.

These indicators are not collected by EDF RE, a subsidiary of EDF Renewables in the United States, or by some Edison sites (only the operating centres managed by Fenice), as their values are negligible at Group level.

### Further details on air emissions

Air emissions from thermal power plants of the EDF group are measured or calculated on the basis of analyses of the fuels or based on standard emissions factors.

The Group's SF<sub>6</sub> emissions are calculated, as a matter of priority, on the basis of a mass balance or, to a lesser extent, using an estimation method approved by Executive Management at the entity in question (for example, application of a leakage rate).

GCC power plants outside EDF do not report dust emissions, which do not have a significant impact at the Group scale. MECO does not collect emissions of N<sub>2</sub>O and SF<sub>6</sub>, also without material impact at the scale of the Group. Dalkia Barkantine plant in the United Kingdom is outside of the scope. Indeed, emissions by that plant are negligible at Group level.

The Global Warming Potential (GWP) coefficients were updated for 2018 according to the recommendations of ADEME and GIEC <sup>(1)</sup>. They are 30 for CH<sub>4</sub>, 23,500 for SF<sub>6</sub> and 265 for N<sub>2</sub>O.

### Scope 1 direct emissions

The EDF group's scope 1 emissions are made up of direct emissions <sup>(2)</sup>:

1. of CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub> and SF<sub>6</sub>;
2. from the vehicle fleet;
3. from buildings;
4. from refrigerant leaks;
5. from hydroelectric dam reservoirs.

Historical reported data show a contribution of emissions from points 2, 3, 4 and 5 above of about 1.04% of the total of scope 1. Given the absence of these emissions at the reporting date, their amounts are estimated based on this historical contribution.

### Scope 3 indirect emissions

Every year, EDF establishes a greenhouse gas emissions report for the scope of the Group. It covers all of the companies in the non-financial reporting scope. Within this scope, the direct and indirect emissions (scopes 1, 2 and 3) are calculated according to the principles of the GHG Protocol Corporate Standard.

The 2017 GHG report enabled us to identify significant information items adopted for the 2018 fiscal year. In 2017, the three items representing the highest contributions to GHG emissions were: direct emissions of CO<sub>2</sub> of 50.5 million tonnes (34% of total emissions), indirect emissions associated with the combustion of gas sold to our end-customers (30% of total emissions), and indirect emissions associated with electricity purchased to serve our end customers (10% of total emissions).

### Further details on conventional waste

The conventional waste data were obtained on the basis of data available on the closing date for the quantities removed and the disposal channels. It should be noted that the reported data are not comprehensive concerning conventional industrial waste from EDF Renewables and from certain operational sites belonging to Edison (Fenice assets), as these data cannot, at this stage, be reported within the Group's reporting deadlines. Dalkia reports on the most significant sites.

Construction and decommissioning waste is included in this report, if its management falls under the responsibility of the EDF group. On the other hand, waste managed by service providers is not accounted for. Regarding Enedis, waste reporting is done on a rolling-year basis, from 1 November N-1 to 31 October N.

### Details on radioactive waste Concerning EDF

Indicators pertaining to "Very Low Level radioactive Waste (VLLW) from operations and from decommissioning" take into account:

- the actual volume of the VLLW directly evacuated from the Industrial Gathering, Storing, and Stockpiling Centre (Centre industriel de regroupement, d'entreposage et de stockage – CIRES) from the production sites, which corresponds:
  - to the volume of waste produced in the year for operating sites,
  - to the volume of waste shipped in the year for sites being decommissioned;
- the actual volume of VLLW waste packages sent to CIRES from Centraco (after upgrading) connected to processing by incineration and by merging EDF metallic waste. The volume to be attributed to sites in operation and sites being decommissioned is determined in proportion to the tonnages delivered by the sites in operation and by the sites being decommissioned.

Indicators pertaining to "Short Lived Low and Intermediate Level radioactive Waste (short lived LLW and ILW) from activity and from decommissioning" take the following into account:

- the actual volume of the short-lived LLW and ILW waste directly evacuated to the Aube Storage Centre (CSA) from the production sites, which corresponds:
  - to the volume of waste produced in the year for operating sites,
  - to the volume of waste shipped in the year for sites being decommissioned;
- the actual volume of LLW and ILW waste packages sent to the CSA from Centraco (after upgrading) connected to treatment by incineration and by merging with EDF waste. The volume to be attributed to sites in operation and sites being decommissioned is determined in proportion to the tonnages delivered by the sites in operation and by the sites being decommissioned.

Since 2016, the reduction in the volume contributed by treatment before storage (by ANDRA) has also applied to VLLW and also to packages sent by Centraco, where applicable. It includes the reduction in volume resulting from treatment before storage (the case of super-compacted waste).

For the indicator "Long-Lived High- and Intermediate-Level solid radioactive Waste", the packaging of the waste is taken into account in the calculation.

Given the technical constraints linked to processing operations, the packages are produced approximately ten years after the fuel has effectively generated waste. The indicator is thus an estimate that relies on the long existence of current

<sup>(1)</sup> See report from the IPCC (2013): [www.ecoinvent.org/database/](http://www.ecoinvent.org/database/).

<sup>(2)</sup> Excluding life cycle analysis of generation plants and fuel.

practices of packaging of Long-Lived waste that projects the current packaging ratio into the near future (number of packages effectively created following the processing of one tonne of fuel). This ratio essentially depends on the mixtures used to optimise the operations and is a combination:

- for waste generated directly by spent fuel: factors from the National Inventory of Radioactive Materials and Waste carried out by the National Agency for Radioactive Waste Management (ANDRA);
- for waste not generated directly from fuel (control rods, etc.) and for which an average lifespan of 10 years is assumed: on the basis of feedback.

### Concerning Framatome

Radioactive waste data from Framatome in France is similar to EDF's dismantling waste and so can be consolidated. Internationally, Class A waste (USA and Belgium), as well as negligible heat production waste (Germany), are not consolidated with French figures. Radioactive waste is shipped and handled in accordance with domestic regulations in force in each country. Reporting of this waste by country is therefore being integrated and will be published in 2019.

### Concerning EDF Energy

The data relating to the indicator "Intermediate-Level radioactive Waste" of nuclear activities of EDF Energy, are founded on the inventory of radioactive waste produced during the year, established by the Nuclear Decommissioning Authority. This is an estimate of the annual volume of waste that will be considered and classified as Intermediate-Level radioactive Waste at the end-of-life of the nuclear generation sites. These estimates include packaging necessary to allow the transport of wastes off site. All of the Intermediate-Level radioactive Waste is temporarily stored at the nuclear generation sites while waiting for a national decision on their final processing. An update of the national inventory was performed in 2016 and the inventory was published on the official site of the "UK Radioactive Waste Inventory" <sup>(1)</sup>.

"Low Level radioactive Waste" includes dessicants that are sent for processing in the form of Intermediate-Level Waste in compliance with applicable regulations.

### Further details on operational releases

EDF operational releases into air and water in France are subject to ongoing measures. The data for EDF is calculated on the basis of:

- measured data for tritium, over the period from December N-1 to November N;
- data measured in 2018 and calculated on the basis of generation of previous years, for carbon 14, of January N to December N.

The consolidation methodology takes account of the number of EDF reactors and SOCODEI operational units.

### Further details on the quantity of electricity and heat generated from renewable energies

For Dalkia, the quantity of electricity is measured. The quantity of heat generated using renewable energies is estimated through benchmark yields based on renewable fuel consumption.

## 3.9.2.3 Further details on social data

Since 2011, the population considered in data collection is all employees who have a non-suspended employment contract with one of the Group's companies.

### Further details on the workforce and transfers

For entities having left the consolidation scope during the year in question:

- the indicators calculated in aggregate since the start of the year take into account those entities for the period during which they belonged to the scope of consolidation;
- indicators measured at 31 December represent the situation at the end of the year and do not take into account the entities which have left the scope of consolidation.

The workforce includes employees shared between EDF and ENGIE. An employee working 50% for EDF is counted for 0.5 in the published workforce.

The indicators "Other arrivals" and "Other departures" include:

- movements between companies of the Group;
- movements of workers in the electricity and gas industry, in compliance with industry-based agreement (IEG status);
- movements of certain categories of employees, in particular those with rotating shifts, doctors and personnel made available by outside entities.

These movements are thus not recognised in hires, resignations or redundancies.

### Further details on calculating absenteeism

In its calculation of absenteeism, EDF includes absences for the following reasons: absences due to sickness, work and travel related injuries as well as absences due to other reasons such as unpaid leave and unjustified absences. Absences related to company and union activities, pre-retirement leave and maternity leave are not included. The number of hours worked used in the calculation of the absenteeism rate is the number of hours theoretically worked.

At the Group level, the "average number of absences" is the sum of absences due to sickness, counted in days worked in proportion to time worked by employees and absences due to work-related accidents, counted in calendar days.

### Further details on the accident indicators

Road accidents may be taken into account when local laws consider them as work-related accidents.

### Fatal service provider accidents

These include fatal accidents involving service providers that occurred during the course of work performed on behalf of the Company regardless of the level of subcontracting. Employee transit accidents while on work-related business are taken into account but not those occurring in transit between home and work.

### Fatal employee accidents

This indicator relates to the number of fatal employee workplace accidents and those occurring in transit between home and work. Only the Company's employees, including work-study employees and apprentices, are taken into account.

### Further details on the overall frequency rate

The Group's overall frequency rate represents the number of workplace accidents (employees and service providers, regardless of the level of subcontracting, including co-contracting and temporary employees) having resulted in one day or more of absence over a 12-month period per million hours worked. The hours worked used for calculating the frequency rate are actual hours corresponding to the hours of "exposure to risks" according to CNAM (French national insurance body).

(1) [ukinventory.nda.gov.uk](http://ukinventory.nda.gov.uk).

### Number of workplace accidents

As regards temporary employees and service providers, the accidents are declared by the temporary employment agency and by the service provider's employer in accordance with applicable local labour regulations. These include accidents that occurred in the course of work performed on behalf of EDF group on its facilities, equipment, sites, networks, etc. Activities conducted by service providers on their own sites, outside EDF group's facilities, are not taken into account.

For a "contracting" company, subcontracting involves entrusting a company, known as the "service provider", with carrying out one or more projects involving studies, design, development, manufacturing, implementation or maintenance. These include any interventions carried out by subcontractors under a contract on EDF group's facilities, equipment (sites, networks, etc.) within the scope of subcontracting as set out in paragraph 3.4.4.

As regards employees, these include the number of work-related accidents declared in accordance with applicable local labour regulations. The frequency rate for employees does not include the accidents occurring in transit between home and work. Any events declared are taken into account even if the Company is awaiting approval from an official body following any reservations.

### Number of hours worked

#### Number of hours worked by employees

The value to take into consideration is the number of hours worked and the "time an employee is exposed to risk under the orders of an employer".

An additional hour counts as an hour worked regardless of the manner or level of remuneration.

#### Number of hours worked by service providers

The number of hours worked by service providers can be calculated in various ways depending on the type of contract or the nature of the service performed.

When there is no way to formally ascertain the number of hours worked, the hours can be counted using time sheets from services provider employers, through time tracking tools or estimated based on a predetermined fixed hourly rate.

Activities conducted by service providers on their own sites, outside EDF group's facilities, are not taken into account.

The hours worked during services involving the transport of equipment or merchandise are not taken into account.

### Further details on integration of health and safety data

In 2017, health and safety data of the IMTECH subsidiary (incorporated into the Group in 2017), 50% held by EDF Energy and 50% by Dalkia, was 100% incorporated into the Dalkia data.

### Details on counting occupational diseases:

The process for listing the occupational diseases of agents working for EDF was changed during 2015. To ensure that all declarations of occupational diseases are processed in a harmonised manner and that the number of occupational diseases published does correspond to their number declared during the year and not rejected by the CPAM, EDF has set up a centralised declaration management system.

The figure of 19 published for 2018 corresponds to occupational illnesses declared and not rejected by CPAM as at 31 December 2018 and will only be consolidated in the 2019 balance sheet.

This situation is due to the fact that initial medical certificates dated 2018 will still be coming into the units, and therefore the PCST, in the months to come.

This delay makes it possible to take into account files received after 31 December.

For 2017, the consolidated figure came to 16. The discrepancy of 11 relates to files rejected by CPAM in 2018. This figure was definitively consolidated.

### Further details on the training indicators

The trainings for which supporting documentation are not received on the date of closure of the report are not taken into account.

The number of training hours includes the hours spent in class for staff on vocational training contracts.

### Further details on the indicators on employees with disabilities

In countries in which regulations do not impose any mandatory declaration of the number of employees with disabilities, the reported data are provided on the basis of voluntary statements of employees. Certain subsidiaries do not communicate this type of data.

### Clarification on the indicator: % of women on the Management Committees

The Management Committee is a decision-making body that meets one of the following criteria:

- all members correspond to 1.5 - 2% of the entity's total staff;
- the Chair is an executive manager or senior manager;
- the Chair of the Committee has a delegation of authority over capital expenditure related to the Company's objects;
- the Chair of the Management Committee has disciplinary authority over all or some of the entity's employees;
- the committees meet at least once a month.

Members of more than one Executive Committee within one subsidiary, or members of both a subsidiary's Executive Committee and an EDF Group Executive Committee are only counted once.

### 3.9.3 INDICATORS

#### 3.9.3.1 Group Sustainable Development policy and CSRG indicators<sup>(1)</sup>

	Unit	2018 result	2017 result	2016 result	Section of the Reference Document
<b>Committed to climate action <sup>(1)</sup></b>					
Direct scope 1 CO <sub>2</sub> emissions <sup>(2)</sup> √	Mt	35.5	51.3	48.5	3.2.1.1
<b>Committed to human development <sup>(3)</sup></b>					
Employee frequency rate for the overall Group (EDF + subsidiaries) <sup>(4)</sup>	-	3.5	-	-	3.2.2.1
Rate of women on the Management Committees <sup>(5)</sup>	%	26.3	-	-	3.2.2.2
% of employees having received training during the year <sup>(6)</sup>	%	83	83.7	85.9	3.4.1.3
<b>Committed to supporting fragile populations <sup>(7)</sup></b>					
Number of "energy support" initiatives <sup>(8)</sup>	Number	1,302,590	1,175,426	-	3.2.3.1
<b>Committed to helping each customer consume better <sup>(9)</sup></b>					
Customer visits on digital consumption monitoring platforms <sup>(10)</sup>	In millions <sup>(10)</sup>	27.7	-	-	3.2.4.1
<b>Committed to consultation <sup>(12)</sup></b>					
Projects subject to consultation	%	82	-	-	3.2.5.1
<b>Committed to biodiversity <sup>(13)</sup></b>					
Knowledge of the ecological quality of land <sup>(14)</sup>	%	69	68	-	3.2.6.1
<b>Air <sup>(15)</sup></b>					
SO <sub>2</sub> emissions	kt	21	31	37	3.3.2.2.3.1
NO <sub>x</sub> emissions	kt	45	63	60	3.3.2.2.3.1
Dusts	kt	3	4	3	3.3.2.2.3.1
<b>Conventional waste <sup>(16)</sup></b>					
Conventional waste recycling rate	%	87.1	85.0	89.9	3.3.2.1

(1) CSRG no. 1

(2) Target of 30 Mt by 2030, scope 1 direct emissions excluding life cycle analysis of generation plants and fuel.

(3) CSRG no. 2

(4) See section 3.9.2.3. "Further details on the social data".

(5) Number of women on the Management Committees / number of people on the Management Committees.

(6) The percentage of employees having received training relates to the number of employees having received training / Physical headcount at the end of the period.

(7) CSRG no. 3

(8) System deployed by phone by the 5,000 customer advisers and nearly 300 solidarity advisers, designed to assist any customers experiencing difficulties, analyse the situation and offer the most appropriate solutions (metropolitan France).

(9) CSRG no. 4

(10) EDF scope. Within the Group, digital consultation tools are also made available to customers. The integration of the number of consultations at Group level into a single indicator is currently under consideration.

(11) Annual number of pages viewed on the e.quilibre and EDF & MOI platforms.

(12) CSRG no. 5

(13) CSRG no. 6

(14) This is based on land surveys. In 2018, the scope of this indicator spanned EDF (mainland) and EDF Energy. It will gradually be extended to all Group entities.

(15) EDF group SD Policy section 2.3: "Reduce air emissions of SO<sub>x</sub>, NO<sub>x</sub> and dust from the Group's fossil-fired thermal fleet by 50% between 2005 and 2020." In 2005, emissions totalled 236, 209 and 14 kt, respectively.

(16) EDF group SD Policy section 2.5: "Achieve an overall conventional waste recovery rate of >90% by 2021."

√: 2018 indicator subject to reasonable assurance check by KPMG S.A.

(1) For details on how these indicators are calculated, see Section 3.9.2 "Methodology for social and environmental data".



## 3.9.3.2 Other indicators

## 3.9.3.2.1 Environmental indicators

	Unit	2018	2017	2016	GRI ref. <sup>(1)</sup>
<b>Fuel and raw materials – fuel consumption</b>					
Nuclear fuel loaded in reactor – EDF	t	1,095	1,104	1,042	301-1
Coal	kt	3,818	9,902	9,306	301-1
Heavy fuel oil	kt	753	931	885	301-1
Domestic fuel oil	kt	324	375	371	301-1
Natural gas	GWh LHV	103,390	106,125	110,720	301-1
Industrial gas	GWh LHV	298	371	335	301-1
Biomass	kt	2,233	2,254	2,676	301-1
<b>Water – raw materials consumed originating from sources outside the Company</b>					
Cooling water withdrawn	10 <sup>9</sup> m <sup>3</sup>	47.2	47.6	47.3	303-3
<i>of which fresh water</i>	10 <sup>9</sup> m <sup>3</sup>	15.4	16.0	16.2	303-3
<i>of which brackish (or estuary) water</i>	10 <sup>9</sup> m <sup>3</sup>	6.2	6.4	6.1	303-3
Cooling water returned	10 <sup>9</sup> m <sup>3</sup>	46.7	47.0	46.8	303-4
<i>of which fresh water</i>	10 <sup>9</sup> m <sup>3</sup>	14.9	15.5	15.7	303-4
<i>of which brackish (or estuary) water</i>	10 <sup>9</sup> m <sup>3</sup>	6.2	6.4	6.1	303-4
<b>Air – gas emissions</b>					
Indirect CO <sub>2</sub> emissions (combustion of natural gas sold to end users) <sup>(1)</sup> – scope 3	Mt eq. CO <sub>2</sub>	54.0	48.8	47.5	305-3
Indirect CO <sub>2</sub> emissions (electricity purchased to serve our end customers) – scope 3	Mt eq. CO <sub>2</sub>	18.9	15.4	14.0	305-3
CH <sub>4</sub> emissions	kt eq. CO <sub>2</sub>	37.0	45.8	44.4	
N <sub>2</sub> O emissions	kt eq. CO <sub>2</sub>	172.0	186.9	267.1	
SF <sub>6</sub> emissions – EDF	kt eq. CO <sub>2</sub>	48.8	38.5	52.1	
SF <sub>6</sub> emissions	kt eq. CO <sub>2</sub>	65.1	53.0	67.5	
SO <sub>2</sub> emissions	kt	20.7	31.2	37.3	305-7
NO <sub>x</sub> emissions	kt	45.1	63.0	59.5	305-7
Dusts	t	3,291	4,170	2,783	305-7
PM10 particles - EDF, EDF Energy, PEI and Polish companies (until 13/11/2017)	t	456	928	1,449	305-7
PM2.5 particles - EDF, EDF Energy, PEI and Polish companies (until 13/11/2017)	t	226	267	217	305-7
Mercury - EDF	t	0.015	0.023	0.02	
Mercury <sup>(2)</sup>	t	0.43	0.10	0.21	305-7
<b>Conventional waste</b>					
Hazardous waste	t	58,833	52,659	51,643	306-2
Non-hazardous waste	t	417,151	557,454	623,957	306-2
Conventional industrial waste recycled or transported for recycling	t	414,627	518,591	607,171	306-2
Ash produced	kt	487	1,105	1,205	306-2
<b>Direct energy consumption, by primary source</b>					
Internal consumption, pumping electricity	TWh	7.3	7.1	7.0	302-1
Internal consumption, electricity and heat (excl. pumping)	TWh	22.3	22.3	21.1	302-1

(1) The emission factor for gas combustion has changed from 0.205kg CO<sub>2</sub>/kWh LHV to 0.187kg CO<sub>2</sub>/kWh. This new factor has been applied since 2018.

(2) These values now include emissions from Dalkia's fleet (0.36 tonnes in 2018). The 2017 value does not include some of Polska's power plants (Polish companies sold on 13/11/17).

NUCLEAR INDICATORS – GROUP IN FRANCE <sup>(1)</sup>

	Unit	2018	2017	2016	GRI ref.
<b>Radioactive emissions to water</b> <sup>(2)</sup>					
Carbon-14	GBq/oper. un.	9.314	9.539	12.853 (11.712)*	306-1
Tritium	TBq/oper. un.	17.169	15.592	17.423 (17.105)*	306-1
<b>Radioactive emissions to air</b> <sup>(2)</sup>					
Carbon-14	TBq/oper. un.	0.163	0.148	0.161 (0.156)*	305-7
Tritium	TBq/oper. un.	0.419	0.447	0.640 (0.455)*	305-7
<b>Fuel</b>					
Transported spent nuclear fuel	t	1,086	1,161	1,170	
<b>Decommissioning nuclear and industrial waste</b>					
Very Low Level radioactive Waste (VLLW) <sup>(3)</sup>	m <sup>3</sup>	4,111	1,186	2,171	
Low and Intermediate Level radioactive Waste (LLW and ILW) <sup>(3)</sup>	m <sup>3</sup>	321	410	443	
<b>Nuclear waste from operations</b>					
Very Low Level solid radioactive Waste <sup>(3)</sup>	m <sup>3</sup>	3,289.3	3,535.9	3,472.1	
	m <sup>3</sup> /TWh		-	8.849	
Short Lived Low and Intermediate Level solid radioactive Waste <sup>(3)</sup>	m <sup>3</sup>	5,827.4	5,603.4	5,687.0	
	m <sup>3</sup> /TWh		-	14.764	
Long-Lived High and Intermediate Level solid radioactive Waste <b>[*]</b>	m <sup>3</sup>	315.4	300.2	299.7	
	m <sup>3</sup> /TWh		-	0.873	

N.B. With a view to homogenising units of measurement, radioactive waste will be expressed in m<sup>3</sup>. Former values in m<sup>3</sup>/TWh are presented for information only.

Radioactive waste is presented by reactor and operational unit.

(1) The Group's scope in France includes EDF, Framatome and SOCODEL.

(2) The methodology relating to nuclear waste was updated in 2017 (see section 3.9.2.2 Methodology for social and environmental data).

(3) The methodology relating to nuclear waste from dismantling and activity was updated in 2016 (see section 3.9.2.2 Methodology for social and environmental data). In 2018, the methodology for dismantling/industrial waste was updated to include Framatome. The impact of Framatome in 2018 relates to the VLLW Dismantling and Industrial Waste indicator, with 1,383m<sup>3</sup>.

\* The values determined according to the new methodologies are presented in brackets.

## NUCLEAR INDICATORS – GROUP IN THE UNITED KINGDOM

	Unit	2018	2017	2016	GRI ref.
<b>Radioactive emissions to water</b>					
Tritium – AGR reactor (Advanced Gas-cooled Reactor)	TBq/react.	142.973	154.770	156.154	306-1
Tritium – PWR reactor (Pressurised Water Reactor)	TBq/react.	11.309	31.928	23.374	306-1
<b>Radioactive emissions to air</b>					
Carbon-14 – AGR reactor	TBq/react.	0.764	0.889	0.762	305-7
Carbon-14 – PWR reactor	TBq/react.	0.206	0.221	0.231	305-7
Tritium – AGR reactor	TBq/react.	0.578	0.614	0.674	305-7
Tritium – PWR reactor	TBq/react.	0.341	0.697	0.557	305-7
<b>Fuel</b>					
Uranium sent to off site	t	194	197	180	
<b>Nuclear waste</b>					
Transported Low Level radioactive Waste <b>[*]</b>	m <sup>3</sup>	474	453	774	
Generated Intermediate Level radioactive Waste	m <sup>3</sup>	161	161	161	

[\*] **IND** Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4).

## 3.9.3.2.2 Nuclear safety indicators

NUMBER OF LEVEL 2 EVENTS ON THE INES SCALE <sup>(1)</sup>

	2018	2017	Section of the Reference Document
EDF	-	4	1.4.1.1.3
Framatome	-	-	1.4.1.3.4
EDF Energy	1	-	1.4.5.1.2.1
<b>NUMBER OF SIGNIFICANT LEVEL 2 EVENTS [*]</b>	<b>1</b>	<b>4</b>	

(1) International Nuclear Event Scale.

## 3.9.3.2.3 Economic indicators

	Unit	2018	2017	2016	GRI ref. <sup>(1)</sup>
<b>Economic indicator – EDF</b>					
Compensation paid or to be paid following a legal decision in environmental matters <sup>(2)</sup>	€000	1,941	0	21	307 - 1
<b>Environmental management – Group</b>					
% of the Group's consolidated sales covered by an ISO 14001 certification <sup>(3)</sup>	%	95.6	98.4	98.0	

(1) GRI - Global Reporting Initiative, version G4.

(2) Excluding court fees and for definitive legal decisions.

(3) Including companies included in the ISO 14001 Group certification and excluding companies under independent management.

[\*] IND Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4).

## 3.9.3.2.4 Social indicators

EDF GROUP	Unit	2018	2017	2016	GRI ref.
<b>Workforce as of 31/12/2018 and breakdown</b>					
EDF	Number	65,368	66,789	68,464	102-8
Enedis		38,691	38,888	38,742	102-8
TOTAL EDF group ✓	Number	165,790	152,033	154,845	102-8
Total EDF group headcount (full-time equivalent – FTE)	Number	162,209	148,785	154,808	102-8
<b>Employee breakdown by age</b>					
Under 25 years old ✓	%	7%	7%	7%	102-8
From 25 to 35 years old ✓	%	29%	30%	29%	102-8
From 36 to 45 years old ✓	%	26%	26%	26%	102-8
From 46 to 55 years old ✓	%	26%	26%	27%	102-8
56 years old and older ✓	%	12%	11%	11%	102-8
Managers	Number	52,366	45,517	45,474	102-8
Percentage of women at managerial level <sup>(1)</sup>	%	35%	32.5%	31.06%	102-8
Non-management employees	Number	113,424	106,515	109,372	102-8
<b>Workplace equality</b>					
Male workforce ✓	Number	124,889	112,504	114,503	102-8
Female workforce ✓	Number	40,901	39,529	40,342	102-8
Male managers	Number	37,888	32,654	32,941	102-8
Female managers	Number	14,478	12,863	12,533	102-8
% of women on the Management Committees <sup>(2)</sup>	%	26.3	-	-	405-1
<b>Hires/departures</b>					
Hires	Number	9,809	9,398	7,724	401-1
Retirement departures/inactive employees	Number	3,775	5,031	6,591	401-1
Resignations <sup>(3)</sup>	Number	3,141	2,397	2,062	401-1
Redundancies, dismissals, people made inactive	Number	1,114	2,140	1,882	401-1
Turnover <sup>(4)</sup>	%	5.4	6.13	5.89	401-1
Other arrivals <sup>(5)</sup>	Number	6,739	9,999	8,270	401-1
Other departures <sup>(5)</sup>	Number	8,562	7,825	8,152	401-1
<b>Compensation</b>					
Total gross compensation	€m	See note 10.1	See note 10.1	See note 10.1	
Part-time employees	Number	Staff costs	Staff costs	Staff costs	
		10,406	9,264	10,061	102-8
<b>Absenteeism</b>					
Average number of days lost through illness and accidents	Number	9.12	9.19	9.55	403-2
<b>Health and safety conditions</b>					
Fatal employee accidents	Number	6	6	1	403-2
Accident frequency rate <sup>(6)</sup>		2.7	2.7	2.7	403-2
Overall Group frequency rate (EDF + subsidiaries)		3.5	-	-	403-2
Employee workplace accidents with at least one lost day	Number	667	613	645	403-2
Accident severity rate <sup>(7)</sup>		0.13	0.15	0.16	403-2
<b>Employee relations</b>					
Employees covered by collective bargaining agreements	%	88	89	91	102-41

EDF GROUP	Unit	2018	2017	2016	GRI ref.
<b>Training</b>					
Hours of training provided	Number	7,629,101	7,830,735	8,306,479	404-1
Number of employees benefiting from training	Number	138,131	129,479	133,130	404-1
% of employees having completed training <sup>(8)</sup>	%	83	83.7	85.9	404-1
<b>Employment and integration of employees with disabilities</b>					
Number of employees with disabilities <sup>(9)</sup>	Number	5,640	5,279	5,211	102-8

(1) This percentage represents the number of women in managerial positions/the number of female employees.

(2) This percentage, collected since 2018, represents the number of women on the Management Committees / number of people on the Management Committees

(3) The end of special contracts (including work-study employees) are counted under "Other departures", regardless of the action that may be taken. Departures during probationary periods are counted under "Other departures".

(4) Turnover is calculated as follows: entries (number of hires) + exits from the workforce (number of retirements + number of resignations + number of redundancies, dismissals, individuals placed on inactive status) divided by two and compared with the physical headcount at the end of the period multiplied by 100.

(5) Entries and exits from scope are accounted for under: "Other arrivals" and "Other departures" respectively. Work-study employees are accounted for under "Other entries".

(6) The frequency rate represents the number of workplace accidents involving at least one lost day for every million hours worked.

(7) The accident severity rate represents the number of days lost for every thousand hours worked.

(8) The % of employees having received training corresponds to the number of employees having received training / Physical headcount at the end of the period.

(9) In certain subsidiaries, this data is declarative.

√: 2018 indicator subject to reasonable assurance check by KPMG S.A.



## 3.10 REPORT BY ONE OF THE STATUTORY AUDITORS, APPOINTED AS INDEPENDENT THIRD PARTY

### Report by one of the Statutory Auditors, appointed as independent third party, on the consolidated non-financial performance statement included in the Management Report

*This is a free English translation of the Statutory Auditor report issued in French and is provided solely for the convenience of English-speaking readers. This report should be read in conjunction with, and construed in accordance with, French law and professional standards applicable in France.*

For the year ended 31 December 2018

To the Annual General Meeting,

In our capacity as Statutory Auditor of EDF S.A., appointed as independent third party and certified by the French Accreditation Committee (*Comité Français d'Accréditation* or COFRAC) under number 3-1049 <sup>(1)</sup>, we hereby report to you on the consolidated non-financial performance statement for the year ended 31 December 2018 (hereinafter the "Statement"), included in the Management Report, in accordance with the legal and regulatory provisions of Articles L.225 102-1, R. 225-105 and R.225-105-1 of the French Commercial Code (*Code de commerce*).

#### Responsibility of the Company

It is the Management Board responsibility to prepare a Statement in accordance with legal and regulatory provisions, including a presentation of the business model, a description of the main non-financial risks, a presentation of policies applied to mitigate these risks and the outcomes of those policies, including key performance indicators.

The Statement has been prepared applying the procedures of the Company (hereinafter the "Guidelines"), the most significant aspects of which are presented in the Statement and available upon request at the Company's headquarters.

#### Independence and quality control

Our independence is defined by the provisions of Article L.822-11-3 of the French Commercial Code and the French Code of Ethics (*Code de déontologie*) for statutory auditors. Moreover, we have implemented a quality control system that includes documented policies and procedures to ensure compliance with applicable ethical rules, professional standards, laws and regulations.

#### Statutory Auditor's responsibility

On the basis of our work, it is our responsibility to express a limited assurance opinion about whether:

- the Statement complies with the provisions of Article R. 225-105 of the French Commercial Code;
- the information provided is fairly presented in accordance with Article R.225-105-I(3) and II of the French Commercial Code concerning policy outcomes, including key performance indicators and actions relating to the main risks (hereinafter the "Information").

It is our responsibility to express, at the request of the Company and outside of the scope of accreditation, reasonable assurance that information selected <sup>(2)</sup> by the Company and identified by the symbol √ in chapter 3 of the Management Report has been prepared, in all material respects, in accordance with the Guidelines.

However, it is not our responsibility to express an opinion on:

- the Company's compliance with any other applicable legal and regulatory provisions, relating, in particular, to the duty of care requirement and the fight against corruption and tax evasion;
- the compliance of products and services with applicable regulatory provisions.

#### Nature and scope of our work

We performed our work described below in compliance with Article A.225-1 *et seq.* of the French Commercial Code, defining the conditions under which the independent third party performs its engagement, and with the professional guidance issued by the French Institute of Statutory Auditors (*Compagnie nationale des commissaires aux comptes* or CNCC) relating to this engagement, and with ISAE 3000 (*International standard on assurance engagements other than audits or reviews of historical financial information*).

We conducted work to form an opinion on the Statement's compliance with legal and regulatory provisions and the fair presentation of the Information therein:

- We gained an understanding of the activity of all companies in the consolidation scope, of the entity's exposure to the main social and environmental risks relating to the business activity and, if applicable, of its effects on respect for human rights and the fight against corruption and tax evasion, including any related policies and their outcomes;
- We assessed the appropriateness of the Guidelines in terms of their relevance, completeness, reliability, neutrality and clarity, by taking into consideration, where relevant, the sector's best practices;
- We verified that the Statement covers every category of information required under Article L.225-102-1, Paragraph III concerning social and environmental matters as well as respect for human rights and the fight against corruption and tax evasion;
- We verified that the Statement presents the business model and the main risks relating to the activity of all companies in the consolidation scope, including – if relevant and proportionate – risks due to its business relationships, products or services, in accordance with the disclosures required under Article R. 225-105-I, and policies, due diligence procedures and outcomes, including key performance indicators;
- We verified that the Statement presents the disclosures required under article R. 225-105-II if they are relevant given the main risks or policies presented;
- We obtained an understanding of the process for identifying, prioritizing and validating the main risks;
- We enquired about the existence of internal control and risk management procedures implemented by the Company;
- We verified that the Statement covers all companies in the consolidation scope in accordance with Article L. 233-16 within the limits specified in the Statement;
- We assessed the data collection process implemented by the entity to ensure the completeness and fair presentation of the policy outcomes and key performance indicators that must be mentioned in the Statement;

(1) Scope available at [www.cofrac.fr](http://www.cofrac.fr)

(2) Total EDF group workforce as of 31 December, breakdown by age and gender; Direct CO<sub>2</sub> emissions (scope 1) from electricity and heat production (including installations not subject to quotas).

- For key performance indicators and the other quantitative outcomes that we considered the most important, we set up:
  - analytical procedures to verify that data collected are correctly consolidated and that any changes to the data are consistent;
  - tests of details based on sampling to verify that definitions and procedures are correctly applied and to reconcile data with supporting documents. The work was carried out with a selection of entities contributing <sup>(1)</sup> to the reported data and represents between 25 and 100% of consolidated data of key performance indicators and outcomes selected for these tests;
- We referred to documentary sources and conducted interviews to corroborate the due diligence procedures that we deemed the most important (organization, policies, actions, qualitative outcomes);
- We assessed the overall consistency of the Statement based on our understanding of the Company.

Environmental indicators	Assurance
Direct CO <sub>2</sub> emissions (scope 1) from electricity and heat production (including installations not subject to quotas)	Reasonable
Coal consumption	Limited
SO <sub>2</sub> emissions	
NO <sub>x</sub> emissions	
SF <sub>6</sub> emissions	
Dusts	
Indirect CO <sub>2</sub> emissions (scope 3) from combustion of natural gas sold to end users	
Quantity of electricity and heat generated using renewable energies (other than hydropower)	
Nuclear fuel loaded in reactors	
Radioactive emissions to air: Carbon-14, Tritium (EDF)	
Radioactive emissions to water: Carbon-14, Tritium (EDF)	
Decommissioning nuclear and industrial waste: Very Low-Level radioactive Waste (VLLW) (EDF and Framatome France)	
Decommissioning nuclear and industrial waste: Low and Intermediate-Level radioactive Waste (LLW and ILW) (EDF)	
Nuclear waste from operations: Very Low-Level solid radioactive Waste (EDF)	
Nuclear waste from operations: Short-Lived Low and Intermediate-Level solid radioactive Waste (EDF)	
Nuclear waste from operations: Long-Lived High and Intermediate-Level solid radioactive Waste (EDF)	
Radioactive emissions to water: Tritium (EDF Energy)	
Radioactive emissions to air: Carbon-14, Tritium (EDF Energy)	
Uranium sent to off site (EDF Energy)	
Transported low-level radioactive waste (EDF Energy)	
Generated Intermediate-Level radioactive waste (EDF Energy)	
EDF group's Electric Vehicles rate in the fleet of light vehicles	
Social indicators	Assurance
Workforce as of 31 December, breakdown by age and gender	Reasonable
Managers, breakdown by gender	Limited
Hours of training provided	
Number of employees benefiting from training	
Average number of days lost through illness and accidents	
Work related illnesses reported in the year to Social Security (EDF)	
Fatal accidents (employees) – Fatal accidents (third party provider)	
Workplace accidents involving at least one lost day (employees)	
Accident frequency rate (employees)	
Accident severity rate (employees)	
Percentage of women at managerial level	
Number of employees with disabilities	
Rate of women on the Management Committees	
Societal indicators	Assurance
Customer visits on digital consumption monitoring platforms	Limited
Number of alerts registered in the Group's whistleblowing system (excluding RTE and Enedis)	

(1) List of the contributing entities annexed to this report

**Qualitative information**

Social policies	<ul style="list-style-type: none"> <li>■ Health and safety at work</li> <li>■ Attracting and managing talent</li> <li>■ Quality of social dialogue</li> <li>■ Equal opportunities</li> </ul>
Environmental policies	<ul style="list-style-type: none"> <li>■ Development of renewable energies</li> <li>■ Reduction and optimisation of energy from fossil sources in the production mix</li> <li>■ Energy efficiency</li> <li>■ Processing and management of radioactive waste and spent fuel</li> <li>■ Adaptation of infrastructure and activities to the consequences of Climate Change</li> <li>■ Management of biodiversity and protection of environmental capital</li> <li>■ Management of milieux: ground and water pollution</li> </ul>
Societal policies	<ul style="list-style-type: none"> <li>■ Regions and local communities: partnership and economic development</li> <li>■ Duty of vigilance and responsible procurement</li> <li>■ Business ethics</li> <li>■ Management and securing of suppliers and subcontractors</li> <li>■ Security of existing and New Nuclear power stations</li> </ul>

We believe that the sampling methods and sample sizes we have used, based on our professional judgment, are sufficient to provide a basis for our limited assurance opinion. A higher level of assurance would have required us to carry out more extensive procedures.

Due to the use of sampling techniques and other limitations inherent to information and internal control systems, the risk of not detecting a material misstatement in the Statement cannot be totally eliminated.

**Means and resources**

Our work drew on the skills of twelve individuals. To assist us in conducting our work, we called on our firm's sustainable development and corporate social responsibility specialists. We conducted about 40 interviews with the individuals responsible for preparing the Statement.

**Opinion**

Based on our work, and given the scope of our responsibilities, we have no material misstatements to report that would call into question the Statement's compliance with the applicable regulatory provisions, or the fair presentation of the information, taken as a whole, in accordance with the Guidelines.

**Reasonable assurance on a selection of CSR information****Nature and scope of our work**

With regard to the information selected by the Company and identified with the symbol √, we conducted the same procedures as those described in the paragraph "Nature and scope of our work". However, these procedures were more in-depth, particularly regarding the number of tests.

Consequently, the selected sample represents 98% of headcount and 65% of direct CO<sub>2</sub> emissions (scope 1) from electricity and heat production (including installations not subject to quotas).

We believe that these procedures enable us to express reasonable assurance regarding the information selected by the Company and identified with the symbol √.

**Conclusion**

In our opinion, the information selected by the Company and identified with the symbol √ has been prepared, in all material respects, in accordance with the Guidelines.

Paris La Défense, 14 February 2019

KPMG S.A.

Anne Garans  
Partner, Sustainability Services

Fanny Houlliot  
Partner, Sustainability Services

Michel Piette  
Partner

Jean-Louis Caulier  
Partner

**Appendix: selection of contributing entities****Sample of selected entities**

Within EDF	Agence RH de Lille
	Agence RH de Rouen
	Agence Entités et Filières Centrales
	Pôle Compétences Santé au Travail de Mulhouse
	Centre Nucléaire de Production d'Electricité de Saint Laurent
	Centre Nucléaire de Production d'Electricité de Penly
	Centre Nucléaire de Production d'Electricité de Chinon
	Centrale de Production Thermique du Havre
	Division Production Nucléaire – Unité d'Ingénierie d'Exploitation
	Division Production Nucléaire – Unité Technique Opérationnelle
	Division Ingénierie Nucléaire – Direction de Projets Déconstruction Déchets
	Division Combustible Nucléaire
	Division Production Ingénierie Thermique
Within Enedis	Enedis head office
	Direction Régionale Alpes (HR)
Within Framatome	Fuel assembly manufacturing site in Romans
	Fuel assembly manufacturing site in Lingen
Within Insular Energy System	Thermal Generation plant in Vazzio
Within EDF PEI	PEI head office (Environment)
Within EDF Energy	Nuclear power plant of Hunterston B
	Nuclear power plant of Torness
	Coal power plant of Cottam
	EDF Energy Crawley Headquarters (HR)
Within EDF Renewables	EDF EN Services, USA
	EDF EN Corporate, Paris La Défense head office
Within Edison	Power plant in Simeri Crichi
	Power plant in Parma (Fenice)
	Fenice S.p.A Headquarters, Rivoli, Torino (HR)
	Edison group Headquarters, Milan
Within Dalkia	Direction Régionale Méditerranée
	Direction Régionale Ile-de-France
	CRAM
	Dalkia, Lille head office (HR)
Within EDF Luminus	EDF Luminus
	EDF Luminus SA, Bruxelles head office (HR)
Within Citelum	Citelum France head office (HR)
Within MECO	Combined Cycle Gas Turbine power plant of MECO

## 4. CORPORATE GOVERNANCE

<b>4.1</b>	<b>CORPORATE GOVERNANCE CODE</b>	<b>238</b>
<b>4.2</b>	<b>MEMBERS AND FUNCTIONING OF THE BOARD OF DIRECTORS</b>	<b>240</b>
4.2.1	Members of the Board of Directors	240
4.2.2	Functioning of the Board of Directors	258
4.2.3	Board of Directors' Committees	262
<b>4.3</b>	<b>BODIES CREATED BY EXECUTIVE MANAGEMENT</b>	<b>269</b>
4.3.1	Members of the Executive Committee	269
4.3.2	Personal information on members of the Executive Committee	269
<b>4.4</b>	<b>CONFLICTS OF INTEREST, ABSENCE OF CONVICTIONS OF THE MEMBERS OF THE ADMINISTRATIVE BODIES AND EXECUTIVE MANAGEMENT, CONTRACTS FOR SERVICES</b>	<b>271</b>
4.4.1	Conflicts of interest	271
4.4.2	Absence of convictions	271
4.4.3	Contracts for services	271
<b>4.5</b>	<b>SHAREHOLDING BY DIRECTORS AND TRADING IN EDF SECURITIES BY CORPORATE OFFICERS AND EXECUTIVES</b>	<b>272</b>
4.5.1	Shareholding by directors	272
4.5.2	Trading in company securities	272
<b>4.6</b>	<b>COMPENSATION AND BENEFITS</b>	<b>273</b>
4.6.1	Compensation of corporate officers	273
4.6.2	Stock options – Bonus shares	276
<b>4.7</b>	<b>REPORT BY THE STATUTORY AUDITORS, PREPARED IN ACCORDANCE WITH ARTICLE L. 225-235 OF THE FRENCH COMMERCIAL CODE, ON THE REPORT OF THE BOARD OF DIRECTORS ON CORPORATE GOVERNANCE</b>	<b>276</b>



### 4.1 CORPORATE GOVERNANCE CODE

EDF has signed up to the AFEP-MEDEF Code <sup>(1)</sup>, which is the Corporate Governance Code to which the Company refers, in accordance with Article L. 225-37-4 of the French Commercial Code <sup>(2)</sup>, subject to the specific laws and regulations applicable to EDF.

These specific laws and regulations, in accordance with EDF's status as a state-owned company and in particular the application to the Company of Order no. 2014-948 of 20 August 2014 and its implementing texts, and decree no. 53-707 of 9 August 1953, are detailed in this Reference Document and relate specifically to:

- the members of the Board of Directors (see section 4.2.1 "Members of the Board of Directors");

- the terms and conditions for the appointment of the Chairman and Chief Executive Officer of EDF and the method of Executive Management (see section 4.2.2.2 "Method of Executive Management – Appointment and powers of the Chairman and Chief Executive Officer");

- the terms and conditions for the setting of the compensation of the Chairman and Chief Executive Officer (see section 4.6.1.1.1 "Terms and conditions for the setting of compensation").

In addition to the aforementioned specific laws and regulations, the table below sets out the AFEP-MEDEF Code recommendations that are not applied by the Company and the related explanations:

AFEP-MEDEF Code recommendation	Company's position	Explanation	Relevant section of the Reference Document
Staggered re-election of the Board of Directors Recommendation no. 13.2: <i>"Terms should be staggered so as to avoid replacement of the entire body and to favour a smooth replacement of directors".</i>	The Shareholders' Meeting called on 15 May 2018 to amend Article 13 of EDF's articles of association, starting from the Shareholders' Meeting held in 2019, to implement the staggered re-election of half of the Board of Directors every other year, excluding the directors elected by the employees and the representative of the French State appointed by decree.	The staggered re-election will be implemented during the Shareholders' Meeting of 16 May 2019.	See section 4.2.2.1 "Term of office of directors – Staggered re-election of the Board".
Succession plan of executive corporate officers Recommendation no. 16.2.2: <i>"The Appointments Committee (or an ad hoc Committee) prepares a succession plan of the executive corporate officers."</i>	The internal rules of procedure of the Board of Directors provide for the Appointments and Compensation Committee to ensure the existence of succession plans in order to anticipate the succession, whether unforeseen or at the end of their term, of executive corporate officers. Nevertheless, the Committee has not reviewed the succession plan concerning the Chairman and CEO within the scope of his work.	In accordance with the provisions of Article 13 of the French Constitution, EDF's Chairman and CEO is appointed by decree of the President of the Republic, on recommendation of the Board of Directors, based on the opinion of the permanent Committees of the French National Assembly and Senate.	See section 4.2.2.2 "Method of Executive Management – Appointment and powers of the Chairman and Chief Executive Officer"
Holding of company shares by directors Recommendation no. 19: <i>"The Director should personally be a shareholder and, by virtue of the provisions in the by-laws or the internal regulations, hold a minimum number of shares that is significant in relation to the directors' fees awarded. If he or she does not hold these shares when assuming office, he or she should use his or her directors' fees to acquire them".</i>	The Company's articles of association and the Board's internal rules of procedure do not require directors to hold a minimum number of shares that is significant in relation to the directors' fees awarded.	In accordance with the law of 26 July 1983, the directors representing the employees receive no directors' fees. Furthermore, the directors' fees payable to directors recommended by the French State who are civil servants are paid to the French State budget. Directors appointed on the recommendation of the State who are not civil servants, can only receive 85% of the directors' fees due to them, the remainder being paid to the French State budget. Finally, the Chairman of the Board of Directors does not receive any directors' fees. Taking account of the wide range of situations, the Board has not established a unique rule on the holding of the Company's shares. Furthermore, each Director must act in the Company's best interests, irrespective of the number of company shares they hold personally.	See sections 4.6.1.3 ("Total compensation of directors") and 4.5 ("Shareholding by directors and trading in EDF securities by corporate officers and executives").

(1) Code updated in June 2018.

(2) After having considered the AFEP-MEDEF recommendations of October 2008 on the compensation of corporate officers and executives of companies, the Company's Board of Directors' meeting of 17 December 2008 approved these recommendations, deeming that they are in line with EDF's corporate governance approach, and that they had already been implemented by the Company.

<b>AFEP-MEDEF Code recommendation</b>	<b>Company's position</b>	<b>Explanation</b>	<b>Relevant section of the Reference Document</b>
<p>Requirement for corporate officers to hold shares</p> <p>Recommendation no. 22:</p> <p><i>"The Board of Directors defines a minimum number of registered shares that the corporate officers must retain through to the end of their term of office. This decision is reviewed at least on each extension of their term of office. (...) Until this objective regarding the holding of shares has been achieved, the corporate Officers will devote a proportion of exercised options or awarded performance shares to this end as determined by the Board".</i></p>	<p>The Board of Directors has not set rules for the holding by the Chairman and Chief Executive Officer of a minimum number of the Company's shares.</p>	<p>The Chairman &amp; Chief Executive Officer does not receive directors' fees. His compensation is limited in accordance with decree no. 53-707 of 9 August 1953 modified by decree no. 2012-915 of 26 July 2012. Finally, the Company has not put in place a stock and/or performance stock option plan in favour of the Chairman and Chief Executive Officer. Accordingly, it was decided to not implement this recommendation. Furthermore, the executive corporate officer must also act in the Company's best interests, irrespective of the number of company shares they hold personally.</p>	<p>See sections 4.6.1.1 ("Total compensation of the Chairman and CEO"), 4.6.2 ("Stock options - Bonus shares").</p>
<p>Rules for the distribution of directors' fees</p> <p>Recommendation no. 20.1:</p> <p><i>The method of distribution of directors' compensation "should take into account, in such ways as it shall determine, the directors' actual attendance at meetings of the Board and Committees, and the amount shall therefore consist primarily of a variable portion".</i></p>	<p>A significant but not "preponderant" share of the directors' fees is dependent upon actual attendance by the directors of the Board and Committee meetings.</p>	<p>Special distribution rules were adopted, which in particular take account of the level of responsibilities and the time spent by the directors on their duties. Though the variable share of compensation paid in directors' fees that compensates the actual presence of directors is not preponderant, the Company considers that it is nonetheless significant, insofar as it accounts for 50% of the total budget of directors' fees and, as recommended by the AFEP-MEDEF Code, as it is appropriate to the level of responsibilities assumed by the directors and to the time that they must spend on their duties.</p>	<p>See section 4.6.1.3 ("Total compensation of directors").</p>

## 4.2 MEMBERS AND FUNCTIONING OF THE BOARD OF DIRECTORS

### 4.2.1 MEMBERS OF THE BOARD OF DIRECTORS

In accordance with order no. 2014-948 of 20 August 2014 regarding governance and trading in state-owned companies, EDF is now administered by a Board of Directors consisting of three to eighteen members, including members appointed by the Shareholders' Meeting, if applicable on recommendation from the French state in accordance with Article 6 of the order, a French State Representative chosen by the Minister for the Economy from the civil service in accordance with Article 4 of the order, and one third employee representatives elected in accordance with the provisions of the law of 26 July 1983 <sup>(1)</sup>.

On the date of filing of this Reference Document, the Board of Directors has eighteen members:

- eleven directors appointed by the Shareholders' Meeting, including five on recommendation from the French State;
- six directors elected by the employees;
- one Representative of the French State.

The Government Commissioner <sup>(2)</sup> and Head of the French State General Economic and Financial Supervisory Mission to the Company <sup>(3)</sup> and the Secretary of the Central Works Council attend the meetings of the Board of Directors, but are not entitled to vote. However, in accordance with Article L.311-5-7 of the French Energy Code, based on law no. 2015-992 dated 17 August 2015 regarding the Energy Transition for Green Growth, the Government Commissioner is informed of the investment decisions and may oppose decisions, the realisation of which would be inconsistent with the objectives of the strategic plan prepared by the Company or with those of the multi-year energy programme (see section 1.5.2 "Public service in France").

Between 1 January 2018 and the date of filing of this Reference Document, no modifications were made to the membership of the Board of Directors.

The terms of office of nine directors expiring at the Shareholders' Meeting called to approve the financial statements for the fiscal year ended 31 December 2018 (see table "Summary presentation of the Board of Directors" below), the Shareholders' Meeting to be held on 16 May 2019 will be called to approve the appointment and/or re-election of the members of the Board of Directors.

### Balanced representation of men and women - Diversity policy

#### Feminisation of the Board of Directors

In accordance with Article L. 225-18-1 of the French Commercial Code and the order of 20 August 2014, EDF is subject to the rules relating to the balanced representation of women and men on Boards of Directors and Supervisory Boards and the Company must comply with a proportion of no less than 40% of directors of each gender on the Board, excluding directors representing employees. At the date of this Reference Document, EDF's Board of Directors thus includes seven women, including two of the directors elected by employees. Women thus make up 41.7% of the Board members taken into consideration to calculate this percentage (i.e. excluding directors representing employees).

#### Other diversity criteria

In accordance with the AFEF-MEDEF Code recommendations and Article L. 225-37-4 (6°) of the French Commercial Code, the Board of Directors periodically reviews the desirable balance in its membership and that of the Committees it creates, particularly in terms of diversity, with respect to criteria such as age, gender or professional qualifications and experience, and in terms of the percentage of independent directors.

After reviewing the membership of the Board in light of these criteria and the Appointments and Compensation Committee's opinion, the Board of Directors meeting of 14 February 2019 defined a diversity policy applicable to its members and objectives that take into account the Group strategy, so that the membership of the Board encourages its deployment, and also takes into account the expectations formulated by the directors during the 2018 evaluation of the Board of Directors.

In order to achieve a good balance in its composition, in connection with the Group's strategy and the missions entrusted to it, the Board considers that priority must be given to the search for skills and experiences that suit its challenges and a complementarity of profiles.

The table below presents the criteria examined by the Board to define the diversity policy applied to its members, which will be implemented when the applications for the posts of directors are reviewed, and are subject to the Shareholders' Meeting to be convened on 16 May 2019:

Criteria	Company's position	Objectives/Implementation by the Board
Directors' age	The directors appointed by the Shareholders' Meeting are between 53 and 73 years old, with an average age of 63 years.	The Board considered that the current average age was satisfactory and decided that the age of the candidates would not be a decisive factor in their selection to the Director's post as part of the re-election of the Board, while remaining attentive to the limit of a third of the directors over the age of 70 years old <sup>(4)</sup> .
Parity	To date, the Board has a total of 7 women, 2 of whom are directors elected by the employees, representing 41.7% women, excluding salaried directors.	The Board of Directors considered that the current ratio of 41.7% women was satisfactory, without excluding the possibility of reinforcing the number of women in the event of further changes in the membership of the Board.

(1) The employee representatives mentioned in I of Article 7 of the order of 20 August 2014 are subject, for their election and their status, to the same provisions as those applicable to employee representatives of companies subject to the law of 26 July 1983 (sections II and III of title II of the law).

(2) Article 15 of the order of 20 August 2014.

(3) This mission exercises the French State's economic and financial supervision of EDF, in accordance with Article 8 of decree no. 55-733 of 26 May 1955. It can exercise extensive supervisory procedures.

(4) Article L. 225-19 of the French Commercial Code provides that, in the absence of an express provision in the articles of association with regard to an age limit applicable to directors, the number of those over the age of 70 cannot be greater than one-third.

Criteria	Company's position	Objectives/Implementation by the Board
Professional experience and complementarity of profiles	The Board combines various profiles and skills.	<p>The Board noted that directors have significant experience in fields of expertise related to EDF's activities and its strategy (particularly in the fields of energy, industry and at the international level), as well as in the financial field and in the Executive Management of large companies, and that most of the directors appointed by the Shareholders' Meeting have held directorships in other French or foreign companies.</p> <p>At the end of this review, the Board considered that the current complementarity of the profiles was likely to favour the deployment of the Group's strategy.</p>
Nationality	The Board of Directors does not have a director of foreign nationality.	<p>Notwithstanding EDF group's strong international presence, the Board deemed that the deployment of the CAP 2030 strategy did not require the appointment of directors of foreign nationality in the short-term. On the other hand, the Board ensures that it has an adequate percentage of members with international experience.</p> <p>If necessary, the Board will review this target in the event of further changes in the Board members.</p>
Independence	Today, the Board of Directors includes 5 independent directors, i.e. 41.7% independent directors out of the 12 directors taken into consideration for this calculation (i.e. excluding directors representing employees).	<p>Considering the presence of a controlling shareholder in the Company's capital, the Board of Directors deemed the current percentage of independent directors satisfactory. It therefore wished to maintain this proportion within the Board and set itself the objective of at least respecting the proportion of one-third of independent directors recommended by the AFEP-MEDEF Code.</p>

Regarding the representation of women and men in the Executive Committee and the results in terms of gender diversity in the top 10% of functions with the highest responsibility (Article L. 225-37-4 (6°) of the French Commercial Code), see

sections 4.3.1 "Members of the Executive Committee" and 3.2.2.2 "Gender equality".

## Information regarding the directors

The table below summarises the main information concerning members of the Board of Directors as of 14 February 2019.

### Summary presentation of the Board of Directors

	Personal information				Experience		Situation within the Board		Attendance in the Committees		
	Age	Gender	Natio- nality	Number of shares	Number of offices held in listed companies (incl. EDF)	Indepen- dence	Initial date of appoint- ment	Expiry of the term of office	Seniority on the Board (years)		
Chairman and Chief Executive Officer											
Jean-Bernard Lévy	63	M	Fr <sup>(1)</sup>	0	2	N	23/11/2014	Shareholders' Meeting 2019 <sup>(2)</sup>	4.25		Chairman of the Strategy Committee
Directors appointed by the Shareholders' Meeting											
Philippe Crouzet	62	M	Fr	294	2	O	23/11/2009	Shareholders' Meeting 2019	9.25		Chairman of the Nuclear Commitments Monitoring Committee/Member of the Audit Committee
Bruno Lafont	62	M	Fr	245	2	O	20/05/2008	Shareholders' Meeting 2019	10.66		Chairman of the Appointments and Compensation Committee
Colette Lewiner	73	F	Fr	1,932	5	O	11/04/2014	Shareholders' Meeting 2019	4.83		Chair of the Governance and Corporate Social Responsibility Committee/Member of the Audit Committee/Member of the Appointments and Compensation Committee
Laurence Parisot <sup>(3)</sup>	59	F	Fr	137	1	O	23/11/2014	Shareholders' Meeting 2019	4.25		Member of the Strategy Committee
Claire Pedini	53	F	Fr	0	1	O	12/05/2016	Shareholders' Meeting 2020 <sup>(4)</sup>	2.75		Member of the Governance and Corporate Social Responsibility Committee
Directors appointed by the Shareholders' Meeting on recommendation from the French State											
Olivier Appert	69	M	Fr	0	1	N	17/06/2013	Shareholders' Meeting 2019	5.66		Member of the Nuclear Commitments Monitoring Committee/Member of the Strategy Committee
Maurice Gourdault-Montagne	65	M	Fr	0	1	N	20/09/2017	Shareholders' Meeting 2019	1.42		Member of the Strategy Committee
Bruno Léchevin	67	M	Fr	0	1	N	06/05/2013	Shareholders' Meeting 2019	5.75		Member of the Governance and Corporate Social Responsibility Committee
Marie-Christine Lepetit	57	F	Fr	0	1	N	07/05/2012	Shareholders' Meeting 2019	6.75		Chair of the Audit Committee/Member of the Nuclear Commitments Monitoring Committee
Michèle Rousseau	61	F	Fr	0	1	N	30/09/2016	Shareholders' Meeting 2019	2.42		Member of the Nuclear Commitments Monitoring Committee
Director – Representative of the French State											
Martin Vial	65	M	Fr	0	2	N	09/09/2015	20/11/2022	3.42		Member of the Strategy Committee/Member of the Appointments and Compensation Committee
Directors elected by the employees											
Christine Chabauty	47	F	Fr	0	1	N	23/11/2009	22/11/2019	9.25		Member of the Governance and Corporate Social Responsibility Committee/Member of the Appointments and Compensation Committee



	Personal information			Experience			Situation within the Board		Attendance in the Committees	
	Age	Gender	Natio- nality	Number of shares	Number of offices held in listed companies (incl. EDF)	Indepen- dence	Initial date of appoint- ment	Expiry of the term of office	Seniority on the Board (years)	
Jacky Chorin	59	M	Fr	307	1	N	23/11/2014	22/11/2019	4.25	Member of the Audit Committee/Member of the Strategy Committee/Member of the Governance and Corporate Social Responsibility Committee
Christophe Cuvilliez	55	M	Fr	24	1	N	07/11/2017	22/11/2019	1.25	Member of the Nuclear Commitments Monitoring Committee
Marie-Hélène Meyling	58	F	Fr	28	1	N	01/09/2011	22/11/2019	7.42	Member of the Audit Committee/Member of the Nuclear Commitments Monitoring Committee/Member of the Strategy Committee/Member of the Governance and Corporate Social Responsibility Committee
Jean-Paul Rignac	56	M	Fr	0	1	N	01/11/2007	22/11/2019	11.42	Member of the Strategy Committee/Member of the Audit Committee
Christian Taxil	43	M	Fr	1,292	1	N	23/11/2014	22/11/2019	4.25	Member of the Audit Committee/Member of the Strategy Committee

(1) Fr: French nationality.

(2) Shareholders' Meeting 2019: Shareholders' Meeting called to approve the financial statements for the 2018 fiscal year.

(3) Ms Parisot was a member of the Audit Committee until 6 November 2018.

(4) Shareholders' Meeting 2020: Shareholders' Meeting called to approve the financial statements for the 2019 fiscal year.

Personal details of directors as well as information on their terms of office can be found in the table below and are provided as at 15 January 2019, unless otherwise stated.

## DIRECTORS APPOINTED BY THE SHAREHOLDERS' MEETING:

### JEAN-BERNARD LÉVY, 63 YEARS OLD

#### Position held within the Company

Chairman and Chief Executive Officer since 27 November 2014 <sup>(1)</sup>

#### Date of appointment to the Board

23 November 2014

#### Expiry of current term

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2018

#### Other position(s)

Chairman of the Strategy Committee

#### Shares held

0

#### Nationality

French

A former student of École Polytechnique (graduating in 1973) and Telecom Paris Tech, Jean-Bernard Lévy began his career at France Télécom in 1979 as a works engineer at the Angers Division. In 1982, he became responsible for managing executive managers and HR budgets at head-office, then assistant to the head of HR. In 1986, he was appointed Technical Advisor to the office of Gérard Longuet, Minister for Postal Services and Telecommunications. From 1988 to 1993, Jean-Bernard Lévy managed the telecommunications satellite activity of Matra Espace, now Matra Marconi Space. From 1993 to 1994, he ran the office of Gérard Longuet, Minister for Industry, Postal Services and Communications and foreign trade. In 1995, he was appointed Chairman & Chief Executive Officer of Matra Communication. In 1998, he joined Oddo & C<sup>ie</sup> as Chief Executive Officer then Managing Partner. In summer 2002, Jean-Bernard Lévy joined Vivendi. He served as its Chief Executive Officer until April 2005 and became Chairman of its Executive Board in April 2005, until June 2012. From December 2012 to November 2014, he was Chairman & Chief Executive Officer of the Thales defence and aerospace group. EDF director since 23 November 2014, Jean-Bernard Lévy has been the Company's Chairman & Chief Executive Officer since 27 November 2014.

### Offices and positions held during 2018

#### Position held within the Company

- Chairman and Chief Executive Officer of EDF

Office/Position	Name	Country	
Chairman and Chief Executive Officer	EDF	France	C
Chairman of the Board of Directors	Edison	Italy	G/C
Director	EDF Energy Holdings	UK	G
Director	EDF Renouvelables	France	G
Chairman of the Board of Directors	EDF Foundation	France	G
Director	Dalkia	France	G
Chairman of the Supervisory Board	Framatome	France	G
Director	Société Générale	France	C
Chairman and Director as the representative of Électricité de France	Conseil français de l'Energie	France	
Director	France Industrie	France	
Chairman	FIPA – Fondation Innovations pour les Apprentissages	France	
Director	Global Sustainable Electricity Partnership	Canada	
Member, Representative of EDF	Haut Comité pour la transparence et l'information sur la sécurité nucléaire	France	

G: EDF group company – C: listed company.

### Expired offices held outside the Company over the past five years

#### France

- Chairman and Chief Executive Officer of Thales
- Chairman of the Board of Directors of Institut Mines Télécom (formerly Institut Télécom)
- Chairman of JBL Consulting & Investments
- Chairman of the Supervisory Board of Viroxis
- Deputy Chairman of GIFAS (Groupement des industries françaises aéronautiques et spatiales)
- Director of DCNS
- Director of the Institut Pasteur
- Director of Vinci

#### Abroad

- Deputy Chairman of the Board of Directors of Eurelectric
- Chairman of the Board of Directors of EDF Energy

(1) Jean-Bernard Lévy was appointed temporary Chairman and Chief Executive Officer effective 23 November 2014, by ministerial decision of 21 November 2014.

**OLIVIER APPERT, 69 YEARS OLD***Position held within the Company*

Director appointed by the Shareholders' Meeting on recommendation from the French State

*Date of appointment to the Board*

17 June 2013

*Last re-elected*

23 November 2014

*Expiry of current term*

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2018

*Other position(s)*

Member of the Nuclear Commitments Monitoring Committee and the Strategy Committee

*Shares held*

0

*Nationality*

French

A former student of the École Polytechnique and a Corps des Mines engineer, Olivier Appert began his career at the Mines de Lyon. After having held various positions at the Ministry for Industry and the Prime Minister's office, he was appointed Deputy Director of the office of the Minister for Industry from 1984 to 1986. In 1987, he was put in charge of strategy at Télécommunications Radioélectriques et Téléphoniques (TRT). In 1989, he was appointed Director of Hydrocarbons at the Ministry for Industry, and in 1994, Olivier Appert joined the Executive Management of IFP where he took the reins of research and development. In 1998, he was appointed Chief Executive Officer of Isis, a technology holding company whose majority shareholder was IFP. In 1999, he became Director of Long-term Cooperation and Energy Policy Analysis at the International Energy Agency (IEA). From 2003 to 2015, he was Chairman and Chief Executive Officer of IFP, renamed IFP Énergies Nouvelles (IFPEN) in July 2010. From 2010 to 2017, he was Chairman of the Conseil français de l'Énergie. He is the General representative of the Académie des technologies of France since March 2015. He has also been Chairman of the French Energy Council since 2010 and France Brevets since December 2016 and member of the Supervisory Board of Ukrenergopro since October 2018. Olivier Appert has been a director of EDF since June 2013.

**Offices and positions held during 2018***Principal positions held outside the Company*

- Chairman of France Brevets

Office/Position	Name	Country
Chairman of the Board of Directors	France Brevets	France
Director	Ukrenergopro	Ukraine

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years***France*

- General representative of the Académie des technologies of France
- Chairman of the Conseil français de l'Énergie
- Chairman & Chief Executive Officer of IFP Énergies Nouvelles
- Director of CGG
- Director of Technip

**PHILIPPE CROUZET, 62 YEARS OLD***Position held within the Company*

Director appointed by  
the Shareholders' Meeting

*Date of appointment to the Board*

23 November 2009

*Last re-elected*

23 November 2014

*Expiry of current term*

Shareholders' Meeting called  
to approve the financial statements  
for the fiscal year closing  
31 December 2018

*Other position(s)*

Chairman of the Nuclear  
Commitments Monitoring Committee  
and member of the Audit Committee

*Shares held*

294

*Nationality*

French

A graduate of the Institut d'Études Politiques de Paris (Paris Institute of Political Studies) and a former student of the École Nationale d'Administration, Philippe Crouzet is a former Counsel (Maître des Requêtes) at the French Council of State. He spent most of his career at Saint-Gobain, which he joined in 1986. He served successively as Head of Corporate Planning, Chief Executive Officer of Papeteries de Condat, General Manager for Spain and Portugal and Head of the Industrial Ceramics branch. From 2000 to 2004, he held the position of Vice-President for Finance, Purchasing and Information Systems. He was then appointed Group Vice-President in charge of the Building Distribution Division, before joining Vallourec, the world leader in steel tubes for the energy markets. Appointed to the Supervisory Board of Vallourec in April 2008, he became Chairman of the Group Executive Board in April 2009, and his term of office was renewed in 2016. He is also Deputy Chairman of the Institut de l'Entreprise and director of the Théâtre de la Ville (Paris). Philippe Crouzet has been a Director of EDF since November 2009.

**Offices and positions held during 2018***Principal position held outside the Company*

- Chairman of the Executive Board of Vallourec

Office/Position	Name	Country	
Chairman of the Executive Board	Vallourec	France	C
Chairman and Director	Vallourec Tubes	France	
Chairman	Vallourec Tubes France	France	
Chairman	Vallourec Oil & Gas France	France	
Director	Vallourec Services	France	
Chairman of the Supervisory Board of	Vallourec Deutschland	Germany	
Director	Vallourec Soluções Tubulares do Brasil	Brazil	
Director	Théâtre de la Ville (Paris)	France	
Deputy Chairman	Institut de l'Entreprise	France	

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years***France*

- Director of the Théâtre National de l'Opéra-Comique

*Abroad*

- Director of Vallourec Tubos do Brasil

**MAURICE GOURDAULT-MONTAGNE, 65 YEARS OLD***Position held within the Company*

Director appointed by the Shareholders' Meeting on recommendation from the French State

*Date of appointment to the Board*

20 September 2017

*Expiry of current term*

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2018

*Other position(s)*

Member of the Strategy Committee

*Shares held*

0

*Nationality*

French

A graduate of the Institut d'Études politiques de Paris (Paris Institute of Political Studies) and of the Institut national des langues et civilisations orientales (National Institute for Oriental Languages and Civilisations), Maurice Gourdault-Montagne holds a master's degree in law and a two-year undergraduate degree (DEUG) in German. He joined the French Foreign Affairs Ministry in 1978. He served in various diplomatic posts in India and in Germany, as well as in the headquarters of the French Foreign Affairs Ministry as a deputy spokesperson for the Foreign Affairs Ministry and as a Deputy Principal Private Secretary to Foreign Affairs Minister Alain Juppé. He later became Prime Minister Juppé's Principal Private Secretary. He was appointed France's Ambassador to Japan in 1998 and became Senior Diplomatic Counsellor to French President Jacques Chirac in 2002 as well as a French sherpa to the G8. From 2002 to 2007, he was responsible for the Franco-Indian and Franco-Chinese strategic dialogue as the personal representative of the French President. He was subsequently appointed France's Ambassador to the United Kingdom in December 2007, France's Ambassador to Berlin in February 2011, and France's Ambassador to China in August 2014. On 22 June 2017, the French Council of Ministers appointed Maurice Gourdault-Montagne as Secretary General of the Ministry for Europe and Foreign Affairs effective 1 August 2017.

**Offices and positions held during 2018***Principal position held outside the Company*

- Secretary General of the Ministry for Europe and Foreign Affairs

Office/Position	Name	Country
Director	Orano	France
Director	Agence Nationale des Titres Sécurisés	France
Director	Commissariat à l'énergie atomique	France
Director	Commission de Récolement des Dépôts d'Œuvres d'Art	France
Director	École Nationale d'Administration (ENA)	France
Director	France Médias Monde	France
Director	Renault Foundation	France
Director	Institut Français	France
Director	Office français de protection des réfugiés et apatrides	France

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years**

France

None



**BRUNO LAFONT, 62 YEARS OLD***Position held within the Company*

Director appointed by the Shareholders' Meeting

*Date of appointment to the Board*

20 May 2008

*Last re-elected*

23 November 2014

*Expiry of current term*

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2018

*Other position(s)*

Chairman of the Appointments and Compensation Committee

*Shares held*

245

*Nationality*

French

A graduate of the École des Hautes Études Commerciales (HEC) and a former student of the École Nationale d'Administration (ENA), Bruno Lafont began his career with the Lafarge group in 1983. Having served in several financial and operational positions in France and abroad, he became Group Vice-President, Finance at the end of 1994 and joined the Executive Committee in early 1995 prior to being appointed Chairman of the plaster business at the end of 1998. He became Group Deputy Chief Executive Officer in 2003, director in 2005 and Chief Executive Officer in January 2006. He was Chief Executive Officer of Lafarge between May 2007 and July 2015, Honorary Chairman of Lafarge since 2015, and co-Chairman of the Board of Directors of LafargeHolcim between July 2015 and May 2017. He has been a director of ArcelorMittal since 2011, and lead independent director since 2017. He is a member of the Executive Committee of the World Business Council for Sustainable Development (WBCSD) since November 2013 and chaired the Sustainable Development Division of the MEDEF (Mouvement des Entreprises de France) between February 2014 and January 2018. Bruno Lafont has been a Director of EDF since May 2008.

**Offices and positions held during 2018***Principal position held outside the Company*

- Lead independent director of ArcelorMittal

Office/Position	Name	Country	
Lead independent director	ArcelorMittal	Luxembourg	C
Member of the Executive Committee	World Business Council for Sustainable Development (WBCSD)	Switzerland	

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years***France*

- Chairman and Chief Executive Officer of Lafarge
- Chairman and director of Lafarge Ciments
- Chairman of Sustainable Development Division at the Mouvement des Entreprises de France (MEDEF)
- Director of the Association Française des Entreprises Privées (AFEP)

*Abroad*

- Co-Chairman of LafargeHolcim (Switzerland)
- Director of Lafarge Cement Shui On (China)

**BRUNO LÉCHEVIN, 67 YEARS OLD***Position held within the Company*

Director appointed by the Shareholders' Meeting on recommendation from the French State

*Date of appointment to the Board*

6 May 2013

*Last re-elected*

23 November 2014

*Expiry of current term*

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2018

*Other position(s)*

Member of the Governance and Corporate Social Responsibility Committee

*Shares held*

0

*Nationality*

French

Holder of a postgraduate degree from the Institut d'Études Politiques in Paris, Bruno Léchevin began his career at EDF and subsequently held various union roles. Federal Secretary of the CFDT Gaz-Electricité federation from 1983 to 1988, he was then its General Secretary in 1988 and member of the national office of the CFDT union association from 1988 to 1997 then Secretary of the Chimie-Energie union from 1997 to 1999. At the same time, he was member of the Haut Conseil du Secteur Public (High Council of the Public Sector) from 1992 to 1999. Appointed in 2000, for two years, commissioner of the Commission de régulation de l'énergie (CRE - French Energy Regulation Committee), his term of office was extended for six years. General Representative of the French National Energy Mediator from March 2008 to March 2013, he was at the same time Special Advisor to the Chairman of the CRE. Appointed as a member of the Board of Directors of the Agence de l'environnement et de la maîtrise de l'énergie (ADEME) in February 2013, he was appointed Chairman from March 2013 to March 2018. Bruno Léchevin is Deputy Chairman, founding member of Electriciens Sans Frontières (Electricians without borders), an organisation that works to provide access to energy and water in developing countries. He has been a Director of EDF since May 2013.

**Offices and positions held during 2018***Principal position held outside the Company*

- Deputy Chairman of Electriciens sans frontières

Office/Position	Name	Country
Deputy Chairman	Electriciens Sans Frontières	France

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years***France*

- Chairman of the Agence de l'environnement et de la maîtrise de l'énergie (ADEME)
- Chairman of the Observatoire national de la précarité énergétique
- Director as representative of ADEME in the Conseil français de l'Energie

**MARIE-CHRISTINE LEPETIT, 57 YEARS OLD***Position held within the Company*

Director appointed by the Shareholders' Meeting on recommendation from the French state

*Date of appointment to the Board*

7 May 2012

*Last re-elected*

23 November 2014

*Expiry of current term*

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2018

*Other position(s)*

Chair of the Audit Committee and member of the Nuclear Commitments Monitoring Committee

*Shares held*

0

*Nationality*

French

A former student of the École Polytechnique and the École Nationale d'Administration (ENA), Marie-Christine Lepetit joined the Inspectorate General of Finance in 1987, where she held auditing and advisory positions. In 1991, she was recruited by Jean Lemierre to the Directorate General for Tax in order to introduce management control. In 1995, she was in charge of synthesis work at the tax law department before joining the office of the Prime Minister, Alain Juppé, as technical advisor in tax matters and macroeconomic studies then taxation and SMEs from 1995 to 1997. She continued her career at the General Directorate for Tax, working to improve service quality (pre-filled tax returns, remote procedures, and certification). She was appointed Director of Tax Law at the Ministry for the Economy and Finance in 2004 and used this role to push through tax reforms from 2004 to 2012. At the same time, she co-chaired the working group on reform of the financing of social welfare in 2006 and co-signed the report by the conference of experts on the "energy-climate contribution" chaired by Michel Rocard. She also sat on the Local Authorities Reform Committee chaired by Edouard Balladur as Executive Director and was a member of the Public Life Renewal and Ethics Committee chaired by Lionel Jospin. She has been Head of the Inspectorate General of Finance since March 2012, and now reports to the Ministry for the Economy and Finance and the Ministry of Public Action and Accounts. She has been director of the Établissement Public de la Réunion des Musées Nationaux et du Grand Palais des Champs-Élysées since 2015. Marie-Christine Lepetit has been a Director of EDF since May 2012.

**Offices and positions held during 2018***Principal position held outside the Company*

- Head of the Inspectorate General of Finance at the Ministry for the Economy and Finance and the Ministry for Public Action and Accounts

Office/Position	Name	Country
Director	Établissement Public de la Réunion des France Musées Nationaux et du Grand Palais des Champs-Élysées	

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years***France*

- Director of the Fondation Nationale des Sciences Politiques (FNSP)

**COLETTE LEWINER, 73 YEARS OLD***Position held within the Company*

Director appointed by the Shareholders' Meeting

*Date of appointment to the Board*

11 April 2014

*Last re-elected*

23 November 2014

*Expiry of current term*

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2018

*Other position(s)*

Chair of the Governance and Corporate Social Responsibility Committee, member of the Audit Committee and the Appointments and Compensation Committee

*Shares held*

1,932 <sup>(1)</sup>

*Nationality*

French

A former student of the École Normale Supérieure and holder of an Agrégation degree in physics and Doctorate in science, Colette Lewiner joined Électricité de France in 1979. In 1989 she created the Development and Commercial Strategy Division, accordingly becoming the first woman appointed Executive Officer at EDF. From 1992 to 1998, she was Chair and Chief Executive Officer of SGN, a subsidiary of AREVA-Orano. In 1998, she joined Capgemini to create then manage until in June 2012 the Global Energy and Utilities sector. Since July 2012, she has been, as Manager of Cowin, a Consultant in the energy field. Non-executive Chairperson of TDF (SAS) from 2010 to 2015, she has been a member of the National Academy of Technologies of France since 2002. She is a director of the Bouygues group as well as Getlink, Nexans and CGG. Colette Lewiner has been a Director of EDF since April 2014.

**Offices and positions held during 2018***Principal position held outside the Company*

- Professional Director

Office/Position	Name	Country	
Director	Bouygues	France	C
Director	Nexans	France	C
Director	Getlink (ex Eurotunnel)	France	C
Director	CGG	France	C

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years***France*

- Chair of the Board of Directors of TDF
- Director of Lafarge
- Director of Ingenico

*Abroad*

- Abroad Director of Crompton Greaves (India)
- Director of TGS Nopec (Norway)

(1) Shares held directly and through the profit-sharing scheme (FCPE).

**LAURENCE PARISOT, 59 YEARS OLD***Position held within the Company*

Director appointed by the Shareholders' Meeting

*Date of appointment to the Board*

23 November 2014

*Expiry of current term*

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2018

*Other position(s)*

Member of the Strategy Committee

*Shares held*

137

*Nationality*

French

Holder of a Masters in public law from Université Nancy II, graduate from the Institut d'Études Politiques (IEP) and holder of an M.A.S. in Political Studies from the IEP, Laurence Parisot joined in 1985, as survey manager at the Louis Harris Survey Institute. She became Chief Executive Officer in 1986. In 1990, she was appointed Chairperson and Chief Executive Officer of the French Institute of Public Opinion (IFOP), in which she gradually acquired the majority of the capital. Having sold IFOP, she led the Gradiva firm for a while, and was then appointed Chairwoman and Managing Director of Citi bank France in 2018. She was Chair of MEDEF from 2005 to 2013. She is also a director of Fives and Foxintelligence, and a member of the Board of Directors of the FNSP. Laurence Parisot has been a Director of EDF since November 2014.

**Offices and positions held during 2018***Principal position held outside the Company*

- Chairwoman and Managing Director of Citi bank France

Office/Position	Name	Country
Director	Fives	France
Director	Foxintelligence	France
Director	Fondation Nationale des Sciences Politiques (FNSP)	France

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years***France*

- Manager and Associate Director of Gradiva
- Deputy Chair of the Executive Board of the IFOP group
- Chairwoman of the Scientific Committee of Fondapol
- Director of Coface
- Director of BNP Paribas
- Member of the Supervisory Board of Fives
- Member of the Supervisory Board of Michelin



**CLAIRE PEDINI, 53 YEARS OLD***Position held within the Company*

Director appointed by the Shareholders' Meeting

*Date of appointment to the Board*

12 May 2016

*Expiry of current term*

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2019

*Other position(s)*

Member of the Governance and Corporate Social Responsibility Committee

*Shares held*

0

*Nationality*

French

Claire Pedini is a graduate of the École des Hautes Études Commerciales and holds a Master's degree in media management from the École Supérieure de Commerce de Paris. In 1988, she joined Total as Corporate Controller. She assumed responsibility for Total's admission to trading on the New York Stock Exchange in 1991, and became President of Investor Relations in 1992, Vice-President of Media Relations in 1994 and President of New Information Technologies in 1997. In 1998, she joined Alcatel as Chief of Financial Information and Shareholder Relations, becoming successively Vice-President, Investor Relations and Public Affairs in 2001, Deputy Chief Financial Officer in 2004, Senior Vice-President, Human Resources and Corporate Communications and member of the Executive Committee in 2006, Senior Vice-President, Human Resources, Corporate Communications and Real Estate in 2007, and Executive Vice-President, Human Resources and Transformation, of Alcatel-Lucent in 2009. Since June 2010, Claire Pedini has served as Senior Vice-President Human Resources and Digital Transformation for the Saint-Gobain Group. She was a director of Arkema from 2010 to 2016 and has been a director of EDF since May 2016.

**Offices and positions held during 2018***Principal position held outside the Company*

- Senior Vice-President Human Resources and Digital Transformation for the Saint-Gobain Group - Member of the Executive Committee of Saint-Gobain

Office/Position	Name	Country
None		

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years***France*

- Director of Arkema

**MICHÈLE ROUSSEAU, 61 YEARS OLD***Position held within the Company*

Director appointed by the Shareholders' Meeting on recommendation from the French state

*Date of appointment to the Board*

30 September 2016

*Expiry of current term*

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2018

*Other position(s)*

Member of the Nuclear Commitments Monitoring Committee

*Shares held*

0

*Nationality*

French

Michèle Rousseau is a graduate of the École Nationale Supérieure des Mines de Paris, and is an Ingénieur Général des Mines. She started her career at the Nord-Pas de Calais DRIRE (Regional Directory for Industry, Research and the Environment) as Head of the Environment Division. She went on to join the Ministry of the Environment where she was responsible for waste, and later the Ministry of Industry where she held the post of Deputy Director of the Nuclear Installation Safety Directorate with responsibility for oversight of EDF's nuclear fleet. She then moved to the French research and innovation agency, ANVAR, as Deputy Director General where she conducted policies supporting innovative projects driven by SMEs, and later to the Ministry of Economy, Finance and Industry as Director with responsibility for energy demand and markets. Here, she was tasked in particular with developing a new legislative and regulatory framework in the wake of the opening up of European electricity and gas markets and expanding energy conservation and renewable energies. Michèle Rousseau subsequently returned to the Ministry of Ecology and Sustainable Development, where she held the positions of Secretary General and, in 2008, Director, Deputy Commissioner General for Sustainable Development, with particular responsibility for implementing the Grenelle Environment initiative. In 2011, she was appointed Director General of the Seine-Normandie Water Agency before returning in 2016 to the General Council for Environment and Sustainable Development where she is Chair of the Haut-de-France Regional Environmental Authority (MRAe). She has been the Chair of the Bureau de Recherches Géologiques et Minières (French Geological Survey) since March 2017, director of the Institut national de recherche en sciences et technologies pour l'environnement (IRSTEA) and she has been a director of EDF since September 2016.

**Offices and positions held during 2018***Principal positions held outside the Company**France*

- Chair of the Board of Directors of the Bureau de Recherches Géologiques et Minières - BRGM

Office/Position	Name	Country
Chairman of the Board of Directors	Bureau de Recherches Géologiques et Minières - BRGM	France
Director	Institut national de recherche en sciences et technologies pour l'environnement (IRSTEA)	France

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years***France*

- Chairwoman of the Mission régionale d'autorité environnementale (MRAe) Hauts-de-France Regional Environmental Authority

## DIRECTOR – REPRESENTATIVE OF THE FRENCH STATE:

## MARTIN VIAL, 65 YEARS OLD

*Position held within the Company*

Director – Representative of the French State

*Date of appointment to the Board*

9 September 2015

*Last re-elected*

21 November 2018

*Expiry of current term*

20 November 2022

*Other position(s)*

Member of the Appointments and Compensation Committee and the Strategy Committee

*Shares held*

0

*Nationality*

French

Graduate from the École Supérieure des Sciences Économiques et Commerciales (ESSEC) and the École Nationale Supérieure des Postes et Télécommunications, Martin Vial began his career as postal services and telecommunications director at the Financial Division of the General Postal Directorate. In 1986, he joined the Treasury Division at the Ministry for the Economy and Finance. From 1988 to 1993, he was successively Technical Advisor, Deputy Director then Director of the offices of the Minister for Postal Services and Telecommunications and Space, the Minister for Equipment, Housing, Transport and Space, and finally the Postal Services and Telecommunications Minister. In 1993, Martin Vial was appointed Chairman and Chief Executive Officer of Aéropostale, airline and joint subsidiary of Air France, La Poste and TAT, and he was elected Chairman of the Chambre Syndicale du Transport Aérien (French air transport union) and Fédération Nationale de l'Aviation Marchande (French national commercial aviation union). At the end of 1997, he became Chief Executive Officer of La Poste group. In September 2000, he was appointed Chairman of La Poste group and at the same time Deputy Chairman of the Caisse Nationale de Prévoyance (CNP). Martin Vial joined the French National Audit Office in September 2002 as Chief Advisor. From 2003 to 2014, he was Chief Executive Officer and Director of the Europ Assistance group, world leader on the assistance market and director and Chief Executive Officer of Europ Assistance Holding. He also chairs several Boards of directors of this group's companies. In January 2015, he founded the Company Premium Care, which provides assistance to the elderly. Commissioner of the French State Shareholdings since August 2015, Martin Vial is a director of Renault and Bpifrance. He has been a Director of EDF since September 2015.

## Offices and positions held during 2018

*Principal position held outside the Company*

- Commissioner of the French State Shareholdings Agency

Office/Position	Name	Country	
Director	Renault	France	C
Director	Bpifrance	France	

G: EDF group company – C: listed company.

## Expired offices held outside the Company over the past five years

*France*

- Chief Executive Officer and director of Europ Assistance Holding
- Chairman of International Health Solutions
- Chairman of Sicav Libertés et Solidarités
- Director of Hormair Vacances
- Director of Business Solutions Capital
- Director of Thales

*Abroad*

- Chairman of Club Santé Afrique (CSA) (United States)
- Chairman of Europ Assistance Brazil, Belgium, France, UK, USA
- Director of Europ Assistance South Africa, Germany, China, Spain, Italy, Portugal

## DIRECTORS ELECTED BY THE EMPLOYEES:

## CHRISTINE CHABAUTY, 47 YEARS OLD

*Position held within the Company*

Director elected by the employees

*Date of appointment to the Board*

23 November 2009

*Last re-elected*

23 November 2014

*Expiry of current term*

22 November 2019

*Other position(s)*

Member of the Governance and Corporate Social Responsibility Committee and the Appointments and Compensation Committee

*Shares held*

0

*Nationality*

French

Graduate in Law, Christine Chabauty gained professional experience in a legal environment and in 2000 joined EDF's Trading Department as commercial attaché to the Key Accounts Department. She now works in the Key Accounts Sales Support Department of the Key Accounts Division. Since December 2008, she has also served as a member of an elected industrial tribunal (conseiller prud'homal). Sponsored by the CGT union, Christine Chabauty has been a Director of EDF since November 2009.

## Offices and positions held during 2018

*Principal position held outside the Company*

- Commercial attaché to the EDF Trading Division Key Accounts Department

Office/Position	Name	Country
Conseiller prud'hommal	Conseil de Prud'hommes	France

G: EDF group company – C: listed company.

## Expired offices held outside the Company over the past five years

None.

## JACKY CHORIN, 59 YEARS OLD

*Position held within the Company*

Director elected by the employees

*Date of appointment to the Board*

23 November 2014 <sup>(1)</sup>

*Expiry of current term*

22 November 2019

*Other position(s)*

Member of the Audit Committee, the Strategy Committee and the Governance and Corporate Social Responsibility Committee

*Shares held*

307 <sup>(2)</sup>

*Nationality*

French

A graduate from the Institut d'Études Politiques (IEP) in Paris and a Doctor of Law, Jacky Chorin began his career at EDF as a legal specialist at the Corporate Office of the Equipment Division in 1983. He is currently representative of the Human Resources Manager at the EDF Nuclear and Division. He was a member of the French National Ecological Transition Council from 2014 to 2016 and has been a member of the French Higher Energy Council since 2012. Sponsored by the Force Ouvrière (FO) trade union, Jacky Chorin was a director of EDF from September 2004 to November 2009. He has again been a director at EDF since November 2014.

## Offices and positions held during 2018

*Principal position held outside the Company*

- Representative of the Director of Human Resources at the EDF Nuclear and Thermal Division.

Office/Position	Name	Country
Member	Conseil supérieur de l'énergie	France

G: EDF group company – C: listed company.

## Expired offices held outside the Company over the past five years

*France*

- Member of the Conseil national de la transition écologique
- Member of the Conseil économique, social et environnemental
- Representative of the Force Ouvrière trade union to the Board of the Institut de recherches économiques et sociales (IRES), a multi-union research body reporting to the French Prime Minister
- Federal Secretary of the FO Energies & Mines trade union, in charge of the Skills Centre

(1) Jacky Chorin was previously director of EDF (EPIC then limited company) from September 2004 to November 2009.

(2) Shares held through the profit-sharing scheme (FCPE).

**CHRISTOPHE CUVILLIEZ, 55 YEARS OLD***Position held within the Company*

Director elected by the employees

*Date of appointment to the Board*

7 November 2017

*Expiry of current term*

22 November 2019

*Other position(s)*

Member of the Nuclear Commitments Monitoring Committee

*Shares held*

24

*Nationality*

French

French Christophe Cuvilliez was hired by Lyonnaise des eaux in January 1988, where he held various positions in the "central laboratory IT", "wastewater" and finally "potable water" departments. He joined EDF in October 1989 as a security guard on the Penly site. He participated in the industrial commissioning of unit 1 in April 1990, prior to working in startup operations for unit 2, commissioned in 1992. Having undergone POT (Technical Advancement for Workers) training from 1994 to 1998, Christophe Cuvilliez was assigned to the department for unit outages in Flamanville as a chief of site. In 2003, he joined the Safety Security Quality Department in Flamanville and began training as a safety engineer. Certified in 2004, he held this position for around two years. In 2005, Christophe Cuvilliez opted for a 50% secondment to the fédération CGT mines-énergie trade union, eventually increasing to 100%, sitting on several EDF employment dialogue bodies such as the Joint Production Committees (CMP), the Works Committee, in which he held the role of Secretary, the Secondary Personnel Commission (CSP) and the Health and Safety at Work Committee (CHSCT). He was the trade union representative for Flamanville from September 2009 to September 2017. Sponsored by the CGT, Christophe Cuvilliez is a director of EDF since 7 November 2017.

**Offices and positions held during 2018***Principal position held outside the Company*

- Member of the Executive Management of the fédération CGT Mines-Énergie

Office/Position	Name	Country
None.		

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years**

None.

**MARIE-HÉLÈNE MEYLING, 58 YEARS OLD***Position held within the Company*

Director elected by the employees

*Date of appointment to the Board*

1 September 2011

*Last re-elected*

23 November 2014

*Expiry of current term*

22 November 2019

*Other position(s)*

Member of the Audit Committee, the Nuclear Commitments Monitoring Committee, the Strategy Committee, and the Governance and Corporate

*Shares held*

28

*Nationality*

French

Graduate in communication (Université Paris V), Marie-Hélène Meyling joined EDF in 1982 where she has held a range of communication positions. She then focused on activities relating to the opening of the electricity market as well as support for renewable energy. From 2008 to 2011, she was a member of the EDF Central Works Council. She is currently Senior Engineer in EDF's Innovation, Corporate Social Responsibility and Strategy Division. In November 2012, Marie-Hélène Meyling also obtained the Company Director Certificate jointly issued by the IEP and the Institut Français des Administrateurs (French Institute of Directors). Sponsored by the CFDT trade union, Marie-Hélène Meyling has been a Director of EDF since September 2011.

**Offices and positions held during 2018***Principal position held outside the Company*

- Senior Engineer in EDF's Innovation, Corporate Social Responsibility and Strategy Division

Office/Position	Name	Country
Représentante des salariés des Industries électriques et gazières au titre de la CFDT	Conseil supérieur de l'énergie (CSE)	France

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years**

None.

**JEAN-PAUL RIGNAC, 56 YEARS OLD***Position held within the Company*

Director elected by the employees

*Date of appointment to the Board*

1 November 2007

*Last re-elected*

23 November 2014

*Expiry of current term*

22 November 2019

*Other position(s)*

Member of the Audit Committee and Strategy Committee

*Shares held*

0

*Nationality*

French

Holder of a doctorate in energy from the Institut National Polytechnique in Toulouse, Jean-Paul Rignac joined EDF in 1991. He served as Secretary of EDF Research & Development's joint generation Committee for five years. He is a research engineer at EDF's Research & Development Division (Renardières Centre), and currently works on energy efficiency in the heating/air-conditioning of industrial buildings and clean rooms. Sponsored by the CGT union, Jean-Paul Rignac has been a Director of EDF since November 2007.

**Offices and positions held during 2018***Principal position held outside the Company*

- Research Engineer at the EDF Research and Development Division

Office/Position	Name	Country
None		

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years**

None.

**CHRISTIAN TAXIL, 43 YEARS OLD***Position held within the Company*

Director elected by the employees

*Date of appointment to the Board*

23 November 2014

*Expiry of current term*

22 November 2019

*Other position(s)*

Member of the Audit Committee and Strategy Committee

*Shares held*

1,292 <sup>(1)</sup>

*Nationality*

French

Graduate from the ESCP Europe School, holding an Executive MBA diploma, and from the École des Mines in Douai, Christian Taxil began his career in 1999 at EDF Gaz de France Distribution in customer, local authority and concession management positions. From 2004 to 2008, he was in charge of electricity and gas industry social dialogue on the Fédération CFE-CGC Énergies union's management team. In 2008, he began work at the EDF group Auditing Division before being elected, from June 2009 to September 2014, General Secretary of the Fédération CFE-CGC Énergies union. Sponsored by the CFE-CGC trade union, Christian Taxil has been a Director of EDF since 23 November 2014.

**Offices and positions held during 2018***Principal position held outside the Company*

- In charge of Dalkia's Trading & Marketing Division Key Accounts Department

Office/Position	Name	Country
Elected representative	Office of the Syndicat Mixte d'Électricité, de France gaz et de télécommunications du Val-d'Oise (SMDEGTVO)	

G: EDF group company – C: listed company.

**Expired offices held outside the Company over the past five years***France*

- General Secretary of the Fédération CFE-CGC Énergies union

(1) Shares held through the profit-sharing scheme (FCPE).



## 4.2.2 FUNCTIONING OF THE BOARD OF DIRECTORS

The internal rules of procedure of the Board of Directors set the principles of its functioning and the terms and conditions according to which the Board and its specialised Committees fulfil their duties. It also defines the role and powers of the Chairman and Chief Executive Officer.

The Board's internal rules of procedure are regularly updated, particularly to take account of legislative and regulatory changes and changes to the AFEF-MEDEF Code (see section 4.1 "Corporate Governance Code").

### 4.2.2.1 Term of office of directors – Staggered re-election of the Board

In accordance with the option provided by the aforementioned order of 20 August 2014, the EDF Shareholders' Meeting held on 21 November 2014 modified the Company's articles of association and reduced the term of office of the directors to four years. By way of exception, the articles of association provide that the duration of the first term of office of directors representing employees, effective after the Shareholders' Meeting of 21 November 2014, will be five years and that the term of office of directors appointed by the Shareholders' Meeting of 21 November 2014 will end at the end of the Ordinary Shareholders' Meeting convened on 16 May 2019 (see 4.2.1 "Members of the Board of Directors").

In accordance with the provisions of Article 2 of decree no. 2014-949 of 20 August 2014 regarding the implementation of the order of 20 August 2014, the Representative of the French State is appointed for a term equal to the term of office of the members of the Board of Directors, i.e. for a four year term. The term of office of Martin Vial as representative of the French State on EDF's Board of Directors, which ended on 20 November 2018, was renewed by a decree of the Minister of the Economy and Finances of 21 November 2018.

The Shareholders' Meeting of 15 May 2018 modified Article 13 of EDF's articles of association in order to provide that, starting from the 2019 Shareholders' Meeting called to approve the financial statements for the 2018 fiscal year, the Board of Directors, excluding directors elected by the employees and the Representative of the French state appointed by decree, be renewed by rotation periodically in such a way that half (rounded to the nearest whole number) of the directors elected by the Shareholders' Meeting be renewed every two years and that the Board be completely renewed, with respect to the members concerned, at the end of each four-year period. The staggered re-election will be implemented during the Shareholders' Meeting of 16 May 2019.

The directors appointed by the Shareholders' Meeting can be dismissed at any time by the Shareholders' Meeting. In accordance with Article 12 of the Law on the Democratisation of the Public Sector, the directors elected by the employees can be individually dismissed for gross negligence in the exercise of their duties by order of the President of the Tribunal de Grande Instance delivered at summary proceedings upon request from the majority of the members of the Board. However, in the event that serious dissent disrupts the Company's administration, dismissal pronounced by the Shareholders' Meeting can be extended to representatives of the employees. The Representative of the French State ceases their duties by resigning or if they lose the capacity by virtue of which they were appointed; they can be replaced at any time for the remainder of the term of office.

### 4.2.2.2 Method of Executive Management – Appointment and powers of the Chairman and Chief Executive Officer

In accordance with the option provided for in Article 18 of the Order of 20 August 2014, EDF's articles of association state that the Chairman of the Board of Directors is the Executive Manager of the Company and holds the title of Chairman and Chief Executive Officer. The "non-separated" Executive Management structure is therefore set out in the Company's articles of association. The Board's internal rules of procedure, and in particular the limitations it applies to the powers of the Chief Executive Officer, ensure a satisfactory balance, in the Company's interest, between the Chairman and Chief Executive Officer and the Board of Directors, whilst preserving the flexibility, effectiveness and responsiveness necessary in the administration and management of the Company.

EDF's Chairman and Chief Executive Officer is appointed by decree of the President of the Republic of France, on recommendation from the Board of Directors. They can be dismissed by decree in accordance with Article 20 of the Order of 20 August 2014. In accordance with the provisions of Article 13 of the French Constitution, the Chairman is appointed based on the opinion of the permanent Committees of the French National Assembly and Senate. At the end of the process Jean-Bernard Lévy was appointed as EDF's Chairman and CEO by decree of 27 November 2014.

In a press release dated 14 February 2019, the President of the Republic of France announced that he would consider renewing Jean-Bernard Lévy's position as Chairman and Chief Executive Officer of the Company, whose term expires at the end of the Shareholders' Meeting which will be convened on 16 May 2019, based on the opinion of the competent Committees of the French National Assembly and Senate under the conditions provided for in Article 13 of the Constitution.

In case of vacation of the office of Chairman and Chief Executive Officer, Article 21 of the order of 20 August 2014 states that the French State can appoint someone to the role temporarily until the appointment of the new Chairman and CEO <sup>(1)</sup>.

Subject to the specific legal provisions governing public sector companies and the powers specifically reserved by law or by the articles of association to the Board of Directors or to Shareholders' Meetings, and the limits to the powers of the Chairman and Chief Executive Officer provided for by the internal rules of procedure of the Board of Directors as internal rules (see section 4.2.2.3 "Powers and duties of the Board of Directors" below), the Chairman and Chief Executive Officer is vested with the most extensive powers to act on behalf of the Company under all circumstances, within the limits of the corporate purpose. Executive Officer organises and supervises the work of the Board of Directors and reports to the Shareholders' Meeting. They oversee the proper running of the Company's bodies and, in particular, ensure that the directors are in a position to fulfil their duties.

### 4.2.2.3 Powers and duties of the Board of Directors

The Board of Directors meets as often as the interest of the Company requires, in accordance with applicable legislative and regulatory provisions. In accordance with the Board's internal rules of procedure, the directors meet once a year to discuss the strategy of the Company and of the Group as part of an *ad hoc* seminar. Moreover, under the internal rules of the Board of Directors, a meeting is to be held each year without the attendance of the Chairman and Chief Executive Officer (executive session), and shall be chaired by the Chair of the Governance and Corporate Social Responsibility Committee.

In accordance with the law, the Board of Directors sets the strategies for the Company's activities and oversees their implementation. It defines the major strategic, economic, financial and technological objectives for the Company and the Group, while taking into consideration the social and environmental issues of its activities. Subject to powers expressly attributed to the Shareholders' Meetings and as limited by the Company's corporate purpose, the Board may consider any question relating to the proper running of the Company and acts, through its deliberations, on any such issue.

The Board deliberates, after examination by the competent Committee or Committees, as the case may be, on the annual budget, the medium-term plan, any significant operation falling outside the Company's announced strategy, the corporate strategic plan presenting the actions to be implemented by the Company or the Group in order to comply with the objectives of the multi-year energy programme (see section 1.5.2 "Public service in France"), the Group's strategies relating to upstream and downstream operations of the nuclear fuel cycle, gas and renewable energies and the public service contract. It reviews risks of any kind, as well as the risks and opportunities related to climate change and their impact on the Group's activities, and the measures taken as a consequence.

In accordance with its internal rules, the Board of Directors is competent to authorise the following transactions prior to their implementation:

- external growth transactions (investments, mergers and acquisitions), divestments, organic growth transactions, as well as stock exchange transactions, carried out by the Company or by one of its subsidiaries, which represent overall financial exposure for the Company or the Group exceeding €350 millions; this threshold falls to €150 million for transactions not in line with the Company's or the Group's strategic objectives;

<sup>(1)</sup> In accordance with this text, Jean Bernard Lévy had been appointed, by ministerial decision of 21 November 2014, temporary Chairman and Chief Executive Officer of the Company from 23 November 2014.

- coherent and inseparable industrial programmes of investments or works on existing assets, by the Company or one of its subsidiaries, exceeding €350 million per programme;
- real estate transactions, carried out by the Company or one of its subsidiaries, exceeding €200 million;
- certain financial transactions (long-term borrowings, debt management, securitisation or hedging transactions) whenever they exceed €5 billion (or the equivalent in any other currency);
- contracts and agreements (supplies, work or services) entered into by the Company involving amounts, including any necessary subsequent amendments, equal to or exceeding €350 million, or between €200 million and €350 million if these contracts relate to a new strategic direction or a new business line for the Group;
- long-term contracts for the purchase or sale of energy, CO<sub>2</sub> emission credits and quotas, by the Company or by one of its subsidiaries, for annual volumes or amounts in excess of 10TWh for electricity, 20TWh for gas (detailed information must also be provided on long-term gas purchase or sale agreements greater than 5TWh and less than 20TWh at the meeting of the Board of Directors following their signing) and €250 million for coal, fuel oil, and CO<sub>2</sub> emission credits and quotas;

- strategic agreements to be entered into by the Company constituting firm and irrevocable commitments relating to cooperation or partnerships with one or more foreign partners, in the nuclear industry involving significant transfers of intellectual property or technologies on the Group's part and constituting major challenges for the Group.

The Board of Directors sets the framework of the policy for the constitution, management and risk management of assets for hedging EDF's nuclear commitments, specifically ruling on asset/liability management and asset allocation strategy. If the Nuclear Commitments Monitoring Committee issues a negative opinion on a plan to invest in unlisted assets for dedicated assets, the Board has sole authority to authorise the aforementioned plan (see section 4.2.3.2 "Nuclear Commitments Monitoring Committee").

In accordance with the provisions of Article L. 225-37-1 of the French Commercial Code, the Board of Directors reviews the Company's policy in terms of equal access to employment and equal pay on an annual basis and it ensures that the Company implements a policy of non-discrimination and diversity, particularly in terms of the balanced representation of women and men in the executive bodies. Finally, it defines the strategic objectives of the Company subject to EDF's Central Works Council in accordance with Article L. 2323-10 of the French Labour Code.

4.

#### 4.2.2.4 Evaluation of director independence

Total number of directors	18
Number of independent directors	5
Percentage of independent directors*	41.7%

\* Excluding directors representing the employees.

The AFEP-MEDEF Corporate Governance Code recommends that, in companies with a controlling shareholder, the proportion of independent directors should be at least one third of the Board of Directors and specifies that directors representing employees are not taken into account to calculate the proportion of independent directors.

The table below recalls the independence criteria stated by the AFEP-MEDEF Code:

##### Independence criteria

###### Criterion 1: Employee or corporate officer in the previous five years

Not be or not to have been during the last five years an employee or executive corporate officer of the Company, employee, executive corporate officer or director of a company consolidated by the Company, or employee, executive corporate officer or director of the parent company of the Company or of a company consolidated by this parent company.

###### Criterion 2: Cross directorships

Not be an executive corporate officer of a company in which the Company holds directly or indirectly a directorship or in which an employee appointed as such or an executive corporate officer of the Company (current or having been one less than 5 years ago) holds a directorship.

###### Criterion 3: Important business relationships

Not be a customer, supplier, business banker, financing banker, important consultant of the Company or its Group, or for which the Company or its Group represents a major part of the business. The assessment of the significant or non significant character of the relation maintained with the Company or its Group is debated by the Board and the quantitative and qualitative criteria that led to this assessment are explained in the annual report.

###### Criterion 4: Family relationships

Not have any close family relationship with a corporate officer.

###### Criterion 5: Statutory Auditor

Not have been a Statutory Auditor of the Company during the last 5 years.

###### Criterion 6: Term of office of more than 12 years

Not be director of the Company for more than 12 years, the loss of the status of independent director occurs upon expiry of the term of office of 12 years.

###### Criterion 7: Variable compensation or performance-based compensation

Not receive variable compensation in cash or securities or any compensation related to the performance of the Company or the Group.

###### Criterion 8: Important shareholders

A director representing an important shareholder of the Company or its parent company can be considered independent as soon as this shareholder ceases to participate in the control of the Company. However, beyond a threshold of 10% of capital or voting rights, the Board shall systematically review the qualification of independence while taking into account the share ownership of the Company and the existence of a potential conflict of interest.

### Evaluation of director independence

The Board of Directors annually reviews the individual situation of the directors with regard to the independence criteria stated by the AFEP-MEDEF Code. It may also be called upon to make a decision during the year in the event of a change in the status of a director justifying a review of his or her independence.

In 2018, the joint meeting of the Governance and Corporate Social Responsibility Committee and the Appointments and Compensation Committee held on 29 November 2018 reviewed the situation of Laurence Parisot with regard to the independence criteria specified by the AFEP-MEDEF Code, in view of her new responsibilities in Citi bank. The Board of Directors meeting held on 14 December 2018 took note, based on the opinion of the Committees, of the absence of any change in the individual situation of Ms Parisot that could question her qualification of independent director. With particular regard to the business relationship between Citi bank, in which Ms Parisot is Chairwoman and Managing Director, and the EDF group, the Board of Directors found that the cross analysis of the nature and volume of business between the EDF group and Citigroup revealed that there were no significant business relationships between EDF and Citi bank, nor any dependence or exclusivity in the business relations between the two groups. In addition, arrangements were made within Citibank so that Ms Parisot does not participate in any reflection, discussion or work of any kind related to EDF.

At a joint meeting on 7 February 2019, the Governance and Corporate Social Responsibility Committee and the Appointments and Compensation Committee conducted an annual review of the individual situations of directors appointed by the Shareholders' Meeting, taking into account the independence criteria provided for by the AFEP-MEDEF Code.

The Committees noted that Jean-Bernard Lévy, due to his capacity as Executive Corporate Officer cannot be considered as independent director (criterion no. 1).

The directors appointed on the recommendation of the French State in accordance with Article 6 of order no. 2014-948 of 20 August 2014 on the governance and equity transactions of companies with a public shareholding "*represents*", by virtue of this text, "*the interests of the French State as shareholder*". In view of the criteria set by the AFEP-MEDEF Code, these directors cannot be considered as independent (criterion no. 8).

The same holds true for the Representative of the French State appointed pursuant to the provisions of Article 2 of the order of 20 August 2014, in his capacity as representative of EDF's majority shareholder (criterion no. 8).

Finally, directors representing employees are not subject to an assessment, in accordance with the recommendations of the AFEP-MEDEF Code.

With respect to business relationships, the Governance and Corporate Social Responsibility Committee and the Appointments and Compensation Committee reviewed the situation of Ms Lewiner, Ms Parisot and Ms Pedini and Mr Crouzet and Mr Lafont with regard to criterion no. 3 provided for by the AFEP-MEDEF Code.

Upon recommendation from these Committees, at its meeting on 14 February 2019, the Board made an annual evaluation of the independence of the directors and confirmed Ms Lewiner, Ms Parisot and Ms Pedini and Mr Crouzet and Mr Lafont as having the status of independent directors, as the Board deemed that these directors had no relations with the Company, its Group or its Management that might compromise the exercise of their freedom of judgement.

In particular, the Committees examined any business ties that might exist between the Company and companies at which these directors hold offices or management posts, as well as groups to which they belong, on a quantitative level, *via* the importance of any business relations existing between the Company and these companies (and their groups) and sales between them recorded in the course of the 2018, and on a qualitative level (director's position in the companies in question, any economic dependence, exclusivity, etc.). Based on their findings, none of the companies at which the directors hold offices or management posts, nor any of the groups to which they belong, could be classified as a significant Group client, supplier, business banker, financing banker or important consultant of the EDF group, nor could EDF be considered a significant client or supplier of these companies or their groups. Following this analysis, the Board concluded that there were no significant business ties involving the directors that it classified as independent.

On the date of this Reference Document, the Company's Board of Directors therefore features five independent directors out of the twelve taken into account to make the calculation in accordance with the AFEP-MEDEF Code, *i.e.* a proportion of independent directors of 41.7%, (excluding directors representing employees) higher than the recommendations of the code (see section 4.2.1 "Members of the Board of Directors").

The table below presents the situation of the administrators classified as independent stated by the AFEP-MEDEF Code of Corporate Governance:

	Criterion no. 1	Criterion no. 2	Criterion no. 3	Criterion no. 4	Criterion no. 5	Criterion no. 6	Criterion no. 7	Criterion no. 8	Classification considered
<b>Philippe Crouzet</b>	x	x	x	x	x	x	x	x	Independent
<b>Bruno Lafont</b>		x	x	x	x	x	x	x	Independent
<b>Colette Lewiner</b>	x	x	x	x	x	x	x	x	Independent
<b>Laurence Parisot</b>	x	x	x	x	x	x	x	x	Independent
<b>Claire Pedini</b>	x	x	x	x	x	x	x	x	Independent

x: means that the criterion is met.

#### 4.2.2.5 Evaluation of the functioning of the Board of Directors and its Committees

In accordance with the provisions of the AFEP-MEDEF Code, the Board's internal rules of procedure state that the Governance and Corporate Social Responsibility Committee supervises annually an evaluation of the functioning of the Board of Directors and propose areas for improvement. Once a year, therefore, the Board dedicates one item on its agenda to this evaluation and holds a discussion on its functioning and that of its Committees in order to improve its efficiency and ensure that important issues are appropriately prepared and discussed.

Every three years, this evaluation is conducted by an external consultant under the supervision of the Governance and Corporate Social Responsibility Committee.

#### 2016 Three-yearly evaluation

The 2016 evaluation was conducted by a specialised external firm, selected following a call for tenders, under the supervision of the Governance and Corporate Social Responsibility Committee. The evaluation was conducted, at the end of 2016 and the start of 2017.

Accordingly, an analysis of the individual contribution of each director to the Board's work was conducted. This involved individual and confidential meetings arranged by the external firm with each director.

The findings of the evaluation were reviewed at a meeting of the Governance and Corporate Social Responsibility Committee and presented to the Board of Directors. The Board of Directors then met during the second half of 2017 for a special working session to explore the areas of improvement identified and to discuss in more detail the expectations expressed by the directors in the triennial evaluation.

## 2018 Annual evaluation

The 2018 annual evaluation was carried out internally via a detailed questionnaire, which is updated each year taking into account current issues pertaining to the Company and the Board and the expectations expressed by directors during previous evaluations. This questionnaire was reviewed by the Governance and Corporate Social Responsibility Committee before being sent to the directors. Including both closed-ended questions, enabling statistical monitoring of the answers provided by directors, and open-ended questions, enabling directors to give detailed answers, provide qualitative observations and propose changes, this questionnaire is filled in anonymously by directors then analysed by the Board's Secretariat.

The evaluation covered the following fields:

- organisation of meetings of the Board of Directors and of the Committees and conduct of meetings;
- assessment of subjects discussed and information provided;
- working methods of the Board and of the Committees and interactions between the Board and the Committees;
- feedback on the Board's strategic seminar and the executive session held in 2018;
- relations between the Board and the Chairman and Executive Management and assessment of the balance of powers between the Chairman and the Board;
- personal opinion on the governance of the Company, expectations and suggestions, in particular in view of the re-election of the Board of Directors in 2019.

The results of this evaluation, which were examined by the Governance and Corporate Social Responsibility Committee on 29 November 2018 and presented to the Board on 14 February 2019, showed that the directors were generally satisfied with the functioning of the Board and of the Committees, with overall satisfaction rates on the rise on most topics covered by the evaluation. The information provided to the Board were deemed to be satisfactory. The directors were satisfied with the functioning of the Committees and considered that their work helped the Board with regard to decision-making. Directors appreciated the strategic seminar held in 2018. The balance of powers between the Board and the Chairman and Chief Executive Officer was deemed satisfactory and the Board's internal rules of procedure in line with its needs. Generally, a large majority of directors considered that the functioning of the Board is satisfactory, with regard to good practices in terms of corporate governance, and that it is also improving.

The areas for improvement identified by directors included: enhancing the monitoring of performance and of value creation by the Company in 2019; spending less time on the presentation of topics during meetings in order to allocate more time to discussions and maintaining the organisation of an annual executive session.

### 4.2.2.6 Information and training of directors – Digitalisation

The Chairman and Chief Executive Officer ensures that the directors have the necessary information for them to carry out their functions. This information is provided to them as soon as possible to enable them to carry out their work under the best conditions.

Under the terms of the Board's internal rules of procedure, it periodically receives information on the financial, treasury and off-balance sheet commitments position of the Company and the Group, as well as information on the performance of the Company's principal subsidiaries on the occasion of the presentation of the annual and half year financial statements, in addition to the purchasing and human resources policy. The Board of Directors is regularly informed of changes to the Company's markets, competitive environment and the main challenges facing the Company, including in the field of corporate social, societal and environmental responsibility.

A document reviewing the Group's current major sectors of business and the market trends, as well as the economic, financial and institutional context is regularly submitted to the Board of Directors. The Company also provides them with any information that may be appropriate between the meetings of the Board, particularly where it is of an urgent or important nature.

The directors can add to this information by meeting with the principal executives of the Company or Group, without the Chairman's presence being necessary, to discuss issues on the Board's agenda.

Each director can receive additional training in the specific characteristics of the Company and the Group, their business activities and their field of activity. In addition, information meetings are organised on complex matters or issues of major strategic importance, together with any training requested by members. In 2018, a special information meeting of the Board of Directors was dedicated to electricity storage, following the launch of the EDF Storage Plan (see section 3.2.4.6.1 "EDF Storage Plan"), and the directors visited an EDF research and development site and an Edison gas-fired plant in Italy.

Since 2016, the Board of Directors has been using a digital management platform, which allows for the smooth, swift and secure availability of Board and Committee files.

### 4.2.2.7 Obligations and duties of the directors

The internal rules of procedure of the Board of Directors state that its members are subject to obligations such as: acting in the corporate interest of the Company, informing the Board of situations of conflict of interest (see also section 4.4.1 "Conflicts of interest"), and refraining from contributing to the discussions and voting on any decision in which there might be a conflict of interest, fulfilling the obligation of confidentiality, carrying out their mandate with diligence and commitment, and complying with the EDF Stock Exchange code of ethics. In addition to the right to obtain disclosure of the documents and information necessary to perform their work, the directors also have a duty to request the information they deem essential to carry out their duties.

The directors and the Chairman and Chief Executive Officer are required to immediately inform the Board of any agreement entered into by the Company in which they hold a direct or indirect interest, or which might be entered into through an intermediary.

Under the internal rules of procedure, each director undertakes to ensure that his/her status complies with the French Commercial Code on plurality of offices. The Chairman and Chief Executive Officer is also required to inform the Board of Directors before accepting an appointment in a listed company.

#### 4.2.2.8 Activity of the Board of Directors in 2018

	2017	2018
Number of meetings	11 <sup>(1)</sup>	9 <sup>(1)</sup>
Average attendance rate	90.9%	92.0%
Average duration of the meetings	3 hours and 10 minutes	3 hours and 25 minutes

(1) In addition to this number of meetings, a one-day off-site strategic seminar was also held.

The table below shows the individual attendance rate of directors over the 2018 fiscal year:

Directors whose terms of office are ongoing on 31 December 2018	Average attendance rate in 2018
Jean-Bernard Lévy	100%
Olivier Appert	88.9%
Christine Chabauty	88.9%
Jacky Chorin	100%
Philippe Crouzet	77.8%
Christophe Cuvilliez	77.8%
Maurice Gourdault-Montagne	66.7%
Bruno Lafont	88.9%
Bruno Léchevin	88.9%
Marie-Christine Lepetit	100%
Colette Lewiner	88.9%
Marie-Hélène Meyling	100%
Laurence Parisot	100%
Claire Pedini	100%
Jean-Paul Rignac	100%
Michèle Rousseau	88.9%
Christian Taxil	100%
Martin Vial	100%

In 2018, the Board of Directors examined and/or authorised, in addition to items relating to the Company's regular business, issues such as the Storage Plan, the long-term industrial and social issues of the electricity mix, the acquisition by EDF Renewables of a company to implement the offshore wind farm of Neart na Gaoithe in Scotland (see section 1.4.1.5.3 "EDF Renewables") and its participation in tenders in Brasil for solar and wind projects, several onshore and offshore wind projects, the signature under conditions precedent of construction contracts relating to the French offshore wind projects at Saint-Nazaire, Fécamp and Courseulles sur Mer, the disposal of 49% of a wind portfolio in the United Kingdom, the Group's participation in Dunkerque LNG and in a portfolio of real-estate assets by Sofilo and EDF, the strategy of the nuclear fuel cycle and the recovery of the reprocessed uranium recycling sector (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"), the continued roll-out of the Linky project led by Enedis, the progress of the "Grand Carénage" ("big refit") programme, and of the Hinkley Point C and Jaitapur projects (see sections 1.4.1.1.2 "Operation and technical performance of the nuclear fleet, 1.4.5.1 "United Kingdom" and 1.4.1.2.2 "Other New Nuclear projects"), the extension to the GNL business of the partnership between EDF Trading and JERA (see section 1.4.6.2 "Gas activities"), the internal control report included in the 2018 annual letter updating the three-yearly report on the securing of financing for nuclear expenses and the updated reference note on the policy on the constitution, management and control of the financial risks involving dedicated assets (see section 4.2.3.2 "Nuclear Commitments Monitoring Committee"), EDF's policy on equal access to employment and equal pay and the results in terms of feminisation of the Group's governing bodies (see section 3.2.2.2 "Gender equality"), corporate social responsibility and risks and opportunities related to climate change, the EDF vigilance plan (see section 3.8.1 "Vigilance plan"), the Company's strategic objectives in view of the consultation of EDF's Central Works Council, the results and outlook of Edison and Framatome, and the 2017 reports of the General Inspector for nuclear safety and radiation protection and of the Inspector of Hydropower Security.

At the annual strategic seminar, the Board examined and discussed energy and climate policies in Europe, digital transformation, the Group's commitments to corporate social responsibility and sustainable development and stakeholders' expectations, the outcome of the "Let's talk Energies" initiative and the progress on CAP 2030 (see sections 3.2.5.5 "Listening to employees and talking about energy" and 1.3.2.7 "CAP 2030 success factors").

#### 4.2.3 BOARD OF DIRECTORS' COMMITTEES

To perform its duties, the Board of Directors has created five Committees to examine and prepare certain projects before they are presented to the whole Board. These specialised Committees are: the Audit Committee, the Nuclear Commitments Monitoring Committee, the Strategy Committee, the Governance and Corporate Social Responsibility Committee and the Appointments and Compensation Committee.

The members, functioning and duties of the Committees are governed by the internal rules of procedure of the Board of Directors.

The Committees include at least three directors chosen by the Board, which appoints the Chair of each Committee. The Company's articles of association state that each Committee should include at least one director representing the employees.

On the date of this document, the Chairs of the Board Committees were as follows:

- Mr. Jean-Bernard Lévy for the Strategy Committee;
- Mrs. Marie-Christine Lepetit for the Audit Committee;
- Mr. Philippe Crouzet for the Nuclear Commitments Monitoring Committee;
- Mrs. Colette Lewiner for the Governance and Corporate Social Responsibility Committee;
- Mr. Bruno Lafont for the Appointments and Compensation Committee.



The membership of each Committee is described below.

The Government Commissioner and the Head of the French State General Economic and Financial Supervisory Mission to the Company can attend the meetings of these Committees.

The work of the Committees is organised within a program prepared for the year. Meetings are recorded in the form of written minutes, and there are oral reports by the Committee Chair at the following meeting of the Board of Directors.

The Board's internal rules of procedure provide that the Committees shall meet in sufficient time before the Board's meeting, whose agenda includes consideration of matters falling within their remit.

The Committees may invite Company executives, including the Chairman and Chief Executive Office, to attend their meetings. They may also invite other parties to attend, whether employed by the Company or not, provided they inform the Chairman and Chief Executive Officer in advance and on the condition that they report such attendance to the Board. The Committees may also seek external technical advice and order studies on issues falling within their remit, at the Company's expense, after having informed the Chairman and Chief Executive Officer and provided that they report this matter to the Board.

In 2018, the average overall attendance rate of the Committees was 93.3%. The average rate of attendance per Committee as well as individual attendance rates by members are provided below.

### 4.2.3.1 Audit Committee

#### Members

In accordance with the provisions of Article L. 823-19 of the French Commercial Code and the recommendations of the AFEP-MEDEF Code, the Committee includes two-thirds of independent members and does not include any executive corporate officer.

The table below outlines the composition of the Audit Committee at the date of filing of the 2018 Reference Document:

#### Composition of the Audit Committee

<b>Marie-Christine Lepetit</b>	Chairwoman	Director appointed by the Shareholders' Meeting on recommendation from the French state
<b>Jacky Chorin</b>	Member	Director elected by the employees
<b>Philippe Crouzet</b>	Member	Independent director appointed by the Shareholders' Meeting
<b>Colette Lewiner</b>	Member	Independent director appointed by the Shareholders' Meeting
<b>Marie-Hélène Meyling</b>	Member	Director elected by the employees
<b>Jean-Paul Rignac</b>	Member	Director elected by the employees
<b>Christian Taxil</b>	Member	Director elected by the employees

In 2018, Mrs. Parisot expressed the wish to withdraw from the Audit Committee on account of the compliance policy of Citi bank, of which she became the Chairwoman and Managing Director in October 2018.

Number of members	7
Number of independent directors	2
Percentage of independent directors*	66.67%

\* Excluding directors representing the employees.

Article L. 823-19 of the French Commercial Code states that at least one member of the Committee must have specific skills in financial or accounting matters and be independent based on the criteria defined and made public by the Board of Directors. The AFEP-MEDEF Code also recommends that the members of the Audit Committee have specific skills in financial or accounting matters.

At the joint meeting of 10 December 2014, the Ethics Committee and the Appointments and Compensation Committee reviewed the situation of Colette Lewiner and Philippe Crouzet and issued a notice to the Board of Directors. The Board of Directors, meeting on 10 December 2014, noted that these directors have specific skills in financial and accounting matters according to the criteria recommended by the French Financial Markets Authority (AMF) in its report on the Audit Committee dated 22 July 2010. On 14 February 2019, the Board of Directors also confirmed the qualification as independent directors of Colette Lewiner and Philippe Crouzet. These two Committee members meet the criteria of both expertise and independence mentioned in Article L. 823-19 of the French Commercial Code.

#### Duties

The Audit Committee carries out the duties entrusted to it in accordance with Article L. 823-19 of the French Commercial Code under the supervision of the Board of Directors. In accordance with this article, the Committee is tasked with the following duties in particular:

- monitoring the process to prepare financial information and making any recommendations to guarantee its integrity;

- monitoring the effectiveness of the internal control, risk management and internal audit systems, regarding procedures relating to the preparation and processing of accounting and financial information;

- monitoring the performance of the duties of the Statutory Auditors, ensuring their independence and approving the provision of the services mentioned in Article L. 822-11-2 of the French Commercial Code.

In fulfilling its duties, it examines and gives its opinion to the Board of Directors, on:

- the Company's financial position, the medium-term plan and the budget;
- the preliminary and consolidated annual and half-yearly financial statements and related financial reports;
- the monitoring of risks and internal control (mapping of Group risks and methods of detection, anticipation and management of risks in all areas, including social, environmental and climate change risks, organisation and evaluation of internal control processes);
- auditing (annual audit programme, main findings and corrective actions, monitoring of their implementation);
- the monitoring of the Statutory Auditors (coordination of the auditor selection procedure, monitoring of the Statutory Auditors' fulfilment of their duties taking account, where applicable, of the findings and conclusions of the High Council of Auditors, verification of the Statutory Auditors' compliance with the conditions of independence provided for in the applicable texts, opinion on the amount of fees, approval of the provision by the Statutory Auditors of non-auditing procedures according to a procedure approved by the Board of Directors on 3 November 2016);

- the financial aspects of external growth or disposal activities that are particularly significant (see section 4.2.2.3 "Powers and duties of the Board of Directors");
- the policies in terms of insurance, energy market risks and risk of bankruptcy of the Group's counterparties.

The examination of the financial statements by the Committee is accompanied by a presentation by the Statutory Auditors underlining the bases for the preparation of the financial statements, the applicable accounting frame of reference, the audit

approach implemented and the conclusions of their auditing work or limited review. In addition to the meetings of the Audit Committee devoted to examining the annual and half-yearly financial statements, the Statutory Auditors also attend the meetings devoted to risk monitoring, internal control and auditing.

For the purposes of its work, the Committee regularly meets with the Statutory Auditors, Executive Management, Corporate Finance, Group Risk Management and Internal Auditing.

### Activity in 2018

The table below presents the statistical data relating to the 2017 and 2018 fiscal years:

	2017	2018
Number of meetings	5	5
Average attendance rate	92.5%	97.5%
Average duration of the meetings	3 hours and 7 minutes	3 hours and 3 minutes

The table below presents individual attendance rates during the 2018 fiscal year by members of the Audit Committee whose terms of office are ongoing on 31 December 2018:

Members of the Audit Committee*	Average attendance rate in 2018
Marie-Christine Lepetit	100%
Jacky Chorin	100%
Philippe Crouzet	100%
Colette Lewiner	100%
Marie-Hélène Meyling	100%
Jean-Paul Rignac	100%
Christian Taxil	100%

\* Mrs. Parisot was a member of the Audit Committee until 6 November 2018. Her individual attendance rate in 2018 was 75%.

In 2018, the Audit Committee, amongst other tasks, examined the half-year and annual financial statements and the related financial reports, the presentation of the Statutory Auditors' 2018 audit plan and the key points of their findings following their work, the 2019 budget and the 2019-2022 medium-term plan (MTP), the review of the value of assets with a view to the closing of the 2018 financial statements, off-balance sheet commitments, the updated risk mapping, changes in priority risks, risk control methods and improvement initiatives identified, the results of the 2017 internal control self-assessment and the progress report on the internal control transformation projects, the summary of internal audits and of the audit programme as well as the overhaul of the audit process, energy market and counterparty risks, supplier risks, the 2018-2019 financial management and

financial risk control agreement and the Group's policy in terms of insurance and the insurability of risks.

In accordance with the procedure approved by EDF's Board of Directors on 3 November 2016, the Committee authorised the Statutory Auditors and the members of their network to provide services other than the certification of the financial statements and it was informed of the services provided as part of the pre-approval process under the terms of this procedure.

The Committee did not need to seek any external technical advice or order any studies on issues falling within its remit during the 2018 fiscal year.

### 4.2.3.2 Nuclear Commitments Monitoring Committee

#### Members

The table below outlines the composition of the Nuclear Commitments Monitoring Committee at the date of filing of the 2018 Reference Document:

Members of the Nuclear Commitments Monitoring Committee			
Philippe Crouzet	Chairman	Independent director appointed by the Shareholders' Meeting	
Olivier Appert	Member	Director appointed by the Shareholders' Meeting on recommendation from the French state	
Christophe Cuvilliez	Member	Director elected by the employees	
Marie-Christine Lepetit	Member	Director appointed by the Shareholders' Meeting on recommendation from the French state	
Marie-Hélène Meyling	Member	Director elected by the employees	
Michèle Rousseau	Member	Director appointed by the Shareholders' Meeting on recommendation from the French state	
Number of members			6
Number of independent directors			1
Percentage of independent directors*			25%

\* Excluding directors representing the employees.

## Duties

The Nuclear Commitments Monitoring Committee (NCMC) was created by Article 9 of Decree no. 2007-243 of 23 February 2007 on the securing of the financing of long-term nuclear expenses.

It is tasked with monitoring the value of nuclear liabilities and changes in the related provisions, issuing an opinion on issues relating to the governance of dedicated assets, the rules for asset-liability matching and on strategic allocation, as well as examining the results of the management of assets constituted by the Company and verifying the compliance of such management with the rules on constituting, managing, and controlling the financial risks of dedicated assets. It provides the Board with an opinion on the internal control procedure for the financing of the expenses set out in Article L. 594-1 of the French Environment Code.

The Committee relies on the works of the Nuclear Commitments Financial Expertise Committee (NCFEC) which is comprised of independent experts appointed by the Board <sup>(1)</sup>, whose duty is to assist the Company and its corporate bodies with matters relating to asset-liability matching and the management of dedicated assets.

Finally, the Committee issues an opinion prior to any investment in unlisted assets for any project exceeding a unit amount of €400 million as well as for any project (excl. real estate) exceeding a unit amount of €200 million resulting in full consolidation of the target investment by the Company. In case the Committee issues a negative opinion on an investment plan, the Board of Directors has sole authority to authorise the aforementioned plan.

## Activity in 2018

	2017	2018
Number of meetings	3	4
Average attendance rate	94.4%	79.2%
Average duration of the meetings	2 hours and 11 minutes	1 hour and 52 minutes

The table below presents individual attendance rates during the 2018 fiscal year by members of the Nuclear Commitments Monitoring Committee whose terms of office are ongoing on 31 December 2018:

Member of the Nuclear Commitments Monitoring Committee	Average attendance rate in 2018
Philippe Crouzet	100%
Olivier Appert	75.0%
Christophe Cuvilliez	50.0%
Marie-Christine Lepetit	100%
Marie-Hélène Meyling	100%
Michèle Rousseau	50.0%

In 2018, the Committee examined the coverage situation and the discount rate for nuclear provisions, the performance of the portfolio of listed and unlisted dedicated assets, the proposed procedure for the allocation of the assets of the EDF group to the unlisted dedicated assets and update of the reference note on the policy on the constitution, management and control of the financial risks involving dedicated assets before its approval by the Board of Directors, the 2018 annual update letter on the three-yearly report on the securing of financing for nuclear expenses and the report on

internal control which it includes, the main conclusions of Cour des comptes's report on dedicated assets, investment decisions and outlook (see section 1.4.1.1.7 "Assets available to cover long-term nuclear commitments (outside the operating cycle)"), the state of progress of the first-generation nuclear power plant decommissioning programme and the industrial geological storage centre project (CIGEO) (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"), and the proposed transfer to dedicated assets of the Group's minority shareholding of the Nam Theun Dam in Laos.

## 4.2.3.3 Strategy Committee

### Members

The table below outlines the composition of the Committee at the date of filing of the 2018 Reference Document. The directors who are not members of the Strategy Committee may attend its meetings.

Members of the Strategy Committee		
Jean-Bernard Lévy	Chairman	Chairman and Chief Executive Officer, director appointed by the Shareholders' Meeting
Olivier Appert	Member	Director appointed by the Shareholders' Meeting on recommendation from the French state
Jacky Chorin	Member	Director elected by the employees
Maurice Gourdault-Montagne	Member	Director appointed by the Shareholders' Meeting on recommendation from the French state
Marie-Hélène Meyling	Member	Director elected by the employees
Laurence Parisot	Member	Independent director appointed by the Shareholders' Meeting
Jean-Paul Rignac	Member	Director elected by the employees
Christian Taxil	Member	Director elected by the employees
Martin Vial	Member	Representative of the French State.

### Duties

The Strategy Committee issues an opinion to the Board of Directors on the Company's major strategic objectives and, specifically, the corporate strategic plan presenting the actions to be implemented in order to comply with the objectives of the multi-year energy programme (see section 1.5.2 "Public service in France"), the

Company's strategic objectives drawn up with a view to the consultation of the EDF Central Works Council, the public service contract (see section 1.5.2 "Public service in France"), strategic agreements, alliances and partnerships, as well as research and development policy.

(1) The current members of the NCFEC were re-elected or appointed on 3 November 2016 for three years by the Board of Directors on recommendation from the NCMC.

## Activity in 2018

	2017	2018
Number of meetings	3	3
Average attendance rate*	100%	92.6%
Average duration of the meetings	3 hours and 10 minutes	2 hours and 45 minutes

\* Attendance rate calculated based on the members of the Committee alone (all of the members of the Board may attend these meetings).

The table below presents individual attendance rates during the 2018 fiscal year by members of the Strategy Committee whose terms of office are ongoing on 31 December 2018:

Member of the Strategy Committee	Average attendance rate in 2018
Jean-Bernard Lévy	100%
Olivier Appert	100%
Jacky Chorin	100%
Maurice Gourdault-Montagne	100%
Marie-Hélène Meyling	100%
Laurence Parisot	66.7%
Jean-Paul Rignac	100%
Christian Taxil	66.7%
Martin Vial	100%

In 2018, the Committee examined progress on the Jaitapur project, the Group's policy on research and development, the strategic and industrial partnership agreement with Orano as part of the overhaul of the French nuclear sector and the agreement concerning the collaboration with Orano on decommissioning at the international level, EDF's commercial strategy, managerial and social challenges of the Group's human resources

policy (see sections 1.3.2 "Priorities of the CAP 2030 Strategy" and 3.4.1.3 "Skill development: preparing for the future"), the main assumptions of the 2019-2022 MTP, the proposed strategic objectives for EDF in view of the consultation of the Central Works Council, as well as an information update on control processes relating to service providers of the nuclear industrial sector.

## 4.2.3.4 Governance and Corporate Social Responsibility Committee

## Members

The table below outlines the composition of the Governance and Corporate Social Responsibility Committee at the date of filing of the 2018 Reference Document:

Members of the Governance and Corporate Social Responsibility Committee		
Colette Lewiner	Chairwoman	Independent director appointed by the Shareholders' Meeting
Christine Chabauty	Member	Director elected by the employees
Jacky Chorin	Member	Director elected by the employees
Bruno Léchevin	Member	Director appointed by the Shareholders' Meeting on recommendation from the French state
Marie-Hélène Meyling	Member	Director elected by the employees
Claire Pedini	Member	Independent director appointed by the Shareholders' Meeting

Number of members	6
Number of independent directors	2
Percentage of independent directors*	67%

\* Excluding directors representing the employees.

## Duties

The Governance and Corporate Social Responsibility Committee oversees issues relating to corporate governance and ensures the implementation, via the Company's corporate bodies, of the principles and rules of good governance outlined in the AFEP-MEDEF Code. It may make proposals concerning changes in the functioning or powers of the Board or its internal rules of procedure.

It examines the Group's commitments and policies, as well as their implementation, in terms of ethics, compliance, corporate social responsibility and sustainable development, in particular the way in which the Company takes into account questions relating to climate change, equal access to employment and equal pay and the way in which the Company implements a non-discrimination and diversity policy, in particular as regards the balanced representation between women and men on its governing bodies.

The Committee examines and gives its opinion on situations of conflicts of interest of which it has become aware or which are reported to it by the Chairman or the Board of Directors, and reports such situations to the Board. It conducts an annual evaluation of the functioning of the Board and its Committees, and every three years oversees a formal assessment entrusted to a specialist external consultant (see section 4.2.2.5 "Evaluation of the functioning of the Board of Directors and its Committees").

Each year, alongside the Appointments and Compensation Committee, it examines the individual situations of the directors according to the criteria defined by the AFEP-MEDEF Code and reports its findings to the Board. In the event of the appointment of new members to the Audit Committee, it examines, jointly with the Appointments and Compensation Committee, these members' expertise in the field of finance, accounting and statutory audit.

## Activity in 2018

	2017	2018
Number of meetings	7*	7**
Average attendance rate	92.9%	92.9%
Average duration of the meetings	1 hour and 35 minutes	1 hour and 32 minutes

\* Including one joint meeting with the Appointments and Compensation Committee.

\*\* Including two joint meetings with the Appointments and Compensation Committee.

The table below presents individual attendance rates during the 2018 fiscal year by members of the Governance and Corporate Social Responsibility Committee whose terms of office are ongoing on 31 December 2018:

Member of the Governance and Corporate Social Responsibility Committee	Average attendance rate in 2018
Colette Lewiner	100%
Christine Chabauty	100%
Jacky Chorin	100%
Bruno Léchevin	57.1%
Marie-Hélène Meyling	100%
Claire Pedini	100%

In 2018, the Committee examined issues relating to corporate social responsibility and climate change, EDF's vigilance plan (see section 3.8.1 "Vigilance plan"), information relating to corporate governance included in the management report for the 2017 fiscal year, the results of the 2017 "My EDF" internal survey (see section 3.4.4.6 "Employees' view: My EDF engagement survey"), the 2017 ethics and compliance review and the priorities for 2018 as well as the Group's new whistleblowing system, the 2017 report by the EDF mediator, the corporate sponsorship policy of the Group and of the EDF Foundation, the Group's organisation as regards the implementation of European regulation no. 2016/679 on personal data protection (GDPR), the new global corporate social responsibility agreement of the EDF group (see section 3.4.4.5 "High-quality social dialogue"), the policy in terms of equal access to employment and equal pay and the results of the feminisation of the Group's governing bodies, the Group's policy and results on

health and safety and the management of the Group's carbon goals (see section 3.2.1.1 "EDF group's ambition (CSRG no. 1)"). It also examined the questionnaire used as a basis for the 2018 internal evaluation of the functioning of the Board of Directors and its Committees and the results of this evaluation before they are presented to the Board.

The Committee also held two joint meetings with the Appointments and Compensation Committee dedicated to reviewing the updated internal rules of procedure of the Board of Directors and the policy on the reimbursement of directors' expenses before their adoption by the Board, the annual review of the independence of directors based on the criteria set out in the AFEP-MEDEF Code and a re-examination of the independence of one director in view of her new duties.

## 4.2.3.5 Appointments and Compensation Committee

## Members

The table below outlines the composition of the Appointments and Compensation Committee at the date of filing of the 2018 Reference Document.

Members of the Appointments and Compensation Committee			
Bruno Lafont	Chairman	Independent director appointed by the Shareholders' Meeting	
Christine Chabauty	Member	Director elected by the employees	
Colette Lewiner	Member	Independent director appointed by the Shareholders' Meeting	
Martin Vial	Member	Representative of the French State.	
Number of members			4
Number of independent directors			2
Percentage of independent directors*			66.67%

\* Excluding directors representing the employees.

## Duties

The Committee submits its recommendations or proposals to the Board of Directors regarding the appointment of directors by the Shareholders' Meeting. It supervises, where appropriate, the selection process of potential candidates and may perform its own review of the candidates before they are approached in any way. It gives its opinion on the diversity policy applicable to directors and, as appropriate, on candidates proposed by the Chairman and Chief Executive Officer for appointment as Deputy Chief Executive Officers. It ensures the existence of succession plans in order to anticipate the succession, whether unforeseen or at the end of their term, of executive corporate officers and members of the Group's Executive Committee; the Chairman and Chief Executive Officer is involved in the Committee's work in the performance of this task.

With regard to remuneration, the Committee examines and gives an opinion on the principles and criteria used to determine and distribute the fixed, variable and exceptional items of the Chairman and Chief Executive Officer's remuneration and benefits of all kinds and, where applicable, of the Deputy Chief Executive Officers. It provides its opinion to the Board of Directors for the discussion and determination of such remuneration and benefits. The Chairman of the Committee submits this opinion for approval to the Minister for the Economy. The Committee prepares its proposals within the limits specified by Decree no. 2012-915 of 26 July 2012, which amended the Decree of 9 August 1953, relating to French State control of the remuneration of the executives of public companies, in accordance with which the Chairman and Chief Executive's annual compensation must not exceed the gross sum of €450,000.



The Committee submits to the Board its opinion on the remuneration policy of the Group's Executive Committee and the main executives, as well as on the amount and terms and conditions for the distribution of directors' fees to the members of the Board of Directors.

Each year, alongside the Governance and Corporate Social Responsibility Committee, it examines the individual situations of the directors according to the criteria defined by the AFEF-MEDEF Code and reports its findings to the Board. In the event of appointment of new members of the Audit Committee, it also examines, jointly with the Governance and Corporate Social Responsibility Committee, these members' expertise in the field of finance, accounting and statutory audit.

### Activity in 2018

	2017	2018
Number of meetings	4*	4**
Average attendance rate	100%	100%
Average duration of the meetings	16 minutes	53 minutes

\* Including one joint meeting with the Governance and Corporate Social Responsibility Committee.

\*\* Including two joint meetings with the Governance and Corporate Social Responsibility Committee.

The table below presents individual attendance rates during the 2018 fiscal year by members of the Appointments and Compensation Committee whose terms of office are ongoing on 31 December 2018:

Members of the Appointments and Compensation Committee	Average attendance rate in 2018
Bruno Lafont	100%
Christine Chabauty	100%
Colette Lewiner	100%
Martin Vial	100%

In 2018, the Committee examined the compensation policy, the Long Term Incentive Plan and the results of 2017 changes in compensation of Group managers, the EDF talent management system applicable to managers. The Committee also issued an opinion for the Board on the compensation policy of the Chairman and Chief Executive Officer and his compensation in respect of the 2018 fiscal year.

The Committee also held two joint meetings with the Governance and Corporate Social Responsibility Committee dedicated to reviewing the updated internal rules of procedure of the Board of Directors and the policy on the reimbursement of directors' expenses before their adoption by the Board, the annual review of the independence of directors based on the criteria set out in the AFEF-MEDEF Code and a re-examination of the independence of one director on account of her new functions.

## 4.3 BODIES CREATED BY EXECUTIVE MANAGEMENT

The Chairman and Chief Executive Officer are assisted by an Executive Committee which includes representatives of all the Group's lines of business.

This Committee is a body that makes decisions on, considers and discusses the Group's operational and strategic issues. It examines all the Group's significant underlying and current issues, tracks the operating objectives and results and contributes to the management and forecasting of the EDF group's major challenges. It reviews and authorises significant projects, specifically the Group's investment or disinvestment projects for amounts which exceed certain thresholds. The Executive Committee meets in principle each week.

In order to reinforce the examination and follow-up of projects, an Executive Committee Commitments Committee examines in-depth the most significant projects in terms of level of commitments or risks incurred before the Executive Committee makes its decision. No investment project by the Company may be submitted for review by the Board of Directors without having first been approved by this Committee.

On the date of filing of this Reference Document, the Executive Committee had thirteen members and a Secretary. The list of members and their personal information appear below.

### 4.3.1 MEMBERS OF THE EXECUTIVE COMMITTEE

On the filing date of this Reference Document, the members of the Executive Committee were as follows:

Names	Duties
<b>Jean-Bernard Lévy</b>	Chairman and Chief Executive Officer
<b>Marc Benayoun</b>	Group Senior Executive Vice-President, Gas and Italy, Chief Executive Officer of Edison
<b>Bruno Bensasson</b>	Group Senior Executive Vice-President, Renewable Energies, Chairman and Chief Executive Officer of EDF Renouvelables <sup>(1)</sup>
<b>Christophe Carval</b>	Group Senior Executive Vice-President, Human Resources
<b>Xavier Girre</b>	Group Senior Executive Vice-President, Group Finance
<b>Véronique Lacour</b>	Group Senior Executive Vice-President, Transformation and Operational Effectiveness
<b>Henri Lafontaine</b>	Group Senior Executive Vice-President, Customers, Services and Regional Action
<b>Marianne Laigneau</b>	Group Senior Executive Vice-President, International Division
<b>Cédric Lewandowski</b>	Group Senior Executive Vice-President, Innovation, Strategy and Planning
<b>Philippe Sasseigne</b>	Group Senior Executive Vice-President, Nuclear and Thermal <sup>(2)</sup>
<b>Simone Rossi</b>	Group Senior Executive Vice-President, Chief Executive Officer of EDF Energy
<b>Pierre Todorov</b>	Group Senior Executive Vice-President, Group General Secretary
<b>Xavier Ursat</b>	Group Senior Executive Vice-President, New Nuclear Projects and Engineering

*Alexandre Perra is the Secretary of the Executive Committee. He is Executive Coordinator to the Chairman and Chief Executive Officer, Government Relations.*

*(1) Bruno Bensasson replaced Antoine Cahuzac effective 16 April 2018.*

*(2) Philippe Sasseigne replaced Dominique Minière effective 8 February 2019.*

On the date of filing of this Reference Document, the Executive Committee had two women members, i.e. 15.4% of women (compared with 7.7% up until December 2016). The EDF group has been fully engaged in the feminisation of its governing bodies for a number of years now. Firstly, the number of women on its Executive Committee has doubled with the arrival in December 2016 of Véronique Lacour, Group Senior Executive Vice-President, Transformation and Operational Effectiveness.

The Chairman and Chief Executive Officer has also implemented several actions to promote the feminisation of the governing bodies and of the Boards of directors of

Group companies. Each member of EDF's Executive Committee mentors women managers or future women managers. Furthermore, women identified as "talents" and who might become managers in the medium-term, benefit from close individual support and specific professionalisation actions, and the related career guidance.

Lastly, a talent pool of women who could be appointed on the Boards of directors of Group companies has been created. Special attention is paid right from the recruitment of employees so that the Company reflects current society (also see sections 3.2.2.2 "Gender equality" and 4.2.1 "Members of the Board of Directors").

### 4.3.2 PERSONAL INFORMATION ON MEMBERS OF THE EXECUTIVE COMMITTEE

**Marc Benayoun**, 52 years old, a graduate of the École Supérieure des Sciences Économiques et Commerciales (ESSEC), began his career at Paribas Group in 1989, before joining the Boston Consulting Group in 1993. He became Partner and Managing Director at the Paris office in 2001 then at the Moscow office in 2008 and during this period held a range of responsibilities, including the development of skills in the natural gas sector. In 2009, he joined the EDF group as Economics, Tariffs and Prices Director. In 2012, he became Director of the B2B Market within the Trading Division with responsibility for electricity, gas and service sales. In this role, he supervised the project linked to the end of regulated electricity tariffs for businesses and local authorities (more than 400,000 sites in all, 120TWh of electrical consumption), with the objective of regaining a leading position in a competitive environment. He is Director of EDF Trading, a member of the Supervisory Board of Trimet France, Chairman of Transalpina di Energia, Chief Executive Officer of Edison, 3rd largest energy company in Italy, which controls most of the Group assets in Italy, Chairman of Fondazione Edison and Director of Fenice. Since 2016, he is the Group Senior Executive Vice-President with responsibility for Gas and Italy.

**Bruno Bensasson**, 46 years old, is a graduate of the École Polytechnique and École des Mines of Paris. He started his career in 1998 at the Autorité de Sûreté Nucléaire (French nuclear security authority) as head of a Regional Division (Lower and Upper Normandy) then as became the Chief of Staff of the CEO. From 2004 to 2006, he was the technical adviser responsible for the environment, new energies and nuclear energy at the office of the Minister of Industry, then adviser at the General Secretariat of the office of the President of the Republic in charge of industry, the environment and transport. He joined SUEZ in 2007 as Director of economic studies at the Department of development and strategy. In 2011, he became a member of GDF SUEZ's Executive Committee as Director for strategy and sustainable development. He was appointed CEO of GDF SUEZ Energie France in early 2013 and, in July 2014, became the Vice-President of GDF SUEZ Energie Europe in charge of development and renewable generation. In 2016, he became the CEO of Engie Afrique. In May 2018, Bruno Bensasson became the Group Senior Executive Vice-President responsible for Renewable Energies and the Chairman and Chief Executive Officer of EDF Renouvelables.

**Christophe Carval**, 58 years old, holds a degree in electrical engineering from HEI Lille, and joined the EDF group in 1982. He has held several management positions in Departmental, Regional and Inter-regional Units in the electricity and gas distribution sector. In 2007, he was appointed to head up the project to create and manage the new Shared Services Division of the EDF group. He was the Director of Human Resources, Health & Safety and the Enedis Transformation project from 2014. Since July 2017, he holds the position of Group Senior Executive Vice-President, Human Resources Division.

**Xavier Girre**, 50 years old, graduated HEC, is the holder of a Masters in business law, a graduate of Institut d'Études Politiques de Paris (IEP) and is ENA alumni. Xavier Girre began his career at the French National Audit Office in 1995, before joining the Veolia Environnement group in 1999 where he spent twelve years and notably held the positions of Group Risk and Auditing Director of Veolia Group, Deputy Chief Executive Officer in charge of Finance of Veolia Transportation then of Veolia Environmental Services. From 2011 to 2015, he was Deputy CEO, CFO of La Poste Group and then XAnge Private Equity CEO. Xavier Girre joined EDF in 2015 as France CFO, before being appointed Group Senior Executive Vice-President, responsible for the Finance Division. Xavier Girre is also Director of EDF Energy, EDF Energies Nouvelles, Dalkia, Chairman of the Board of Directors of EDF Trading, a member of the Supervisory Board of Enedis and Chief Executive Officer of CTE. Xavier Girre is, in addition, a member of the MEDEF Ethics Committee, Director and Chairman of the Audit Committee of La Française des Jeux.

**Véronique Lacour**, 54 years old, holds a postgraduate diploma in Information Systems from the University of Paris I Panthéon Sorbonne. Véronique Lacour started her career at Thales in 1987, where she gained solid experience in Information Systems, before taking up the position of Chief Information Officer for a new Division of Thales in 2004. Between 2007 and 2009, she managed the HR information systems shared services of such Division. She moved to Safran in 2009 where she held the position, first, of Chief Information Officer for Safran Aircraft Engines (formerly Snecma), and later, in 2013, Vice-President Improvement Initiatives, where she managed continuous improvement and transformation initiatives. She went on to become Vice-President Programs for Safran Analytics, and was involved in the creation of this new Big Data-focused entity as part of the Group's digital transformation strategy. She joined EDF on 1 December 2016 as Group Senior Executive Vice-President, Transformation and Operational Effectiveness and is a member of the Executive Committee. She is tasked with directing the Group's activities in the areas of information systems, purchasing, property, consultancy and tertiary services and IT.

**Henri Lafontaine**, 62 years old, a graduate of the Supélec Engineering School with a Master's in Mathematics, joined EDF in 1983 where he had a wide range of responsibilities in the Distribution Division, finally becoming Director of the Distribution Division of EDF GDF Services Marseille in 2000. In 2002, he was appointed as Chief Executive Officer of Edenor, EDF's subsidiary in Argentina. He became Director of EDF Island Power Systems Division in 2007, before being made Director of EDF Entreprises in the Commerce Division in 2010. In July 2013, Henri Lafontaine was appointed Group Senior Executive Vice-President responsible for Commerce, Optimisation and Trading as well as Island Energy Systems. Since March 2015, he has been Group Senior Executive Vice-President, Customers, Services and Regional Action. He supervises the service subsidiaries (Dalkia group, Citelum, Netseenergy, Izivia, Sowee, EDF ENR, etc.). He is also Chairman of Citelum, and Director of Dalkia and EDF Energy. He also heads EDF's Commerce Division.

**Marianne Laigneau**, 54 years old, is a graduate of the École Normale Supérieure de Sèvres, the École Nationale d'Administration ("Condorcet" Class) and the Institut d'Études Politiques de Paris; she also holds an aggregation in Classics and a Masters Degree in French Literature. After graduating from the École Nationale d'Administration, Marianne Laigneau joined the Council of State and became Counsellor of State in 2007. In 1997, she was assigned to the Ministry for Foreign Affairs and served as First Counsellor to the French Embassy in Tunis. From 2000 to 2002, as a member of the French Council of State, she was specifically responsible for being representative to the Director of ENA, legal advisor to the Ministry for Culture, and senior lecturer in public law at ENA. In 2003, Marianne Laigneau joined Gaz de France as Head of the Institutional Affairs Department at Headquarters, and then became Representative for Public Affairs (2004). She joined the EDF group in January 2005 as Group General Counsel, then held the position of Corporate Secretary, member of the Executive Committee, from June 2007. She held the position of Group Senior Executive Vice-President, Human Resources as a member of the Executive Committee from 2010 to 2017. She was appointed Group Senior Executive Vice-President, International Division in July 2017. On 11 January 2018, she was appointed Chairwoman of the Supervisory Board of Enedis. She is also a

director of EDF Renouvelables, EDF Trading, Vinci Autoroutes and the Cité Internationale Universitaire de Paris.

**Cédric Lewandowski**, 49 years old, is a graduate of the Paris Institute of Political Studies (IEP) and holds a postgraduate degree (DEA) in Geopolitics (Paris-VIII). Cédric Lewandowski began his career at EDF in 1998 as the Chief of Staff for the Chairman of EDF from 1998 to 2004, he then served as Director of the Electric Transport and Vehicles Division of Électricité de France from 2005 to 2008. He subsequently became Director of EDF Regional Authorities within EDF's Commerce Division from 2008 to 2012, Chairman of the Board of Directors of H4 from 2009 to 2012, Director of Safidi from 2009 to 2012 and Chairman of the Board of Directors of Tiru from 2009 to 2012. He was then appointed Chief of Staff of the Civil and Military Cabinet of the French Ministry of Defence from May 2012 until mid-2017. He has held the position of EDF group Senior Executive Vice-President, Innovation, Strategy and Planning since July 2017. He is Chairman of the Executive Committee of EDF Pulse Croissance Holding, a member of the Board of Directors of Enedis, a director of the UFE and Chairman of the Board of Directors of Électricité de Strasbourg.

**Philippe Sasseigne**, 61 years old, is a graduate of the École Nationale Supérieure de Mécanique (school of engineering) of Nantes. He started his career in 1982 at the Saint-Laurent-des-Eaux Nuclear Power Plant (CNPE), as a Radio Protection Safety Engineer. He then held various positions at the same CNPE in the fields of safety and operations before moving to the Technical Operations Unit in 1992 and then joining the DPN Head Office in 1994 to take up various responsibilities in the area of management control. In 1999, he moved to the CNPE in Blayais to take up the position of Maintenance and Unit Shutdown Executive Officer. He was named Manager of the CNPE in Golfech in 2002 before being appointed Manager of the CNPE in Blayais in 2006. In 2009, he joined the DPN Management Team in Paris as Operations Manager. From 2010 to 2013, he was the Deputy Director of the Nuclear Generation Division, responsible for technical, security, generation, radiation protection and environmental issues. He became DPN Manager in 2013 before being appointed as Executive Director in charge of the Nuclear and Thermal Department in February 2019.

**Simone Rossi**, 50 years old, graduates of the University of Bocconi (Milan) in business administration. Simone Rossi began his career as a consultant, firstly at KPMG Consulting in corporate finance, then from 1996 at McKinsey & Company, where he mainly specialised in the sectors of energy, financial institutions, and information and communication technologies. In 2004, he joined Edison SpA in Milan (Italy) as Head of Strategy, before being promoted to become Director of Planning, Control and IT in 2007. At the end of 2009, he was appointed Chief Financial Officer of Constellation Energy Nuclear Group (CENG), a company based in Baltimore in the United States. He then became Chief Financial Officer of EDF Energy in April 2011. In March 2015, Simone Rossi was appointed EDF group Senior Executive Vice-President, International Division. Since 1 November 2017, he is the Chief Executive Officer of EDF Energy and Group Senior Executive Vice-President of EDF.

**Pierre Todorov**, 60 years old, a graduate of the École Normale Supérieure (Ulm) and the École Nationale d'Administration and holder of an advanced teaching degree in philosophy. Pierre Todorov was an auditor then Counsel at the French Council of State from 1986 to 1990. He then joined Lagardère Group, where he held a range of responsibilities in the media branch, particularly serving as International Deputy Chief Executive Officer of Hachette Filipacchi. In 1997, he was appointed General Secretary of Accor Group, a position he held until 2008. Between 2008 and 2011, he was partner at the law firm Hogan Lovells LLP, then joined PSA Peugeot Citroën in 2011, as General Secretary, member of the Executive Management Committee. Pierre Todorov has been EDF group General Secretary and a member of the Executive Committee since 2 February 2015.

**Xavier Ursat**, 52 years old, a graduate of the École Polytechnique and Télécom Paris. He joined EDF in 1991, first holding various positions in the hydraulic engineering department until 2002. He oversaw the construction of EDF's hydraulic engineering centres and contributed to international projects, especially in South America. From 2002 to 2005, he was a special advisor to EDF's Deputy General Manager in charge of Generation and Engineering. From 2005 to 2007, he was Assistant Director of the Alps Generation Unit in Grenoble and from 2007 to 2010, Director of the Southwest Generation Unit in Toulouse. From 2010 to 2014, he was successively Deputy Manager and Manager of the Hydraulic Generation & Engineering Division. Since March 2015, Xavier Ursat has been Group Senior Executive Vice-President in charge of New Nuclear Projects and Engineering. He is also a director of EDF Renouvelables, an honorary governor of the World Water Council, Chairman of the Supervisory and Steering Committee of Edvance and a member of the Supervisory and Steering Board of Framatome. He is also Vice-Chairman of the SFEN.

## 4.4 CONFLICTS OF INTEREST, ABSENCE OF CONVICTIONS OF THE MEMBERS OF THE ADMINISTRATIVE BODIES AND EXECUTIVE MANAGEMENT, CONTRACTS FOR SERVICES

### 4.4.1 CONFLICTS OF INTEREST

To the Company's knowledge, on the date of filing of this Reference Document, there were no potential conflicts of interest involving EDF between the duties of the members of the Company's Board of Directors and Executive Management and their private interests or other duties (regarding the rules applicable to the members of the Board of Directors in terms of conflicts of interest, see section 4.2.2.7 "Obligations and duties of directors").

Subject to the specific legal and regulatory provisions applicable to the members of the Company's Board of Directors (see section 4.2.1 "Members of the Board of Directors"), to the Company's knowledge, no arrangements or agreements have been entered into with shareholders, clients, suppliers or others under which a member of the Board of Directors or Executive Management has been appointed in this capacity.

To the Company's knowledge, no member of the Board of Directors has agreed to restrict for a fixed period of time his/her ability to sell his/her holdings in the Company's capital, except for the restrictions resulting from the EDF Stock Exchange Ethics Code (see section 4.5.2 "Trading in Company securities"). In addition, corporate officers holding shares in mutual funds through an EDF group Corporate Savings Plan invested in EDF shares, or who have acquired shares from the French state within the legal framework of the privatisation, can be subject to the lock-in and non-transferability rules resulting from the provisions applicable to these transactions.

To EDF's knowledge, there are, moreover, no family ties between members of the administrative bodies or Executive Management.

### 4.4.2 ABSENCE OF CONVICTIONS

To EDF's knowledge, within at least the past five years, no member of the Board of Directors or of the Executive Management of EDF has been subject to: (i) a conviction for fraud, (ii) bankruptcy, receivership or liquidation, or (iii) conviction and/or official public sanction issued by the statutory or regulatory authorities.

Moreover, to EDF's knowledge, no member of the EDF Board of Directors or Executive Management has been prevented by a court from serving as a member of an administrative, management or supervisory body of an issuer or from participating in the management or direction of an issuer's affairs during the past five years.

### 4.4.3 CONTRACTS FOR SERVICES

EDF's company officers did not enter into any contract for services with the Company or any of its subsidiaries pursuant to which they would be entitled to any kind of benefits.

### 4.5 SHAREHOLDING BY DIRECTORS AND TRADING IN EDF SECURITIES BY CORPORATE OFFICERS AND EXECUTIVES

#### 4.5.1 SHAREHOLDING BY DIRECTORS

As at 31 December 2018, the members of the Board of Directors of the Company, whose terms of office are ongoing as at 31 December 2018, held a total of 4,259 shares. The table, below, details the number of EDF shares held individually by these directors on 31 December 2017 and 31 December 2018:

	Number of EDF shares held on 31/12/2017	Number of EDF shares held on 31/12/2018
Jacky Chorin <sup>(1)</sup>	294	307
Philippe Crouzet	294	294
Christophe Cuvilliez	24	24
Bruno Lafont	238	245
Colette Lewiner <sup>(2)</sup>	1,870	1,932
Marie-Hélène Meyling	28	28
Laurence Parisot	137	137
Christian Taxil <sup>(1)</sup>	1,237	1,292
<b>TOTAL</b>	<b>4,122</b>	<b>4,259</b>

(1) Shares held through the profit-sharing scheme (FCPE).

(2) Shares held directly and through the profit-sharing scheme (FCPE).

Directors whose terms of office are ongoing on 31 December 2018 and are not included in the above table, hold no EDF shares.

#### 4.5.2 TRADING IN COMPANY SECURITIES

In 2006, the EDF group adopted a set of principles and rules applicable to trading in shares in EDF or listed EDF group subsidiaries. These rules were compiled into an Ethics Code presented to the EDF Executive Committee on 4 April 2011. This code was updated in 2016 to take account of the entry into force of regulation (EU) no. 596/2014 on market abuse (so-called "MAR" – market abuse regulation), its implementing regulations<sup>(1)</sup>, law 2016/819 of 21 June 2016 reforming the system for the repression of market abuse and the new guide on ongoing information and the management of inside information published by the AMF on 26 October 2016.

At the same time as this Code was distributed, awareness campaigns on stock exchange rules were launched for Group employees, specifically regarding precautions and obligations relating to the holding of inside information and the black-out periods during which permanent or temporary insiders, including third parties acting in the name or on behalf of the Group, and, more specifically regarding black-out periods, all persons performing executive duties within the Group, are required to refrain from trading Company securities or other related financial instruments.

The Ethics Code also notes the obligations imposed on executives, high-level managers as well as persons closely linked to them to declare to the AMF and to the Company trades in EDF securities or other related financial instruments that they make on their own behalf. Indeed, under the terms of Article 19 of MAR, specified in Article 223–22 A of the AMF general regulations, the executives of companies with shares listed for trading on a regulated market must declare trades in Company securities to the AMF and to the Company within three trading days of their completion, when the combined amount of these trades exceeds the sum of €20,000 for the current calendar year.

The AMF general regulations<sup>(2)</sup> also state that the EDF Board of Directors must mention in its annual report to the Shareholders' Meeting trades that have been declared by executives and similar persons<sup>(3)</sup> over the past fiscal year.

No trades in EDF securities were declared to the AMF or to the Company during the 2018 fiscal year by the members of the Board of Directors and the Company's Executive Committee.

(1) Delegated regulation (EU) 2016/522 of 17 December 2015 regarding the indicators for stock market manipulation, the disclosure thresholds, the permission for trading during closed periods and types of notifiable managers' transactions; delegated regulation (EU) 2016/908 of 26 February 2016 regarding accepted market practices; delegated regulation (EU) 2016/909 of 1 March 2016 regarding notifications and lists of financial instruments to be submitted to competent authorities in accordance with Article 4 of the MAR; delegated regulation (EU) 2016/1052 of 8 March 2016 regarding the conditions applicable to buy-back programmes and stabilisation measures; delegated regulation (EU) 2016/957 of 9 March 2016 regarding abusive practices or suspicious orders or transactions; delegated regulation (EU) 2016/958 of 9 March 2016 regarding technical arrangements for the objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and the disclosure of particular interests or indications of conflicts of interest; delegated regulation (EU) 2016/960 of 17 May 2016 regarding market soundings; implementing regulation (EU) 2016/347 of 10 March 2016 regarding insider lists; implementing regulation (EU) 2016/523 of 10 March 2016 regarding transactions performed by persons exercising Executive Management functions; implementing regulation (EU) 2016/378 of 11 March 2016 defining the technical standards regarding the date, format and template for the submission of the notifications noted in Article 4 of the MAR; implementing regulation (EU) 2016/959 of 17 May 2016 regarding market soundings; implementing regulation (EU) 2016/1055 of 29 June 2016 regarding the technical methods for publishing and reporting insider information.

(2) Article 223–26 of the AMF general regulations.

(3) At EDF, staff "similar to executives" are the members of the Company's Executive Committee.



## 4.6 COMPENSATION AND BENEFITS

### 4.6.1 COMPENSATION OF CORPORATE OFFICERS

The remuneration and benefits of all kinds paid in the 2018 fiscal year to corporate officers by the Company and the companies it controls are listed below.

The tables below were drawn up in accordance with the format recommended by the AFEP-MEDEF Code of Corporate Governance and the AMF's position-recommendation no. 2009-16, modified on 13 April 2015.

#### 4.6.1.1 Total compensation of the Chairman and Chief Executive Officer

##### SUMMARY TABLE OF COMPENSATION AND OPTIONS AND SHARES AWARDED TO THE CHAIRMAN AND CHIEF EXECUTIVE OFFICER <sup>(1)</sup>

(in euros)	2017 fiscal year	2018 fiscal year
Jean-Bernard Lévy, Chairman and Chief Executive Officer		
Remuneration due for the fiscal year	452,868	452,868
Valuation of multi-year variable remuneration awarded during the fiscal year	None	None
Valuation of options awarded during the fiscal year <sup>(2)</sup>	None	None
Valuation of bonus shares awarded during the fiscal year <sup>(2)</sup>	None	None
<b>TOTAL</b>	<b>452,868</b>	<b>452,868</b>

(1) Table 1 of AMF position-recommendation 2009-16.

(2) As indicated in section 4.6.2, the Company has not implemented any stock options plans and the corporate officers receive no allocation of bonus shares.

The table below details the remuneration of all kinds owed and paid to Jean-Bernard Lévy, Chairman and Chief Executive Officer, for the 2017 and 2018 fiscal years.

##### SUMMARY TABLE OF THE COMPENSATION OF THE CHAIRMAN AND CHIEF EXECUTIVE OFFICER <sup>(1)</sup>

(in euros)	2017 fiscal year		2018 fiscal year	
	Amounts due for the fiscal year	Amounts paid during the fiscal year	Amounts due for the fiscal year	Amounts paid during the fiscal year
Jean-Bernard Lévy, Chairman and Chief Executive Officer				
Fixed remuneration	450,000	450,000	450,000	450,000
Variable remuneration	None	None	None	None
Multi-year variable remuneration	None	None	None	None
Exceptional remuneration	None	None	None	None
Directors' fees	None	None	None	None
Benefits in kind <sup>(2)</sup>	2,868	2,868	2,868	2,868
<b>TOTAL</b>	<b>452,868</b>	<b>452,868</b>	<b>452,868</b>	<b>452,868</b>

(1) Table 2 of AMF position-recommendation 2009-16.

(2) These benefits in kind consist of a company car.

#### 4.6.1.1.1 Terms and conditions for the setting of compensation

In accordance with Article 3 of decree no. 53-707 of 9 August 1953 and Article L. 225-47 of the French Commercial Code, the items comprising the remuneration of the Chairman and Chief Executive Officer are set by the Company's Board of Directors on the recommendation from the Appointments and Compensation Committee and approved by the Minister for the Economy after consultation of the relevant Ministers (see section 4.2.3.5 "Appointments and Compensation Committee").

Decree no. 2012-915 of 26 July 2012 modified the decree of 9 August 1953 by introducing a limit of €450,000 on remuneration payable to corporate officers of state-owned companies to which this decree is applicable.

Pursuant to the provisions of Article L. 225-37-2 of the French Commercial Code, the policy and the items comprising the compensation of the Chairman and Chief Executive Officer as well as, where applicable, the payment of variable and exceptional items of compensation, are subject to resolutions submitted to the approval of the Shareholders' Meeting (see section 4.6.1.2 "Compensation policy to be presented to EDF's Shareholders' Meeting convened to approve the financial statements for the fiscal year ended 31 December 2018").

#### 4.6.1.1.2 Setting of the compensation of the Chairman and Chief Executive Officer

##### Remuneration for the 2018 fiscal year

The Appointments and Compensation Committee meeting of 7 February 2018 reviewed the remuneration policy of the Chairman and Chief Executive Officer and decided to recommend to the Board of Directors that the principles and criteria for the determination of items comprising his remuneration be maintained for the 2018 fiscal year.

On recommendation from the Committee, the Board of Directors meeting on 15 February 2018 decided to maintain the fixed annual remuneration of the Chairman and Chief Executive Officer for the 2018 fiscal year at €450,000 gross. This fixed annual compensation has remained unchanged since the appointment of Jean-Bernard Lévy as the Chairman and Chief Executive Officer of EDF in 2014 (see section 4.2.2.2 "Method of Executive Management – Appointment and powers of the Chairman and Chief Executive Officer").

### Remuneration for the 2019 fiscal year

The Appointments and Compensation Committee meeting of 7 February 2019 reviewed the remuneration policy of the Chairman and Chief Executive Officer and decided to recommend to the Board of Directors that the principles and criteria for the determination of items comprising his remuneration be maintained for the 2019 fiscal year.

On recommendation from the Committee, the Board of Directors meeting on 14 February 2019 decided to maintain the fixed annual remuneration of the Chairman and Chief Executive Officer for the 2019 fiscal year at €450,000 gross.

### 4.6.1.1.3 Other items of compensation

In 2018, Mr. Jean-Bernard Lévy did not receive any directors' fees for his duties as Chairman of the Board of Directors and director of EDF. He also did not receive any directors' fees for the positions held at companies controlled by EDF, or any remuneration of any kind whatsoever from the companies it controls.

The Company allocated no stock options to the Chairman and Chief Executive Officer in 2018 and no options were exercised during the fiscal year. Similarly, no bonus shares were awarded to the Chairman and Chief Executive Officer during the past fiscal year, and none became available.

Jean-Bernard Lévy did not receive any hiring bonus from EDF.

## EMPLOYMENT CONTRACT, SUPPLEMENTAL PENSION, SEVERANCE PAYMENTS AND NON COMPETITION CLAUSE

Chairman and Chief Executive Officer <sup>(1)</sup>	Employment contract	Supplemental pension plan	Remuneration or benefits due or liable to be due for termination or modification of duties	Non-competition clause remuneration
Jean-Bernard Lévy, Chairman and Chief Executive Officer	no	no	yes	no

(1) Table 11 of AMF position-recommendation 2009-16.

On recommendation from the Appointments and Compensation Committee, the Board of Directors meeting on 8 April 2015 decided to award to Mr. Jean-Bernard Lévy severance payments in accordance with the provisions of the French Commercial Code and the recommendations of the AFEP-MEDEF Corporate Governance Code in case of termination of his term of office of Chairman and Chief Executive Officer of EDF. These payments are subject to the following terms and conditions:

- **payment due following:** definitive award of the payments by decision of the Board of Directors, only in the event of forced departure (dismissal except for gross negligence or wilful misconduct);
- **calculation method and limit:** initial amount of severance payment of €200,000 gross after one year of seniority from the date of initial appointment, i.e. 23 November 2014, then increased by €60,000 gross per additional quarter of seniority, without exceeding the limit of one year of remuneration;
- **performance criteria:** the severance payments shall only be due in the event that 80% of budgeted Group EBITDA is achieved in at least two of the three last full fiscal years at the time of termination of their duties; in the event that their duties are terminated during the second year of the term of office, the Board shall assess the meeting of this criterion based on the last full fiscal year; in the event that their duties are terminated during the third year of the term of office, the meeting of the criterion shall be measured based on the last two full fiscal years.

This regulated commitment mentioned in Article L. 225-42-1 of the French Commercial Code was the subject of a special report by the auditors dated 8 April 2015 included in appendix C of the 2014 Reference Document.

### 4.6.1.2 Compensation policy that will be presented to EDF's Shareholders' Meeting convened to approve the financial statements for the fiscal year ended 31 December 2018

In accordance with the provisions of the French Commercial Code, EDF's Shareholders' Meeting, convened to approve the financial statements for the fiscal year ended 31 December 2018, will be asked to decide upon the items of compensation due or allocated to Jean-Bernard Lévy, Chairman and Chief Executive Officer of the Company, for the 2018 fiscal year as well the 2019 compensation policy pertaining to him.

Shareholders will also be asked to decide at the Shareholders' Meeting, after having considered the information set out in paragraph one of Article L.225-37 of the French Commercial Code, on the approval of the fixed, variable and exceptional components of overall compensation and benefits of any kind paid or allocated to Jean-Bernard Lévy, Chairman and Chief Executive Officer of the Company, for the fiscal year ended 31 December 2018, which are described in section 4.6.1.1 "Total compensation of the Chairman and Chief Executive Officer".

Shareholders will also be asked to decide on the approval of the principles and criteria for the determination, distribution and allocation of all items comprising the overall compensation and benefits in kind that may be allocated for the 2019 fiscal year to the Chairman and Chief Executive Officer of the Company, which are set by the Company's Board of Directors on the recommendation from the Appointments and Compensation Committee and are described in section 4.6.1.1 "Total compensation of the Chairman and Chief Executive Officer".

These principles and criteria are as follows:

- payment of gross fixed annual remuneration of €450,000;
- provision of a company car representing a benefit in kind;
- payment of severance pay in the event of a forced departure, subject to the achievement of performance criteria; and
- absence of any other items of remuneration or benefits of any type whatsoever, including directors' fees.

### 4.6.1.3 Total compensation of directors

The table below shows the gross amounts of directors' fees paid during the 2017 and 2018 fiscal years to the members of the Board of Directors. No exceptional remuneration or any other type of remuneration was paid to directors during the 2018 fiscal year in return for their duties.

Directors whose terms of office are ongoing on 31 December 2018	2017 <sup>(1)</sup>	2018 <sup>(1)</sup>
Olivier Appert	40,046	39,186
<i>share paid to the French state budget</i>	28,032	22,397
Philippe Crouzet	48,548	41,744
<i>including amount paid for participation in a working group<sup>(2)</sup></i>	7,500	0
Maurice Gourdault-Montagne <sup>(3)</sup>	n/a	21,400
<i>share paid to the French state budget</i>	n/a	21,400
Bruno Lafont	42,033	37,907
<i>including amount paid for participation in a working group<sup>(2)</sup></i>	7,500	None
Bruno Léchevin	38,041	36,628
<i>share paid to the French state budget</i>	38,041	30,224
Marie-Christine Lepetit	48,064	45,581
<i>share paid to the French state budget</i>	48,064	45,581
Jean-Bernard Lévy	n/a	n/a
Colette Lewiner	79,066	49,419
<i>including amount paid for participation in a working group<sup>(2)</sup></i>	30,000	None
Laurence Parisot	48,548	39,826
<i>including amount paid for participation in a working group<sup>(2)</sup></i>	7,500	None
Claire Pedini	40,530	39,826
<i>including amount paid for participation in a working group<sup>(2)</sup></i>	7,500	None
Michèle Rousseau	19,566	37,907
<i>share paid to the French state budget</i>	19,566	37,907
Martin Vial	40,547	39,826
<i>share paid to the French state budget</i>	40,547	39,826
<b>TOTAL (IN EUROS)</b>	<b>444,989</b>	<b>429,249</b>

n/a: not applicable.

(1) The payments made during a fiscal year include 50% of the fixed portion and the entirety of the variable portion for the preceding fiscal year and 50% of the fixed portion for the current fiscal year.

(2) As regards participation in a working group, see the paragraph on "Budget and distribution of directors' fees" below.

(3) Director since 20 September 2017. Directors' fees allocated to Maurice Gourdault-Montagne for the 2017 fiscal year were paid in early 2018.

### Budget and distribution of directors' fees

The directors representing the employees hold office without fees in accordance with law 83-675 of 26 July 1983 concerning the democratisation of the public sector, and the Chairman of EDF's Board of Directors receives no directors' fees.

In accordance with order 2014-948 of 20 August 2014, the directors' fees allocated to directors appointed by the Shareholders' Meeting on recommendation from the French state in accordance with Article 6 of the order and who are French civil servants are paid to the French state budget.

As regards other directors appointed by the Shareholders' Meeting on recommendation from the French state and who are not civil servants, an order of the Minister for the Economy and Finance dated 5 January 2018<sup>(1)</sup> states that the Company pays into the French state budget 15% of the directors' fees allocated to them, with the remaining 85% paid to the director.

Regarding the Representative of the French State appointed in accordance with Article 4 of the order of 20 August 2014, any compensation that he/she is entitled to receive for the performance of his/her duties is paid to the French state budget.

After the issuing of an opinion by the Appointments and Compensation Committee and approval by the Minister for the Economy in accordance with Article 3 of decree no. 53-707 of 9 August 1953, the Board of Directors submits for the approval of

the Shareholders' Meeting the budget for the directors' fees to be allocated to directors based on the distribution approved by the Board of Directors.

The terms and conditions for the distribution of the annual budget for directors' fees applicable since the 2011 fiscal year were adopted by the Board of Directors on 22 June 2011, on recommendation from the Appointments and Compensation Committee. They were re-examined and confirmed by the Board of Directors on 24 January 2018. The total budget is distributed between a fixed portion and a variable portion, each representing half of the budget, distributed as follows:

- the fixed portion is shared equally among the directors in question; 50% of the fixed annual portion is paid during the fiscal year it is awarded and the remaining 50% at the beginning of the following fiscal year;
- the distribution of the variable portion among the directors is established through the application of a variable coefficient depending on the type of meetings (Board or Committee) and depending on the particular positions held by each director (Committee member or Chairman): a coefficient of 2 for the presence of a director at a meeting of the Board of Directors, a coefficient of 1 for the presence of a director as a member at a Committee meeting and a coefficient of 2 for chairmanship of a Committee. The variable portion is divided by the total of the coefficients for the fiscal year in order to set the unit value of the coefficient; the variable portion for a fiscal year is fully paid at the start of the following fiscal year.

(1) The provisions of the order of 5 January 2018, amending the order of 18 December 2014 in accordance with Article 6-V of the order dated 20 August 2014, have been applicable since 1 February 2018. Prior to that, the order of 18 December 2014 provided that the compensation to be earned by these directors was paid to the tune of 30% to the directors in question, with the remaining 70% paid into the French state budget.

The Shareholders' Meeting of 18 May 2017 approved, on the recommendation of the Board of Directors, the annual amount of directors' fees of €500,000 for the 2017 fiscal year, including compensation for the work done during the 2016 and 2017 fiscal years by the working group of independent directors on the project for the closure of the Fessenheim plant <sup>(1)</sup>.

The Shareholders' Meeting of 15 May 2018 maintained, on the recommendation of the Board of Directors, the annual amount of directors' fees at €500,000 for the 2018 fiscal year and subsequent years, until a new decision by the Shareholders' Meeting. Of this amount, the Board of Directors, meeting on 15 February 2018, decided to continue to pay directors the amount of €440,000 from the annual budget for directors' fees, in accordance with the applicable distribution rules, in order to have a buffer of €60,000 which would only be paid in case of allocation of *ad hoc* or exceptional compensation on decision of the Board.

#### 4.6.2 STOCK OPTIONS – BONUS SHARES

The Company has not implemented any stock options plans and the corporate officers receive no allocation of bonus shares <sup>(2)</sup>.

### 4.7 REPORT BY THE STATUTORY AUDITORS, PREPARED IN ACCORDANCE WITH ARTICLE L. 225-235 OF THE FRENCH COMMERCIAL CODE, ON THE REPORT OF THE BOARD OF DIRECTORS ON CORPORATE GOVERNANCE

For the year ended 2018

In accordance with Article L. 225-37 of the French Commercial Code, the information that must be contained within the report on corporate governance is included in a section of the management report. The report of the Statutory Auditors regarding this information is therefore included in their general report (see 6.4).

(1) The Board had decided, on 3 June 2016, to entrust to a working group comprising members of the Board of Directors who are independent within the meaning of the AFEP-MEDEF Code (Mrs. Lewiner, Mrs. Parisot and Mrs. Pedini and Mr. Crouzet and Mr. Lafont), and chaired by Mrs. Lewiner, the monitoring of discussions between EDF and the French State regarding the early closure of the Fessenheim plant, and the examination of the terms of the compensation agreement to be entered into with the French state before submitting them for deliberation to the Board of Directors. This working group, which met several times in 2016 and 2017, issued an opinion on the draft settlement agreement between the French state and EDF which was submitted for authorisation to the Board of Directors.

(2) With the exception of any directors elected by the employees who may benefit from the systems implemented by the Company for the benefit of all its employees.



## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

<b>5.1</b>	<b>OPERATING AND FINANCIAL REVIEW</b>	<b>278</b>
5.1.1	Key figures	278
5.1.2	Economic environment	280
5.1.3	Significant events of 2018	286
5.1.4	Analysis of the business and the consolidated income statements for 2017 and 2018	288
5.1.5	Cash flow and net indebtedness	295
5.1.6	Management and control of market risks	299
5.1.7	Informations on invoice settlement times (account payable and receivable required by Article L. 441-6-1 of the French Commercial Code)	309
5.1.8	Informations on existing branches required by Article L. 232-1 of the Commercial Code	309
<b>5.2</b>	<b>SUBSEQUENT EVENTS</b>	<b>310</b>
<b>5.3</b>	<b>CHANGES IN MARKET PRICES IN JANUARY AND FEBRUARY 2019</b>	<b>311</b>
<b>5.4</b>	<b>OUTLOOK</b>	<b>312</b>



# 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

## Operating and financial review

### 5.1 OPERATING AND FINANCIAL REVIEW

#### 5.1.1 KEY FIGURES

Pursuant to European regulation no. 1606/2002 of 19 July 2002 on the adoption of international accounting standards, the EDF group's consolidated financial statements for the year ended 31 December 2018 are prepared under the international accounting standards published by the IASB and approved by the European Union for application at 31 December 2018. These international standards are IAS (International Accounting Standards), IFRS (International Financial Reporting Standards), and SIC and IFRIC interpretations.

The Group's accounting policies are presented in note 1 to the consolidated financial statements for the year ended 31 December 2018.

The figures presented in this document are taken from the EDF group's consolidated financial statements at 31 December 2018.

The comparative figures for the year ended 31 December 2017 presented in the notes to the consolidated financial statements have been restated for the impact of

retrospective application of IFRS 15 "Revenue from Contracts with Customers". As a consequence of these restatements, sales and energy purchases as published at 31 December 2017 have been reduced, with no impact on EBITDA see note 2.1 to the 2018 consolidated financial statements).

IFRS 9 "Financial Instruments" became mandatory on 1 January 2018. It introduces new principles for classification and measurement of financial instruments, impairment for credit risk on financial assets, and hedge accounting. In application of the simplified approach allowed by IFRS 9, the comparative figures for the first year of application have not been restated. The transition measures and the new standard's principal implications for the Group are presented in note 2.2 to the 2018 consolidated financial statements.

The Group's key figures for 2018 are shown in the following tables.

#### EXTRACT FROM THE CONSOLIDATED INCOME STATEMENT

<i>(in millions of euros)</i>	2018	2017 <sup>(1)</sup>	Variation	Variation (%)	Organic growth (%)
Sales	68,976	64,892	4,084	+6.3	+4.0
Operating profit before depreciation and amortisation (EBITDA)	15,265	13,742	1,523	+11.1	+11.3
Operating profit (EBIT)	5,282	5,637	(355)	-6.3	-1.9
Income before taxes of consolidated companies	473	3,401	(2,928)	-86.1	-79.0
EDF net income	1,177	3,173	(1,996)	-62.9	-57.5
Net income excluding non-recurring items <sup>(2)</sup>	2,452	2,820	(368)	-13.1	-7.5

(1) The figures published at 31 December 2017 have been restated to reflect the impact of application of IFRS 15 standard on sales. However, no restatements have been made for the first application of IFRS 9 from 1 January 2018, in accordance with the simplified approach allowed by IFRS 9.

(2) Net income excluding non-recurring items is not defined by IFRS, and is not directly visible in the Group's consolidated income statement. It corresponds to the Group's share of net income (EDF net income) excluding non-recurring items, net changes in the fair value of energy and commodity derivatives (excluding trading activities), and net changes in the fair value of debt and equity instruments, net of tax (see section 5.1.4.9 "Net income excluding non-recurring items").

#### FROM EDF NET INCOME TO NET INCOME EXCLUDING NON RECURRING ITEMS

<i>(in millions of euros)</i>	2018	2017
EDF net income	1,177	3,173
Gain on sale of 49.9% of the Group's investment in CTE <sup>(1)</sup>	-	(1,289)
Other, including net changes in fair value on energy and commodity derivatives, excluding trading activities and changes in the fair value of debt and equity instruments	777	(94)
Impairment	498	1,030
<b>NET INCOME EXCLUDING NON-RECURRING ITEMS</b>	<b>2,452</b>	<b>2,820</b>
Payments to bearers of perpetual subordinated bonds	(584)	(565)
<b>NET INCOME EXCLUDING NON-RECURRING ITEMS, ADJUSTED FOR PAYMENTS ON HYBRID BONDS</b>	<b>1,868</b>	<b>2,255</b>

(1) The Company that holds 100% of RTE (an independent EDF subsidiary as defined in the French Energy Code).

## EXTRACT FROM THE CONSOLIDATED BALANCE SHEET

(in millions of euros)	31/12/2018	31/12/2017 <sup>(1)</sup>
Intangible and tangible assets	162,219	156,900
Other non-current assets	48,165	47,424
<b>Non-current assets</b>	<b>210,384</b>	<b>204,324</b>
Inventories and trade receivables	30,137	30,981
Other current assets	39,358	32,845
Cash and cash equivalents	3,290	3,692
<b>Current assets</b>	<b>72,785</b>	<b>67,518</b>
Assets held for sale	-	-
<b>TOTAL ASSETS</b>	<b>283,169</b>	<b>271,842</b>
Equity (EDF's share)	44,469	41,357
Equity (non-controlling interests)	8,177	7,341
<b>Total equity</b>	<b>52,646</b>	<b>48,698</b>
Non-current provisions	71,772	71,373
Special concession assets	46,924	46,323
Non-current other liabilities	59,012	58,591
<b>Non current liabilities</b>	<b>177,708</b>	<b>176,287</b>
<b>Current liabilities</b>	<b>52,815</b>	<b>46,857</b>
Liabilities related to assets classified as held for sale	-	-
<b>TOTAL EQUITY AND LIABILITIES</b>	<b>283,169</b>	<b>271,842</b>

(1) The comparative figures for the year ended 31 December 2017 have been restated for the impact of retrospective application of IFRS 15 (see note 2.1.3.2 to the 31<sup>st</sup> december 2018 consolidated financial statements).

## GROUP CASH FLOW

(in millions of euros)	2018	2017	Variation	Variation (%)
Group cash flow <sup>(1) (2)</sup>	(480)	(209)	(271)	-129.7

(1) Group cash flow is not an aggregate defined by IFRS as a measure of financial performance, and is not comparable with indicators of the same name reported by other companies. It is equivalent to the operating cash flow after net change in working capital, net investments, allocations and withdrawals from dedicated assets, and dividends (see section 5.1.5.2).

(2) Before the capital increase.

## DETAILS OF NET INDEBTEDNESS

(in millions of euros)	31/12/2018	31/12/2017	Variation	Variation (%)
Loans and other financial liabilities	59,188	56,846	2,342	+4.1
Derivatives used to hedge liabilities	(1,972)	(1,176)	(796)	+67.7
Cash and cash equivalents	(3,290)	(3,692)	402	-10.9
Available-for-sale financial assets – Liquid assets	(20,538)	(18,963)	(1,575)	+8.3
<b>NET INDEBTEDNESS <sup>(1)</sup></b>	<b>33,388</b>	<b>33,015</b>	<b>373</b>	<b>+1.1</b>

(1) Net indebtedness is not defined in the accounting standards and is not directly visible in the Group's consolidated balance sheet. It comprises total loans and financial liabilities, less cash and cash equivalents and liquid assets. Liquid assets are financial assets consisting of funds or securities with initial maturity of over three months that are readily convertible into cash and are managed according to a liquidity-oriented policy.

# 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

## Operating and financial review

### 5.1.2 ECONOMIC ENVIRONMENT

#### 5.1.2.1 Market prices for electricity and the principal energy sources

In an interconnected European market, analysis of market prices in France and the rest of Europe provides important context.

Spot electricity prices in Europe were higher overall in 2018 than 2017.

##### 5.1.2.1.1 Spot electricity prices in Europe <sup>(1)</sup>

	France	United Kingdom	Italy	Germany	Belgium
Average baseload price for 2018 (€/MWh)	50.2	64.9	61.3	44.5	55.3
Variation in average baseload prices, 2018/2017	+11.6%	+25.4%	+13.6%	+30.0%	+24.0%
Average peakload price for 2018 (€/MWh)	59.1	70.0	67.9	52.1	64.8
Variation in average peakload prices, 2018/2017	+10.1%	+23.5%	+10.0%	+22.0%	+18.4%

The comments below concern baseload prices.

In **France**, average spot electricity prices for 2018 stood at €50.2/MWh (baseload) and €59.1/MWh (peakload), up by €5.2/MWh and €5.4/MWh respectively compared to 2017. This increase is mainly explained by a rise in prices for all commodities between March and September, a wave of cold weather in late February 2018, and a summer of very low winds across the whole of Europe.

In 2018 demand in France totalled 475.2TWh, down by 4.6TWh from 2017. Less use was made of fossil-fired thermal plants due to significantly higher nuclear fleet availability and hydropower generation levels (+14.1TWh and +9.4TWh <sup>(2)</sup> respectively compared to 2017). Wind and photovoltaic solar power output was also up, by 4.0TWh and 0.8TWh respectively to 26.8TWh and 9.7TWh in 2018.

France's export balance saw a year-on-year increase of 23.0TWh <sup>(3)</sup>, in line with the substantial rise in exports to the Central West Europe (CWE) area between May and July, then in September and December due to low wind power generation in Germany, and higher CO<sub>2</sub> prices which had a strong impact on German prices (France's export balance was up by +8.2TWh between May and July, then +10.4TWh between September and December).

In the **United Kingdom**, average spot electricity prices rose by €13.2/MWh compared to 2017, reaching €64.9/MWh for 2018. This increase began in March when all monthly average prices registered year-on-year rises of around 33% (+€16/MWh on average) due to higher fuel prices. Another notable factor was the significant price rise during the spell of cold weather in late February and early March 2018; its impact was accentuated by tension over gas supplies, after unscheduled outages at a Norwegian gas field and at the interconnection with the Netherlands just after the closure of the Rough gas storage facility.

In **Italy**, average spot prices were up by €7.4/MWh from 2017, reaching an average €61.3/MWh in 2018. This movement particularly concerned the months of March to October: over that period prices rose to a level around 28% higher than in 2017 following climbing fuel prices, whereas January prices had been 32% lower due to the milder weather of 2018.

In **Germany**, spot prices increased by €10.3/MWh from 2017 to an average €44.5/MWh in 2018. Although January prices were €22.9/MWh lower year-on-year due to milder temperatures, prices were then driven upwards by a recovery in commodity prices – particularly for CO<sub>2</sub> and coal, with a significant effect on operating costs for the German generation fleet – and the low winds of June. Since June, monthly prices have been close to €20/MWh higher on average than in 2017. Wind power output grew by 2.7TWh from 2017 to 108.6TWh for 2018, while photovoltaic power output was up by 4.8TWh to 41.2TWh in 2018. At 31 December 2018, the total installed wind power and photovoltaic power capacities in Germany stood at approximately 59GW and 46GW respectively. Several episodes of significant wind and photovoltaic power generation led to negative prices (134 hours in 2018 versus 146 hours in 2017). The lowest hourly price, -€76.0/MWh, was registered on 1 January.

In **Belgium**, spot prices were up by €10.7/MWh compared to 2017, with an average price of €55.3/MWh in 2018. This rise particularly concerned the months of March to November, when prices rose by around 44% year-on-year, reflecting the increase in fuel prices, whereas prices in January 2018 were almost 50% lower than in January 2017 as a result of milder temperatures. Spot prices at the end of the year were also driven upwards by the low availability of the nuclear fleet operated by the Engie group: five of the seven Belgian reactors have been shut down from mid-September to end of December, and a sixth unit had to be closed for maintenance between mid-October and mid-November.

(1) **France and Germany:** average prior-day trading price on the Belpex stock exchange for same-day delivery;  
**United Kingdom:** EDF Trading's average prior-day trading price for same-day delivery, in the over-the-counter market;  
**Italy:** average prior-day trading price on the GME stock exchange for same-day delivery.

(2) 9.4TWh gross and 9.1TWh net of pumping.

(3) Source: ENTSO-E Transparency Website.

5.1.2.1.2 Forward electricity prices in Europe <sup>(1)</sup>

	France	United Kingdom	Italy	Germany	Belgium
Average forward baseload price under the 2019 annual contract for 2018 (€/MWh)	48.9	60.1	59.0	44.1	51.0
Variation in average forward baseload price under the annual contracts, 2018/2017	+27.9%	+20.1%	+26.7%	+36.1%	+36.9%
Forward baseload price under the 2019 annual contract at 31 December 2018 (€/MWh)	61.6	65.3	66.8	55.8	60.9
Average forward peakload price under the 2019 annual contract for 2018 (€/MWh)	62.1	65.8	66.8	54.2	63.7
Variation in average forward peakload price under the annual contracts, 2018/2017	+24.3%	+18.2%	+26.6%	+33.8%	+33.0%
Forward peakload price under the 2019 annual contract at 31 December 2018 (€/MWh)	75.6	71.1	75.7	67.8	73.3

Annual contract prices for baseload and peakload electricity in Europe were higher on average than in 2017, due to increases in commodity prices (coal, gas and CO<sub>2</sub>).

In **France**, the average annual contract baseload price for next-year delivery was €48.9/MWh, up by 27.9% from 2017. This increase is principally explained by rising fuel and CO<sub>2</sub> prices: the average coal price increased by 18%, the average gas price by 22% and the average CO<sub>2</sub> price practically tripled between 2017 and 2018. The "Calendar N+1" contract price ended the year 2018 at €61.6/MWh.

In the **United Kingdom**, the April Ahead contract baseload price for 1 April Y+1 to 31 March Y+2 increased by 20.1% from 2017 to an average €60.1/MWh for 2018, due to a rise between the two years in CO<sub>2</sub> prices but also gas prices, which make a significant contribution to the formation of British electricity prices.

In **Italy**, the annual contract baseload price for next-year delivery also rose to an average €59.0/MWh in 2018, 26.7% higher than in 2017. This increase was driven

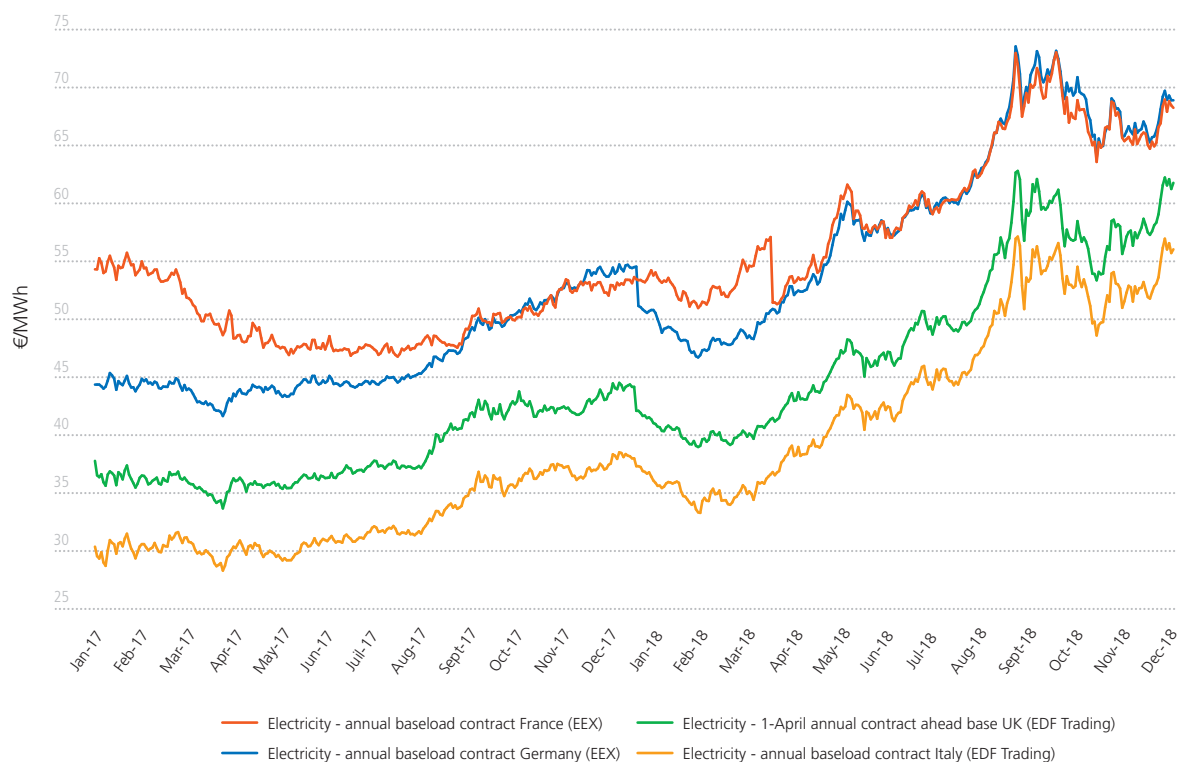
by the significant increase in gas and CO<sub>2</sub> prices, which are a major factor in Italian electricity prices.

In **Germany**, the average annual contract baseload price for next-year delivery was up by 36.1% from 2017, at €44.1/MWh in 2018. This increase resulted from year-on-year rises in fuel and CO<sub>2</sub> prices, since coal-fired facilities still make a significant contribution to the formation of German electricity prices, and are more strongly affected than gas-fired facilities by higher CO<sub>2</sub> prices.

In **Belgium**, the annual contract baseload price for next-year delivery was nearly 37% higher in 2018 than in 2017 at an average €51.0/MWh, due to higher coal and CO<sub>2</sub> prices. Another factor in this increase was the announcement that Tihange reactors 2 and 3 were to be shut down in late 2018: this pushed prices up from 21 September, before they fell back in mid-October following announcements of measures introduced to ensure secure power supplies for Belgium during the winter.

(1) **France and Germany:** average year-ahead EEX price;  
**Belgium and Italy:** average year-ahead EDF Trading price;  
**United Kingdom:** average ICE annual contract prices, April 2018 then April 2019 (in the UK, annual contract deliveries take place from 1 April to 31 March).

➔ Principal forward electricity prices in Europe (baseload, year ahead)



#### 5.1.2.1.3 CO<sub>2</sub> emission rights prices <sup>(1)</sup>

The price of CO<sub>2</sub> emission rights for delivery in December Y+1 ended the year at €25.0/t, up by €16.8/t compared to December 2017. CO<sub>2</sub> prices rose almost constantly between January and early September, continuing the trend that began in

September 2017 after the agreement to reform the EU-ETS for the period 2021-2030, which was approved by the European Parliament in February 2018. This upward movement brought the return of many speculative actors who had abandoned the CO<sub>2</sub> market, accentuating the trend and increasing market volatility.

(1) Average ICE prices for the annual contract, Phase III (2013-2020).



## → CO<sub>2</sub> emission rights prices



5.

### 5.1.2.1.4 Fossil fuel prices <sup>(1)</sup>

	Coal (US\$/t)	Oil (US\$/bbl)	Natural gas (€/MWhg)
Average price for 2018	87.0	71.7	20.9
Average price variation, 2018/2017	+18.0%	+31.0%	+21.9%
Highest price in 2018	100.0	86.3	27.4
Lowest price in 2018	72.8	50.5	16.9
Closing price, 2018	85.9	53.8	20.4
Closing price, 2017	90.3	66.9	18.2

**Coal** prices for next-year delivery in Europe stood at an average US\$87.0/t in 2018, up by 18% (+US\$13.3/t), although the year-end price was US\$4.4/t lower than in 2017. Coal prices declined during the first quarter of 2018 (-US\$13/t) due to a falling oil price and plentiful supplies in Asia, particularly in Indonesia where a change in regulations encouraged producers to focus on exports. With the recovery of oil prices and rising demand in China and India, coal prices then increased by more than US\$27/t between late March and early October. After nearing the US\$100/t mark on 3 October, prices saw a sharp downturn in the final quarter (-US\$15/t) due to a decline in oil prices, restrictions on Chinese imports and high stocks in the Benelux ports as the low level of the river Rhine affected deliveries to German power plants.

**Oil** prices for 2018 stood at an average US\$71.7/bbl, an annual increase of 31% (+US\$16.9/bbl), although the year-end price was US\$13.1/bbl lower than in 2017. After falling by close to US\$/8bbl in early February due to fears of a slowdown in worldwide demand in the short term, oil prices rose almost constantly from March to May as the OPEC countries respected their agreement for record limitation of oil production. Oil prices then remained stable over the summer before showing a

marked increase in September following the United States' threats of sanctions against importers of crude oil from Iran. That rise was short-lived, and the final quarter registered a drop in oil prices (-US\$29/bbl) as the sanctions against Iran were more lenient than expected, and production levels were very high in Russia and the United States.

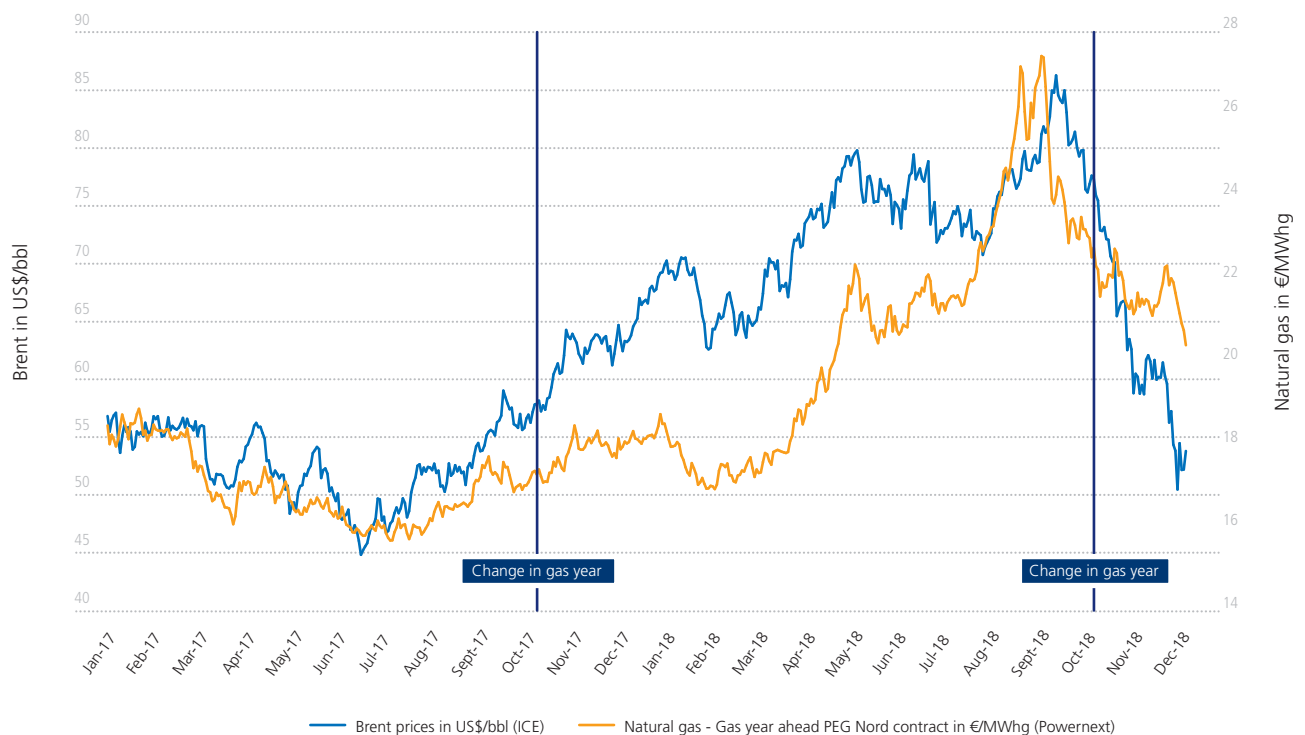
The annual **gas** contract for next-year delivery at the French PEG Nord hub traded at an average €20.9/MWh in 2018, nearly 22% (+€3.8/MWh) more than 2017. The year 2018 was marked by a merger between the PEG Nord and TRS zones on 1 November to form a single gas market area, PEG. During the first quarter of 2018, annual gas contract prices were generally stable. The rise principally occurred between April and September, largely driven by the oil price recovery, since long-term contracts are partly indexed on oil prices, but also by tensions over short-term stock levels which affected long-term prices. With the drop in oil prices, the final quarter saw declining gas prices (-€6.7/MWh) due to very good LNG supplies in Europe, and comfortable stock levels while the forecast was for a relatively mild winter.

(1) **Coal**: average ICE prices for delivery in Europe (CIF ARA) for the next calendar year (US\$/t);

**Oil**: Brent first reference crude oil barrel, IPE index (front month) (US\$/barrel);

**Natural gas**: average ICE OTC prices, for delivery starting from October of the following year in France (PEG Nord) (€/MWhg).

## ➔ Natural gas and oil prices



### 5.1.2.2 Electricity and gas consumption

#### 5.1.2.2.1 Electricity and gas consumption in France

Electricity consumption in **France**<sup>(1)</sup> reached 478.2TWh in 2018, slightly less (-0.8%) than in 2017. 2018 was a warmer year, registering an annual average temperature of 13.4°C compared to 12.8°C in 2017.

The first quarter of 2018 was a period of sharp contrasts. After a very mild January (+3.0°C above normal), February and March were very cold (respectively -3.5°C and -1.1° C below normal). After correction for weather effects, electricity consumption in France was down slightly compared to 2017 (-0.3%).

Estimated natural gas consumption in **France**<sup>(2)</sup> declined by -4.7% between 2017 and 2018 to 470.0TWh. In February and March, colder year-on-year temperatures resulted in significantly higher demand for heating. Nonetheless, consumption was down overall in 2018, due to lower use of gas-fired plants for electricity generation throughout the year (-11TWh), and milder weather, especially in January and December, which led to a general reduction in the demand for heating.

#### 5.1.2.2.2 Electricity and gas consumption in Italy

In **Italy**<sup>(3)</sup>, electricity consumption was practically stable between 2017 and 2018 (+0.4%). The lower levels of thermal and solar power generation were counterbalanced by higher hydropower generation and net imports.

In **Italy**, domestic demand for natural gas<sup>(4)</sup> decreased by 3.4% due to exceptionally high temperatures during the final quarter of 2018, which resulted in lower consumption by the residential market and thermal power generation.

### 5.1.2.3 Electricity and natural gas sales tariffs

In **France**, the regulated tariffs changed as follows:

- the "blue" tariffs were raised by +0.7% for residential customers and +1.6% for non-residential customers from 1 February 2018;
- the "blue" tariffs were reduced by -0.5% for residential customers and raised by +1.1% for non-residential customers from 1 August 2018.

(1) Sources for **France**: unadjusted data and data adjusted for weather effects provided by RTE.

(2) Sources for **France**: unadjusted data provided by Smart GRTgaz.

(3) Sources for **Italy**: unadjusted data and data provided by Terna, the Italian national grid operator and adjusted by Edison.

(4) Sources for **Italy**: Ministry for Economic Development (MSE), Snam Rete Gas data adjusted by Edison on the basis of 1Bcm = 10.76TWh.

In the **United Kingdom**, EDF Energy made two changes to the variable tariffs for residential customers:

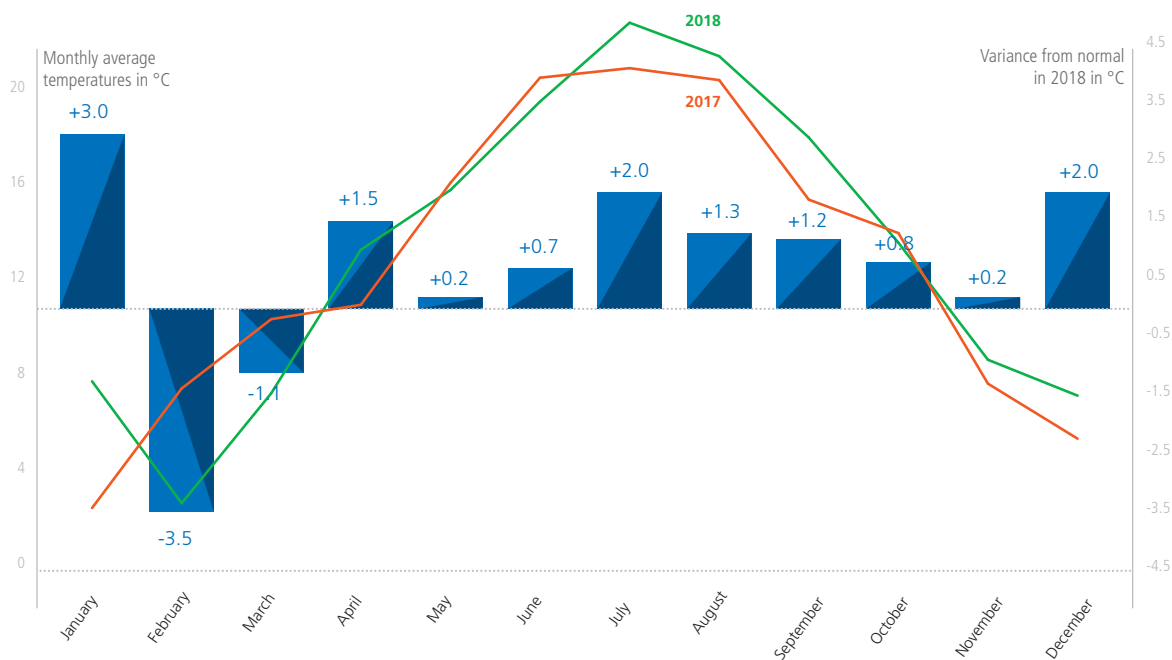
- the tariffs for residential customers were raised by 2.7% from 7 June 2018;
- electricity tariffs were raised by 6.1% and gas tariffs by 6% from 31 August 2018.

This rise is mainly explained by increases in wholesale market prices.

#### 5.1.2.4 Weather conditions: temperatures and rainfall

Average temperatures were +0.7°C above normal for 2018 as a whole. Only February and March registered below-normal monthly temperatures. The month of January was particularly mild (+3°C above normal), and July and December were also warmer than usual (+2°C above normal). The average annual temperature in France in 2018 was 13.4°C, making it the warmest year since 1900.

#### → Temperatures <sup>(1) (2)</sup> in France in 2018 and 2017



(1) Average temperatures recorded in 32 cities weighted by electricity consumption.  
 (2) Source: Miréor (data from Météo-France).

Concerning rainfall, 2018 was a year of contrasts:

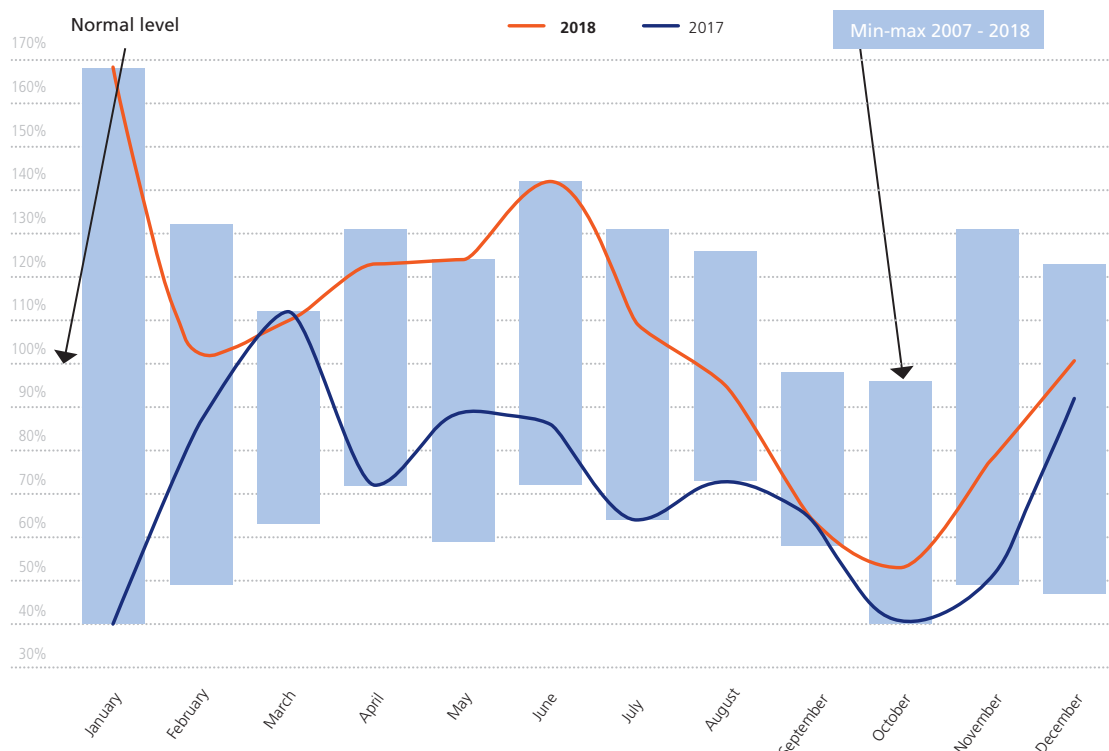
- the first half of the year saw excess precipitation in much of the southern half of Europe (including France), a shortfall in Germany and part of Central Europe, and close to normal levels in the North of Europe;
- the second half of the year saw a serious shortage of precipitation over much of Europe, particularly France, Germany and all of Scandinavia.

Annual rainfall for 2018 thus registered surplus levels across all of southern Europe and shortages in Central Europe and Scandinavia.

## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

#### → Water flow coefficients in France in 2018 and 2017 <sup>(1)</sup>



(1) Weekly monitoring by EDF's OSGE energy observatory of French reservoir levels (Miréor project) as far as the coast.

France had very high precipitation in the first part of the year, with exceptionally high snowfall on all mountain ranges during the winter. A very warm, very dry summer and autumn then followed, gradually diminishing water flow coefficients and leading to very low water levels in autumn, particularly in the northern half of the country.

As a result of these contrasting weather conditions, water flow coefficients in France showed a relative surplus in every month of the first half of 2018 (registering some of the highest levels in 40 years), then a shortfall in the second part of the year. For the year as a whole, however, the coefficients were slightly above normal by about 10%.

### 5.1.3 SIGNIFICANT EVENTS OF 2018 <sup>(1)</sup>

This chapter reports on significant events following the publication, on 15 March 2018, of the 2017 Reference Document (see section 5.1.3 "Significant events of 2017" and 5.2 "Subsequent events").

#### 5.1.3.1 Major events

##### 5.1.3.1.1 Sustainable development and Group Renewables

##### EDF Renewables <sup>(2)</sup>

- In 2018, EDF Renewables commissioned new facilities, signed electricity purchase agreements and undertook new projects.
- EDF Renewables entered into exclusive talks with a view to acquire the Luxel group, a French solar energy specialist (see press release of 14 February 2019).
- EDF Renewables and SITAC group signed power purchase agreement covering 300MW of wind project in India (see press release of 4 February 2019).

- EDF Renewables has closed on a purchase agreement with York Nebraska Wind Partners, LLC, a partnership comprised of Aksamit Resource Management, LLC and York Capital Management for 100-percent of the interests in the 300MW Milligan 1 Wind Project (see press release of 17 January 2019).
- The EDF Renewables-Masdar consortium awarded a 400MW wind project in Saudi Arabia (see press release of 11 January 2019).
- EDF Renewables and Shell invested in New Jersey offshore wind (see press release of 20 December 2018 and note 3.8.1 to the 2018 consolidated financial statements).
- EDF Renewables announced the repowering of the Eckolstädt wind farm in Germany (see press release of 11 December 2018).
- EDF Renewables entered into an agreement with Shell Energy North America to supply 132MWp of solar power in California (see press release of 15 November 2018).
- EDF Énergies Nouvelles was rebranded EDF Renouvelables (see press release of 6 September 2018) and EDF Énergies Nouvelles' international entities were rebranded EDF Renewables (see press release of 12 April 2018).
- EDF Renewables won a 276MW wind energy project in Brazil (see press release of 5 September 2018).
- EDF Renewables sold a 49% minority stake in twenty-four of its UK wind farms (c.550MW) (see press release of 29 June 2018 and note 3.8.2 to the 2018 consolidated financial statements).
- The realisation of the three offshore wind projects at Fécamp, Courseulles-sur-Mer and Saint-Nazaire that EDF Renewables is developing with its partners Enbridge Inc. and WPD has been confirmed (see press release of 20 June 2018).
- EDF Renewables acquired a 450MW offshore wind project in Scotland from Mainstream Renewable Power (see press release of 3 May 2018 and note 5.2 to the 2018 consolidated financial statements).

(1) A full list of press releases is available from the EDF website: [www.edf.fr](http://www.edf.fr)

(2) A full list of press releases is available from the EDF Renouvelables website: [www.edf-renouvelables.com](http://www.edf-renouvelables.com)

## Hydropower

- EDF, IFC and the Republic of Cameroon signed final and binding agreements for the construction of the Nachtigal hydroelectric dam in Cameroon (see press release of 8 November 2018). Financial closing was reached on 24 December 2018, when the shareholding structure changed due to Africa50 (15%) and STOA (10%) joining the project. IFC now owns a 20% stake, the Republic of Cameroon a 15% stake and EDF's share is unchanged at 40%.

## EDF Pulse Croissance

- EDF Nouveaux Business became EDF Pulse Croissance.
- EDF and McPhy signed a partnership agreement to develop carbon-free hydrogen in France and around the world (see press release of 5 June 2018).

### 5.1.3.1.2 Group Energy Services

- Edison, through its subsidiary Fenice, acquired the control of Zephyro SpA. and launched a mandatory tender offer (see press release of 2 July 2018).
- Dalkia, which owned 75% of Dalkia Wastenergy (previously Tiru), acquired the 25% of shares previously held by the Engie group (see Dalkia press release of 30 March 2018 available on the website [www.dalkia.fr](http://www.dalkia.fr)).

### 5.1.3.1.3 Nuclear industry

- Flamanville 3 EPR project:
  - welds in the main secondary system of the Flamanville EPR: EDF sets up corrective actions and adjusts schedule and target construction costs (see press release of 25 July 2018 and note 3.10 to the 2018 consolidated financial statements);
  - the "hot tests" are now scheduled to commence during the second half of February (see press release of 21 January 2019 and note 3.10 to the 2018 consolidated financial statements);
  - ASN would issue a statement in May concerning the validation programme on the welds in the main secondary system. A detailed progress update of the Flamanville EPR, including the schedule and construction cost, will then be given after the ASN ruling has been published (see press release of 31 January 2019).
- The first of two EPR reactors at China's Taishan nuclear power plant entered into commercial operation (see press release of 14 December 2018 and note 3.1 to the 2018 consolidated financial statements).
- EDF and Nawah signed operations and maintenance assistance agreement for Barakah Nuclear Energy Plant, United Arab Emirates (see press release of 22 November 2018).
- EDF and GE signed a strategic cooperation agreement for the planned construction of 6 EPRs in India (see press release of 26 June 2018).

### 5.1.3.2 Assets disposal plan

- EDF sold a portfolio of more than 200 real estate and business assets to Colony Capital (see press release of 29 November 2018 and note 3.2 to the 2018 consolidated financial statements).

- EDF closed the disposal of its stake in Dunkerque LNG (see press release of 30 October 2018 and note 3.3 to the 2018 consolidated financial statements).

### 5.1.3.3 Financial structure

- EDF announced the successful syndication of an innovative ESG-Indexed Revolving Credit Facility (see press release of 27 November 2018 and note 3.7 to the 2018 consolidated financial statements).
- EDF announced the success of its hybrid refinancing operation (see press release of 3 October 2018 and notes 3.5 and 3.6 to the 2018 consolidated financial statements).
- EDF priced €1.25 billion hybrid note offering and successfully priced a €1 billion senior note offering (see press release of 25 September 2018 and notes 3.4 and 3.5 to the 2018 consolidated financial statements).
- EDF raised \$3.75 billion through a multi-tranche U.S. Dollar senior bond issuance (see press release of 19 September 2018 and note 3.4 to the 2018 consolidated financial statements).

### 5.1.3.4 Regulatory environment

Regulatory changes are detailed in the following notes to the 2018 consolidated financial statements:

- note 4.1 "Multi-year energy plan (PPE)";
- note 4.2 "Regulated electricity sales tariffs in France";
- note 4.3 "TURPE network access tariffs";
- note 4.4 "CSPE compensation mechanism for public energy service charges" (CSPE);
- note 4.5 "French capacity mechanism";
- note 4.6 "Energy savings certificates";
- note 4.7 "ARENH".

### 5.1.3.5 Other significant events

- Philippe Sasseigne appointed Senior Executive in charge of Nuclear and Thermal (see press release of 8 February 2019).
- EDF announced the payment of an interim cash dividend of €0.15 per share for 2018 fiscal year (see press release of 6 November 2018 and note 27.3 to the 2018 consolidated financial statements).
- Results of the option for payment of the balance of the dividend for the 2017 financial year in the form of shares (see press release of 15 June 2018 and note 27.1 to the 2018 consolidated financial statements).
- Appointment of Bruno Bensasson to the EDF group's Executive Committee as Group Senior Executive President responsible for Renewable Energies (see press release of 30 March 2018).
- Edison finalised the acquisition of Edison Énergie (formerly Gas Natural Vendita Italia) (see press release of 22 February 2018 and note 5.3 to the 2018 consolidated financial statements).



## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

#### 5.1.4 ANALYSIS OF THE BUSINESS AND THE CONSOLIDATED INCOME STATEMENTS FOR 2017 AND 2018

Presentation and analysis of the consolidated income statements for 2017 and 2018 is shown at two levels of analysis for Sales and EBITDA: a first focusing on the Group, then a second reporting on the different business segments (France – Generation and supply activities, France – Regulated activities, EDF Renewables<sup>(1)</sup>, Dalkia, Framatome<sup>(2)</sup>, United Kingdom, Italy, Other international and Other activities). EBIT (operating profit) and net income are analysed from a general standpoint.

In 2018, for strategic reasons, the Group has modified its segment reporting and now presents EDF Renewables and Dalkia separately (they were previously included in the "Other activities" segment). The segments used by the Group are presented in note 6.1 to the 2018 consolidated financial statements.

(in millions of euros)	2018	2017 <sup>(1)</sup>
<b>Sales</b>	<b>68,976</b>	<b>64,892</b>
Fuel and energy purchases	(33,012)	(32,901)
Other external purchases	(9,364)	(8,739)
Personnel expenses	(13,690)	(12,456)
Taxes other than income taxes	(3,697)	(3,541)
Other operating income and expenses	6,052	6,487
<b>Operating profit before depreciation and amortisation (EBITDA)</b>	<b>15,265</b>	<b>13,742</b>
Net changes in fair value on Energy and Commodity derivatives, excluding trading activities	(224)	(355)
Net depreciation and amortisation	(9,006)	(8,537)
Net increases in provisions for renewal of property, plant and equipment operated under concessions (Impairment)/reversals	(50)	(58)
Other income and expenses	(105)	1,363
<b>Operating profit (EBIT)</b>	<b>5,282</b>	<b>5,637</b>
Cost of gross financial indebtedness	(1,716)	(1,778)
Discount effect	(3,486)	(2,959)
Other financial income and expenses	393	2,501
<b>Financial result</b>	<b>(4,809)</b>	<b>(2,236)</b>
<b>Income before taxes of consolidated companies</b>	<b>473</b>	<b>3,401</b>
Income taxes	149	(147)
Share in net income of associates and joint ventures	569	35
<b>GROUP NET INCOME</b>	<b>1,191</b>	<b>3,289</b>
EDF net income	1,177	3,173
Net income attributable to non-controlling interests	14	116
<b>EARNINGS PER SHARE (EDF SHARE) (IN EUROS)</b>		
Earnings per share	0.20	0.98
Diluted earnings per share	0.20	0.98

(1) The figures published at 31 December 2017 have been restated to reflect the impact of application of IFRS 15 on sales. However, no restatements have been

##### 5.1.4.1 Sales

Consolidated sales were up by 6.3% corresponding to an organic increase of 4.0%.

##### 5.1.4.1.1 Change in Group sales

(in millions of euros)	2018	2017 <sup>(1)</sup>	Variation	Variation (%)	Organic growth (%)
<b>Sales</b>	<b>68,976</b>	<b>64,892</b>	<b>4,084</b>	<b>+6.3</b>	<b>+4.0</b>

(1) The figures published at 31 December 2017 have been restated to reflect the impact of application of IFRS 15 standard on sales.

Sales amounted to €68,976 million in 2018, up by €4,084 million (+6.3%) from 2017. Excluding the effects of exchange rates (-€203 million), principally the decline in the pound sterling, the US dollar and the Brazilian real against the Euro, and

(1) EDF Renewables, ex EDF Énergies Nouvelles.

(2) Framatome has been included in the consolidation since 31 December 2017. Its total net income for 2018 is included in the effect of changes in the scope of consolidation.

### 5.1.4.1.2 Change in sales by segment

The following table shows sales by segment, excluding inter-segment eliminations.

(in millions of euros)	2018	2017 <sup>(1)</sup>	Variation	Variation (%)	Organic growth (%)
France – Generation and supply activities <sup>(2)</sup>	26,096	25,084	1,012	+4.0	+4.0
France – Regulated activities <sup>(3)</sup>	16,048	15,836	212	+1.3	+1.3
EDF Renewables	1,505	1,280	225	+17.6	+8.4
Dalkia	4,189	3,751	438	+11.7	+8.5
Framatome	3,313	-	3,313	-	-
United Kingdom	8,970	8,688	282	+3.2	+3.9
Italy	8,507	7,722	785	+10.2	+6.2
Other international	2,411	3,166	(755)	-23.8	+3.4
Other activities	2,601	2,475	126	+5.1	+5.3
Eliminations	(4,664)	(3,110)	(1,554)	+50.0	+4.2
<b>GROUP SALES</b>	<b>68,976</b>	<b>64,892</b>	<b>4,084</b>	<b>+6.3</b>	<b>+4.0</b>

(1) The figures published at 31 December 2017 have been restated to reflect the impact of application of IFRS 15 standard on sales, and changes in segment reporting (IFRS 8).

(2) Generation, supply and optimisation in mainland France, and sales of engineering and consulting services.

(3) Regulated activities comprise distribution in mainland France, which is carried out by Enedis <sup>(1)</sup>, EDF's island activities and the activities of Électricité de Strasbourg. In mainland France, distribution network activities are regulated via the network access tariff TURPE (Tarifs d'Utilisation des Réseaux Publics d'Électricité).

#### 5.1.4.1.2.1 France - Generation and supply activities

Sales by the **France – Generation and supply activities** segment amounted to €26,096 million, an organic increase of €1,012 million (+4.0%) from 2017.

Resales of electricity subject to purchase obligations developed favourably due to the higher levels of renewable energy generation and the rise in market prices. This had a positive impact estimated at +€606 million on sales (the effect on EBITDA was neutral because expenses relating to purchase obligations are compensated by the CSPE tax).

Downstream market conditions had a positive effect estimated at +€220 million on sales since the negative effect of shrinking electricity sales to final customers was more than offset by favourable electricity price effects and growth in income from gas supply activities.

Sales of capacity certificates had a positive impact of +€55 million compared to 2017.

The changes in the non-delivery component of regulated sale tariffs for electricity <sup>(2)</sup> had a positive impact of around +€48 million.

The volumes sold under the ARENH mechanism and the balance of purchases and sales on the wholesale markets, excluding weather effects, changes in demand and losses of customers, had an estimated -€203 million negative impact on sales.

#### Electricity generation

Nuclear output stood at 393.2TWh in 2018, an increase of +14.1TWh from 2017. This increase is explained by better availability of the nuclear plant fleet in 2018, as 2017 was marked by several reactor outages, notably in connection with the Creusot manufacturing record checks, the carbon segregation issue and the temporary shutdown of four generation units at the Tricastin plant.

Hydropower output stood at 46.5TWh <sup>(3)</sup> in 2018, a 25.4% increase from 2017 (+9.4TWh). This increase is explained by hydrological conditions, which were particularly unfavourable in 2017 and then favourable in 2018 (see section 5.1.2.4 "Weather conditions: temperatures and rainfall").

Less use was made of thermal generation facilities. Their output was down by 5.1TWh compared to 2017 to 11.0TWh.

Sales volumes to final customers (a market segment that includes local distribution companies and excludes foreign operators) were down by -17.0TWh, including -13.1TWh reflecting the impact of losses of customers.

EDF was a net seller on the wholesale markets to the extent of 78.6TWh. The +26.1TWh rise in net market sales compared to 2017 is explained by a more favourable situation in nuclear and hydropower generation, and growth in supplies under purchase obligations.

#### 5.1.4.1.2.2 France - Regulated activities

Sales by the **France – Regulated activities** segment amounted to €16,048 million, an organic rise of €212 million (+1.3%) from 2017.

Sales essentially benefited from favourable effects for Enedis, relating to the rise in the TURPE 5 distribution tariff (€242 million <sup>(4)</sup>) and income from connection services (€37 million).

#### 5.1.4.1.2.3 EDF Renewables

**EDF Renewables's** sales totalled €1,505 million in 2018, an organic increase of €107 million (+8.4%) from 2017.

This rise was mainly due to the commissioning of wind and solar power projects in 2017, which contributed to organic growth of 10.2% in revenues attributable to generation, as most sales of plants (with change of control) took place towards the end of 2018.

#### 5.1.4.1.2.4 Dalkia

**Dalkia's** contribution to consolidated sales in 2018 was €4,189 million, corresponding to organic growth of €319 million (+8.5%) compared to 2017.

This growth is mainly explained by the positive impact of higher energy prices, favourable trends in the indexes for revising service contract prices, and the conclusion or renewal of contracts, for example the contract for a new heat network in Perpignan and Montbéliard (France), and the 15-year energy efficiency contract signed with Saint-Étienne hospital (also in France).

(1) Enedis is an independent EDF subsidiary as defined in the French Energy Code.

(2) +1.70% from 1 August 2017 on "blue" tariffs for residential and non-residential customers (notably incorporating an indexed adjustment of +2.71% to the TURPE 5 distribution tariff at 1 August 2017) and tariff changes in 2018 (+0.7% on "blue" tariffs for residential customers, +1.6% on "blue" tariffs for non-residential customers from 1 February 2018, and -0.5% on "blue" tariffs for residential customers and +1.1% on "blue" tariffs for non-residential customers from 1 August 2018), including an indexed adjustment of -0.21% to the TURPE 5 distribution tariff at 1 August 2018.

(3) After deduction of pumped volumes, hydropower production stood at 39.2TWh for 2018 (30.0TWh for 2017).

(4) Indexed adjustment of the TURPE 5 distribution tariff: +2.71% at 1 August 2017 and -0.21% at 1 August 2018.

## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

#### 5.1.4.1.2.5 Framatome<sup>(1)</sup>

Framatome's sales amounted to €3,313 million in 2018. A significant portion of these sales is realised within the Group.

Order intake amounted to €3 billion (more than 60% from non-Group entities).

Framatome registered a good level of activity in the Fuel business, with notable achievements in 2018 such as delivery of the first batch of fuel cladding tubes for the Hualong-1 reactor at the Fuqing nuclear power plant. Framatome also won new contracts with Vattenfall for the delivery of fuel assembly reloads. On the other hand, the Installed Base activity registered a slight slowdown, particularly in the United States.

Thanks to the purchase of Schneider Electric's nuclear instrumentation and control (I&C) offering in North America in February 2018, Framatome is expanding its engineering expertise and broadening its portfolio of I&C solutions. It supplied a complete I&C system for unit 3 of the Tianwan nuclear power plant (a VVER type pressurized water reactor with net installed capacity of 1,000MW). In Sweden, Framatome completed the successful commissioning of a safety I&C system upgrade for unit 3 of the Forsmark nuclear power plant.

#### 5.1.4.1.2.6 United Kingdom

The **United Kingdom's** contribution to Group sales amounted to €8,970 million in 2018, up by €282 million from 2017. The pound sterling's decline against the Euro had an unfavourable impact of €82 million compared to 2017. Excluding foreign exchange effects and changes in the scope of consolidation, the organic growth in sales compared to 2017 was 3.9%.

The positive change in UK sales reflects higher electricity tariffs and prices on the residential and business market, and higher electricity volumes sold to business customers. This growth was partly offset by a decline in sales volumes on the wholesale markets, due to the lower level of nuclear power generation, and a decrease in sales volumes to residential electricity customers in line with the smaller number of customer accounts.

#### 5.1.4.1.2.7 Italy

**Italy** contributed €8,507 million to consolidated sales, an organic increase of €478 million (+6.2%) compared to 2017.

Sales from exploration-production activities increased as a result of the favourable change in Brent prices and gas prices.

Sales were up for the electricity activities, principally due to higher sales volumes to business customers and growth in hydropower generation.

#### 5.1.4.1.2.8 Other international

The **Other international** segment principally covers operations in Belgium, the United States, Brazil and Asia (China, Vietnam and Laos).

This segment contributed €2,411 million to Group sales in 2018, €755 million less than in 2017. Excluding foreign exchange effects (-€81 million) and changes in the scope of consolidation (-€783 million, mainly relating to the sale of EDF Polska's assets in 2017), sales showed organic growth of 3.4%.

In **Belgium**<sup>(2)</sup>, sales amounted to €1,806 million, corresponding to organic growth of 3.1% compared to 2017, including a price increase and a decrease in volumes for the supply business in an intensely competitive market. In energy generation, wind power capacities rose to 440MW, up by +17% from 2017. Generation levels remain affected by lengthy outages of nuclear reactors operated by the Engie group. Service sales continued the upward trend begun in 2015.

In **Brazil**, sales amounted to €422 million, an organic increase of +9.5% from 2017. The favourable impact of the introduction of the IMCS tax invoiced on PPA sales (with a neutral effect on EBITDA) was partly counterbalanced by the decline in sales on the spot market.

#### 5.1.4.1.2.9 Other activities

**Other activities** comprise, among other entities, EDF Trading and the gas activities.

Sales by the **Other activities** segment amounted to €2,601 million in 2018, an organic increase of €130 million from 2017.

EDF Trading's sales totalled €873 million, a substantial 47.8% organic increase. This growth reflects the volatility in commodity markets which EDF Trading turned to its advantage, a positive weather effect, and occasional favourable tensions in the supply-demand balance in Europe and the United States. Activities related to LNG (Liquefied Natural Gas) also contributed to this performance, thanks to rising demand in Asia and upward oil price trend until late September 2018.

### 5.1.4.2 Operating profit before depreciation and amortisation (EBITDA)

EBITDA increased by 11.1%, and registered organic growth of +11.3%.

(in millions of euros)	2018	2017 <sup>(1)</sup>	Variation	Variation (%)	Organic growth (%)
<b>Sales</b>	<b>68,976</b>	<b>64,892</b>	<b>4,084</b>	<b>+6.3</b>	<b>+4.0</b>
Fuel and energy purchases	(33,012)	(32,901)	(111)	+0.3	+1.0
Other external expenses	(9,364)	(8,739)	(625)	+7.2	+0.1
Personnel expenses	(13,690)	(12,456)	(1,234)	+9.9	-0.6
Taxes other than income taxes	(3,697)	(3,541)	(156)	+4.4	+3.3
Other operating income and expenses	6,052	6,487	(435)	-6.7	-9.7
<b>EBITDA</b>	<b>15,265</b>	<b>13,742</b>	<b>1,523</b>	<b>+11.1</b>	<b>+11.3</b>

(1) The figures published at 31 December 2017 have been restated to reflect the impact of application of IFRS 15 standard on sales.

(1) Framatome has been included in the consolidation since 31 December 2017. Its total net income for 2018 is included in the effect of changes in the scope of consolidation.

(2) Belgium comprises EDF Luminus and EDF Belgium.

#### 5.1.4.2.1 Change in consolidated EBITDA and analysis

Consolidated **EBITDA** for 2018 amounted to €15,265 million, an increase of 11.1% from 2017. Excluding foreign exchange effects (-€58 million) and changes in the scope of consolidation (+€26 million), EBITDA showed organic growth of +11.3%.

The Group's **fuel and energy purchases** amounted to €33,012 million in 2018, up by €111 million (+0.3%) from 2017, or an organic increase of €344 million (+1.0%):

- in the **France – Generation and supply activities** and **France – Regulated activities** segments, fuel and energy purchases registered an organic decrease of €760 million (-4.1%) to €17,935 million, principally due to the higher levels of nuclear power and hydropower generated, and the decrease in purchase prices, particularly to respond to demand under the ARENH mechanism;
- the organic increase in fuel and energy purchases observed in the **United Kingdom** (+€468 million or +8.7%) principally relates to the rise in regulatory costs and increases in energy prices and coal costs;
- **Italy** saw an organic increase of €566 million (+9.5%) in fuel and energy purchases, mainly reflecting higher volumes, delivery costs and network services in the electricity business, and higher gas and Brent prices in the hydrocarbon business.

**Other external expenses** amounted to €9,364 million, +€625 million more than in 2017 (+7.2%). Excluding foreign exchange effects (+€26 million) and changes in the scope of consolidation (-€646 million, mainly relating to the acquisition of Framatome), other external expenses were stable on an organic basis (+€5 million) despite the growth in business, particularly in renewable energies and services.

- In the **France – Generation and supply activities** and **France – Regulated activities** segments, other external expenses totalled €4,638 million. The organic decrease of €216 million (-4.4%) notably reflects continued cost-cutting actions implemented as part of performance improvement plans across all areas of business.
- The organic increase in other external expenses for **EDF Renewables** (+€67 million) principally relates to growth in service activities in the United States, and development costs.

#### 5.1.4.2.2 Change in consolidated EBITDA and analysis by segment

(in millions of euros)	2018	2017 <sup>(1)</sup>	Variation	Variation (%)	Organic growth (%)
France – Generation and supply activities	6,327	4,896	1,431	+29.2	+29.2
France – Regulated activities	4,916	4,898	18	+0.4	+0.4
EDF Renewables	856	751	105	+14.0	+4.1
Dalkia	292	259	33	+12.7	+12.0
Framatome	202	-	202	-	-
United Kingdom	783	1,035	(252)	-24.3	-15.4
Italy	791	910	(119)	-13.1	-12.7
Other international	240	457	(217)	-47.5	-3.1
Other activities	858	536	322	+60.1	+62.1
<b>GROUP EBITDA</b>	<b>15,265</b>	<b>13,742</b>	<b>1,523</b>	<b>+11.1</b>	<b>+11.3</b>

(1) The figures published at 31 December 2017 have been restated to reflect changes in segment reporting (IFRS 8).

##### 5.1.4.2.2.1 France – Generation and supply activities

EBITDA for the **France – Generation and supply activities** segment amounted to €6,327 million, corresponding to an organic increase of €1,431 million (+29.2%) from 2017.

The increase in hydropower and nuclear power output had a very favourable impact on EBITDA estimated at +€1,079 million. Better conditions on the wholesale markets also contributed an estimated +€413 million improvement in EBITDA.

(1) Excluding apprentices and work-study contracts.

(2) Excluding the Energy Savings Certificate component of market-price offers.

- The organic increase in other external expenses observed at **Dalkia** (+€112 million) is attributable to the expansion of its service activities.

The Group's **personnel expenses** totalled €13,690 million, up by €1,234 million from 2017. Excluding foreign exchange effects (+€25 million) and changes in the scope of consolidation (-€1,336 million, mainly relating to the acquisition of Framatome), the organic change in personnel expenses was a decrease of €0.6%.

- In the **France – Generation and supply activities** segment, personnel expenses totalled €6,013 million, a €177 million decrease from 2017 reflecting the efforts made to control payroll costs. The average workforce shrank by 3.1% <sup>(1)</sup> over 2018, with decreases in all areas of business.
- In the **France – Regulated activities** segment, personnel expenses totalled €3,141 million, down by €17 million from 2017. Average workforce numbers were stable compared to 2017.
- The organic increase in personnel expenses observed at **Dalkia** (+€35 million) is chiefly explained by an increase in the average workforce, in keeping with its expanding service activities.

**Taxes other than income taxes** amounted to €3,697 million for 2018, €156 million or +4.4% more than in 2017 (+3.3% in organic terms).

- This increase mainly concerned the **France – Generation and supply activities** segment, where non-income taxes were up by €50 million due to a rise in taxes correlated with value added.

**Other operating income and expenses** generated net income of €6,052 million in 2018, €435 million less than in 2017 (an organic change of -€629 million or -9.7%).

- In the **France – Generation and supply activities** segment, the income generated by other operating income and expenses was down by €816 million. Notable causes of this decrease were the higher cost of energy savings certificate obligations, movements in provisions, and positive items that were recorded in 2017 and had no equivalent in 2018.
- The **Other activities** segment registered an organic increase of €115 million in other operating income and expenses, principally generated by the sale of real estate assets in France.

Conditions on the downstream market <sup>(2)</sup> had a positive impact of +€150 million compared to 2017, as favourable price developments on new market-price offers made up for erosion of market shares (-13.1TWh).

Price developments and the end of the tariff adjustment component on the regulated sales tariff, excluding the Energy Savings Certificate component, led to an estimated -€152 million decrease compared to 2017.

## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

Under the EDF group's performance plan, operating expenses <sup>(1)</sup> were reduced by €313 million (-3.5%) through control of purchases and payroll costs. These measures are in application across all entities, notably in support functions and in the supply business, and reducing operating costs for the nuclear, hydropower and thermal power plant fleet.

A number of factors had a total effect of -€372 million on EBITDA: principally the rise on taxes based on value added (the CVAE tax), movements in provisions, and positive items that were recorded in 2017 and had no equivalent in 2018.

#### 5.1.4.2.2.2 France – Regulated activities

EBITDA for the **France – Regulated activities** segment stood at €4,916 million, an organic increase of €18 million (+0.4%) from 2017.

EBITDA benefited from favourable indexed adjustments to the TURPE 5 tariffs <sup>(2)</sup> amounting to an estimated +€68 million.

The favourable +€37 million effects of business growth in network connection services (particularly for energy producers) and the reduction in operating expenses (+€38 million) had a positive impact on EBITDA.

However, the unfavourable weather effect, the negative price effect on grid losses purchases, and making provision for the risk of changes in Enedis' and Électricité de Strasbourg's contributions to the Electricity Equalisation Fund for the period 2012-2018, had the combined effect of a -€125 million decrease in EBITDA.

#### 5.1.4.2.2.3 EDF Renewables

**EDF Renewables's** contribution to Group EBITDA for 2018 was €856 million, corresponding to organic growth of +€31 million (+4.1%).

EBITDA from generation recorded an organic increase of 15% to €903 million, underpinned by energy production levels of 15.2TWh in 2018. This was particularly attributable to facilities commissioned in late 2017, as sales of facilities (with change of control) took place in late 2018.

Development and Sales of Structured Assets made a lower contribution to EBITDA in 2018 than in 2017. Development and support function costs increased, in order to support business growth.

The gross capacities brought into operation by EDF Renewables during 2018 totalled 1.6GW, including 0.9GW for solar power. The net installed capacities at 31 December 2018 showed a year-on-year increase of 0.5GW to 8.3GW (12.9GW gross). The gross portfolio of projects under construction at 31 December 2018 amounted to 2.4GW, consisting of 1.2GW for wind power and 1.2GW for solar power.

In 2018, EDF Renewables sold a 49% minority stake in twenty-four of its UK wind farms. This operation has no impact on EBITDA as EDF Renewables retains control of the operations concerned.

#### 5.1.4.2.2.4 Dalkia

**Dalkia's** contribution to Group EBITDA for 2018 amounted to €292 million, reflecting organic growth of €31 million (+12.0%). This increase takes into account the difficulties encountered on a contract by one Dalkia subsidiary in 2017, which had no equivalent in 2018. Corrected for that factor, the organic growth in EBITDA is +1.3% driven by competitiveness improvements resulting from the operational performance plan, and good control of overheads. Signatures and renewals of commercial contracts had a favourable effect on EBITDA, especially in the fields of energy efficiency and heat networks. However, Dalkia's EBITDA was adversely affected by maintenance operations at several important plants, the weather, and movements in prices.

#### 5.1.4.2.2.5 Framatome <sup>(3)</sup>

**Framatome's** EBITDA was €465 million, including the margin realised with other EDF group entities. Framatome's contribution to Group EBITDA for 2018 stood at €202 million.

Framatome registered good levels of business in the Fuel activity, with notable achievements in 2018, and a slight slowdown in the Installed Base activity, particularly in the United States.

Framatome's EBITDA is supported by the implementation of the operating and structure costs reduction plan, in line with expectations. In 2018, it includes a non-recurring €42 million expense related to the revaluation of inventories undertaken in the context of Framatome's purchase price allocation.

#### 5.1.4.2.2.6 United Kingdom

The **United Kingdom's** contribution to Group EBITDA for 2018 was €783 million, down by 15.4% in organic terms from 2017.

EBITDA in the United Kingdom was impacted by the downturn in nuclear power generation and the lower realised net prices for nuclear power, which were partly attributable to purchases undertaken due to lower nuclear fleet availability as the market rose. Nuclear generation output for 2018 totalled 59.1TWh, down by 4.8TWh from 2017. The decrease is mainly explained by Hunterston B inspection and extension of the shutdowns of Dungeness B.

The supply activities benefited from increases in residential tariffs, although the customer portfolio showed a year-on-year decrease of -4.2% in a highly competitive environment.

#### 5.1.4.2.2.7 Italy

**Italy's** contribution to Group EBITDA for 2018 amounted to €791 million, corresponding to an organic decrease of 12.7% compared to 2017.

In 2017, Italy's EBITDA benefited from the gain of around €100 million on the sale of Edison's Milan headquarters. After elimination of this non-recurring item, EBITDA was practically stable.

EBITDA for the electricity activities was up, essentially due to a good performance in hydropower generation and electricity system services. However, wind power generation was lower, reflecting a negative price effect. The supply activity, which mainly concerns business customers, progressed despite lower margins in a more competitive market.

EBITDA for the gas activities was down, principally as a result of unfavourable price effect that affected the margin on long-term contracts.

The exploration-production activity benefited from positive price and volume effects thanks to the rise in Brent oil prices and the commissioning of a new field in Algeria.

#### 5.1.4.2.2.8 Other international

EBITDA for the **Other international** segment stood at €240 million in 2018, an organic decrease of €14 million (-3.1%) compared to 2017.

In **Belgium**, EBITDA showed an organic decline of -€8 million (-5.5%). The extended outages of 4 nuclear reactors partly owned by EDF Luminus and operated by Engie penalised EBITDA by an estimated €76 million in 2018. Thermal generation partly counterbalanced this effect, and production of renewable energy benefited from the increase in installed wind power capacities, which totalled 440MW at 31 December 2018 (up by +17% compared to 2017). Supply activities are still marked by the strongly competitive environment, but are benefiting from growth in service activities.

EBITDA in **Brazil** also showed an organic decline (-€46 million), principally due to the suspension of gas supplies caused by work on the transmission network, and scheduled outages in 2018 for major inspections at the EDF Norte Fluminense plant. These events made significant purchases on the energy markets necessary to cover the Power Purchase Agreement (PPA) at a time of rising market prices.

#### 5.1.4.2.2.9 Other activities

**Other activities** contributed €858 million to Group EBITDA for 2018, an organic increase of €333 million (+62.1%) from 2017.

(1) Sum of personnel expenses and other external expenses. Based on comparable scope and exchange rates and constant discount rates for pensions. Excluding changes in operating expenses of the service activities.

(2) Indexed adjustment of the TURPE 5 distribution tariff: +2.71% at 1 August 2017 and -0.21% at 1 August 2018; indexed adjustment of the TURPE 5 transmission tariff: +6.76% at 1 August 2017 and +3.0% at 1 August 2018.

(3) Framatome has been included in the consolidation since 31 December 2017. Its total net income for 2018 is included in the effect of changes in the scope of consolidation.



EBITDA at EDF Trading amounted to €633 million in 2018, an organic increase of €263 million (+73.5%) from 2017. This rise follows the increase in the trading margin mentioned earlier in the discussion of sales, which was driven by high volatility on the markets (see section 5.1.4.1.2.9).

EBITDA for the Other activities segment also benefited from a substantial capital gain on the final operation of the real estate sale programme initiated in 2015.

### 5.1.4.3 Operating profit (EBIT)

EBIT was down by 6.3% from 2017.

(in millions of euros)	2018	2017	Variation	Variation (%)
<b>EBITDA</b>	<b>15,265</b>	<b>13,742</b>	<b>1,523</b>	<b>+11.1</b>
Net changes in fair value on Energy and Commodity derivatives, excluding trading activities	(224)	(355)	131	-36.9
Net depreciation and amortisation	(9,006)	(8,537)	(469)	+5.5
Net increases in provisions for renewal of property, plant and equipment operated under concessions	(50)	(58)	8	-13.8
(Impairment)/reversals	(598)	(518)	(80)	+15.4
Other income and expenses	(105)	1,363	(1,468)	-107.7
<b>EBIT</b>	<b>5,282</b>	<b>5,637</b>	<b>(355)</b>	<b>-6.3</b>

The Group's consolidated **EBIT** amounted to €5,282 million for 2018, down by €355 million from 2017. This downturn, despite the higher EBITDA, is essentially explained by the sale of 49.9% of CTE during 2017, which had no equivalent in 2018, and the rise in net depreciation and amortisation.

#### 5.1.4.3.1 Net changes in fair value on Energy and Commodity derivatives, excluding trading activities

The net changes in fair value on Energy and Commodity derivatives, excluding trading activities, amounted to -€355 million in 2017 and -€224 million in 2018.

In **Italy**, this change was mainly attributable to the renegotiation of long-term gas contracts in recent years, which has reduced the impact of volatility.

#### 5.1.4.3.2 Net depreciation and amortisation

Net depreciation and amortisation was up by €469 million compared to 2017.

The **France – Generation and supply activities** segment registered a €169 million increase in net depreciation and amortisation, essentially explained by a volume effect related to newly-commissioned facilities in the nuclear fleet. This rise was partly offset by the effect of oil-fired thermal plant closures.

The **France – Regulated activities** segment registered a €145 million increase in net depreciation and amortisation, principally attributable to the step-up of the Linky<sup>(1)</sup> project and investments in connections and network reinforcements.

### 5.1.4.4 Financial result

(in millions of euros)	2018	2017 <sup>(1)</sup>	Variation	Variation (%)
Cost of gross financial indebtedness	(1,716)	(1,778)	62	-3.5
Discount effect	(3,486)	(2,959)	(527)	+17.8
Other financial income and expenses	393	2,501	(2,108)	-84.3
<b>FINANCIAL RESULT</b>	<b>(4,809)</b>	<b>(2,236)</b>	<b>(2,573)</b>	<b>+115.1</b>

(1) No restatements have been made for the first application of IFRS 9 from 1 January 2018, in accordance with the simplified approach allowed by IFRS 9.

The financial result for 2018 corresponds to a financial expense of €4,809 million, €2,573 million higher than in 2017. This change is explained by:

- a €62 million decrease in the cost of gross financial indebtedness. The expenses on bond issues of 2018 and the full-year effect of the issues of October 2017 were more than offset by the lower financial expenses following redemption of a bond during the year;

#### 5.1.4.3.3 Net increases in provisions for renewal of property, plant and equipment operated under concessions

The €8 million decrease between 2017 and 2018 in net increases in provisions for renewal of property, plant and equipment operated under concessions is attributable to the **France – Regulated activities** segment.

#### 5.1.4.3.4 Impairment/reversals

In 2018, impairment amounted to €598 million (see note 13 to the 2018 consolidated financial statements).

In 2017, impairment amounted to €518 million.

#### 5.1.4.3.5 Other income and expenses

In 2018, other income and expenses amounted to -€105 million (see note 14 to the 2018 consolidated financial statements for details).

In 2017, other income and expenses amounted to +€1,363 million and principally comprised a gain of €1,462 million on the sale of 49.9% of the Group's investment in CTE.

- an unfavourable change of €527 million in the discount effect, principally due to a larger decrease between 2017 and 2018 in the real discount rate applied to calculate nuclear provisions in France at 31 December 2018 (-0.2% for the real rate) than the previous year (-0.1% for the real rate). At 31 December 2018, the discount rate was 3.9% incorporating an average inflation rate of 1.5% (respectively 4.1% and 1.5% at 31 December 2017, and 4.2% and 1.5% at 31 December 2016);

(1) Linky is a project led by Enedis, an independent EDF subsidiary as defined in the French Energy Code.

## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

■ a €2,108 million decrease in other financial income and expenses, principally due to impacts associated with dedicated assets, particularly due to the performance by growth assets (equities and equity funds): +12.7% in 2017 followed by -7.0% in 2018 in reflection of unfavourable market developments, with overall effects of:

- net changes in the fair value of debt and equity instruments, after hedging, of -€989 million in 2018 after application of IFRS 9,
- net gains on sales of EDF's dedicated assets amounting to -€12 million in 2018 (compared to +€985 million in 2017 before application of IFRS 9).

#### 5.1.4.5 Income taxes

Income taxes amounted to +€149 million in 2018, corresponding to an effective tax rate of -31.5% (compared to -€147 million in 2017, corresponding to an effective tax rate of +4.3%). This change essentially reflects the lower pre-tax income of consolidated companies, and non-recurring items.

After eliminating these non-recurring items, the effective tax rate for current taxes in 2018 was +25.7%, compared to +18.1% in 2017. The increase in the Group's effective current tax rate between 2017 and 2018 mainly results from the favourable impact in 2017 of disposals subject to reduced-rate taxation, which had no equivalent in 2018.

#### 5.1.4.6 Share in net income of associates and joint ventures

The Group's share in net income of associates and joint ventures was a positive €569 million in 2018, compared to €35 million in 2017.

This +€534 million change is mainly explained by the increase in CTE's net income and the impairment of €491 million booked in 2017 on the assets of CENG, for which there was no equivalent in 2018.

The share in net income of associates in 2018 includes impairment totalling €39 million. Details of this impairment are given in note 23 to the 2018 consolidated financial statements, "Investments in associates and joint ventures".

#### 5.1.4.7 Net income attributable to non-controlling interests

Net income attributable to non-controlling interests amounted to €14 million in 2018, €102 million less than in 2017. This downturn is mainly explained by the sale of EDF Polska's assets in 2017, and by Centrica's lower income from nuclear generation in the **United Kingdom**, due to the lower level of both nuclear generation and realised net prices for nuclear power.

#### 5.1.4.8 EDF net income

EDF net income totalled €1,177 million for 2018, down by €1,996 million (-62.9%) from 2017, notably as a result of the gain on the sale of CTE in 2017, which had no equivalent in 2018, and a deterioration of the situation on the financial markets which had a significant impact on the financial result.

#### 5.1.4.9 Net income excluding non-recurring items

The Group's net income excluding non-recurring items<sup>(1)</sup> stood at €2,452 million for 2018, down by 13.1% from 2017 due to significant gains on financial assets in 2017 that had no equivalent in 2018.

(1) Group net income excluding non-recurring items, net changes in fair value on Energy and Commodity derivatives, excluding trading activities, and net changes in the fair value of debt and equity instruments, net of tax. The amounts of non-recurring items, net changes in fair value on Energy and Commodity derivatives, excluding trading activities, and net changes in the fair value of debt and equity instruments, net of tax, are:

- €385 million for miscellaneous risks and impairment in 2018 compared to +€617 million in 2017;
- €145 million of net changes in fair value on Energy and Commodity derivatives, excluding trading activities, net of tax in 2017, compared to -€264 million in 2017;
- €745 million of net changes in the fair value of debt and equity instruments in 2018 (IFRS 9).

## 5.1.5 CASH FLOW AND NET INDEBTEDNESS

### 5.1.5.1 Cash flow

(in millions of euros)

	2018	2017	Variation	Variation (%)
<b>Net cash flow from operating activities</b>	<b>13,364</b>	<b>11,663</b>	<b>1,071</b>	<b>+14.6</b>
<b>Net cash flow used in investing activities</b>	<b>(17,165)</b>	<b>(11,713)</b>	<b>(5,452)</b>	<b>+46.5</b>
<b>Net cash flow from financing activities</b>	<b>3,530</b>	<b>712</b>	<b>2,818</b>	<b>n.a.</b>
<b>NET INCREASE (DECREASE) IN CASH AND CASH EQUIVALENTS</b>	<b>(271)</b>	<b>662</b>	<b>(933)</b>	<b>n.a.</b>
<b>Cash and cash equivalents – opening balance</b>	<b>3,692</b>	<b>2,893</b>	<b>799</b>	<b>+27.6</b>
Net increase (decrease) in cash and cash equivalents	(271)	662	(933)	n.a.
Effect of currency fluctuations	(95)	(13)	(82)	n.a.
Financial income on cash and cash equivalents	13	21	(8)	-38.1
Effect of reclassifications	(49)	129	(178)	n.a.
<b>CASH AND CASH EQUIVALENTS – CLOSING BALANCE</b>	<b>3,290</b>	<b>3,692</b>	<b>(401)</b>	<b>-10.9</b>

n.a.: not applicable.

#### 5.1.5.1.1 Net cash flow from operating activities

(in millions of euros)

	2018	2017	Variation	Variation (%)
<b>Income before taxes of consolidated companies</b>	<b>473</b>	<b>3,401</b>	<b>(2,928)</b>	<b>-86.1</b>
(Impairment)/reversals	598	518	80	+15.4
Accumulated depreciation and amortisation, provisions and changes in fair value	13,180	9,980	3,200	+32.1
Financial income and expenses	729	764	(35)	-4.6
Dividends received from associates and joint ventures	387	243	144	+59.3
Capital gains/losses	(1,014)	(2,739)	1,725	-63.0
Change in working capital	462	1,476	(1,014)	-68.7
<b>Net cash flow from operations</b>	<b>14,815</b>	<b>13,643</b>	<b>1,172</b>	<b>+8.6</b>
Net financial expenses disbursed	(1,062)	(1,209)	147	-12.2
Income taxes paid	(389)	(771)	382	-49.5
<b>NET CASH FLOW FROM OPERATING ACTIVITIES</b>	<b>13,364</b>	<b>11,663</b>	<b>1,701</b>	<b>+14.6</b>

The net cash flow from operating activities amounted to €13,364 million in 2018, up by €1,701 from 2017.

This change primarily includes a €1,172 million increase in the net cash flow from operations, resulting from:

- the change in the pre-tax income of consolidated companies after correction for impairment, depreciation, provisions and changes in fair value, which totalled €14,251 million in 2018 against €13,899 million in 2017, an increase of €352 million;
- the smaller change in working capital (-€1,041 million compared to 2017);

- a decrease in capital gains (+€1,725 million compared to 2017, essentially reflecting the sale of 49.9% of CTE for €1,462 million in 2017).

#### 5.1.5.1.2 Net cash flow used in investing activities

The net cash outflow for investing activities in 2018 amounted to €17,165 million, compared to €11,713 million in 2017. The following table sets forth the breakdown of the net cash flow used in investing activities between purchases and disposals of property, plant and equipment and intangible assets, acquisitions and disposals of companies net of cash acquired/transferred, and the change in financial assets:

	2018	2017	Variation	Variation (%)
Investments in intangible assets and property, plant and equipment	(16,186)	(14,747)	(1,439)	+9.8
Net proceeds from sale of intangible assets and property, plant and equipment	611	1,140	(529)	-46.4
<b>Net capex</b>	<b>(15,575)</b>	<b>(13,607)</b>	<b>(1,968)</b>	<b>+14.5</b>
Acquisitions of equity investments, net of cash acquired	(484)	(2,463)	1,979	-80.3
Disposals of equity investments, net of cash transferred	1,261	2,472	(1,211)	-49.0
Changes in financial assets	(2,367)	1,885	(4,252)	n.a.
<b>NET CASH FLOW USED IN INVESTING ACTIVITIES</b>	<b>(17,165)</b>	<b>(11,713)</b>	<b>(5,452)</b>	<b>+46.5</b>

n.a.: not applicable.

## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

#### Net capex

Net capital expenditure amounted to €15,575 million in 2018, up by €1,968 million (+14.5%) from 2017.

Changes in the Group's net capital expenditure over the period were as follows:

(in millions of euros)	2018	2017	Variation	Variation (%)
France – Generation and supply activities	5,507	5,822	(315)	-5.4
France – Regulated activities	4,308	3,995	313	+7.8
EDF Renewables	1,898	756	1,142	n.a.
Dalkia	385	352	33	+9.4
Framatome	261	-	261	n.a.
United Kingdom	2,938	2,385	553	+23.2
Italy	407	182	225	n.a.
Other international	199	309	(110)	-35.6
Other activities	(328)	(194)	(134)	+69.1
<b>NET CAPEX</b>	<b>15,575</b>	<b>13,607</b>	<b>1,968</b>	<b>+14.5</b>

n.a.: not applicable.

Capital expenditure is one of the components of net investments for which details are given in section 5.1.5.2 "Net indebtedness".

#### Acquisitions/disposals of equity investments, net of cash (acquired/transferred)

New investments in 2018, net of cash acquired, were down by €1,979 million from 2017 to €484 million. This decrease is mainly explained by the acquisition in 2017 of 75.5% of Framatome for €1,868 million.

Disposals of investments, net of cash transferred, were down by €1,211 million to €1,261 million in 2018. This change primarily reflects the sale of 49.9% of CTE in 2017 for €1,282 million.

#### Changes in financial assets

The change in financial assets in 2018 was a decrease of -€2,367 million, principally corresponding to sales of liquid assets (other than dedicated assets).

The change in financial assets in 2017 was an increase of +€1,885 million, principally corresponding to sales of liquid assets (other than dedicated assets).

#### 5.1.5.1.3 Net cash flow from financing activities

(in millions of euros)	2018	2017	Variation	Variation (%)
EDF capital increase	-	4,005	(4,005)	-
Transactions with non-controlling interests <sup>(1)</sup>	1,548	481	1,067	n.a.
Dividends paid by parent company	(511)	(109)	(402)	n.a.
Dividends paid to non-controlling interests	(183)	(183)	-	-
Purchases/sales of treasury shares	(3)	(6)	3	-50.0
<b>Cash flows with shareholders</b>	<b>851</b>	<b>4,188</b>	<b>(3,337)</b>	<b>-79.7</b>
Issuance of borrowings	5,711	2,901	2,810	+96.9
Repayment of borrowings	(2,844)	(6,304)	3,460	-54.9
Issuance of perpetual subordinated bonds	1,243	-	1,243	n.a.
Redemptions of perpetual subordinated bonds	(1,329)	-	(1,329)	n.a.
Payments to bearers of perpetual subordinated bonds	(584)	(565)	(19)	+3.4
Funding contributions received for assets operated under concessions	131	144	(13)	-9.0
Investment subsidies	351	348	3	+0.9
<b>Other cash flows from financing activities</b>	<b>2,679</b>	<b>(3,476)</b>	<b>6,155</b>	<b>n.a.</b>
<b>NET CASH FLOW FROM FINANCING ACTIVITIES</b>	<b>3,530</b>	<b>712</b>	<b>2,818</b>	<b>n.a.</b>

(1) Contributions via capital increases and reductions and acquisitions of additional interests in controlled companies.

n.a.: not applicable.

Cash flows related to financing activities generated a net inflow of €3,530 million in 2018, up by €2,818 million from 2017. This change is primarily attributable to the following:

- issuance of a 3-tranches senior bond totalling €3.75 billion on 19 September 2018, and a single-tranche €1 billion bond on 25 September;

- transactions with non-controlling interests, which increased by €1,067 million. In 2018, these transactions include £701 million received for sale to Dalmore Capital Limited and Pensions Infrastructure Platform of a 49% stake in twenty-four UK wind farms (around 550MW), and €743 million corresponding to CGN's contribution to the Hinkley Point C capital increases. In 2017, transactions with non-controlling interests included an amount of €501 million for CGN's contribution to earlier capital increases at Hinkley Point C;

- EDF's capital increase in 2017, amounting to €4,005 million.

### 5.1.5.2 Net indebtedness

Net indebtedness comprises total loans and financial liabilities, less cash and cash equivalents and liquid assets. Liquid assets are financial assets consisting of funds or securities with initial maturity of over three months that are readily convertible into cash and are managed according to a liquidity-oriented policy.

The Group's net indebtedness stood at €33,388 million at 31 December 2018 compared to €33,015 million at 31 December 2017.

(in millions of euros)	2018	2017	Variation	Variation (%)
<b>Operating profit before depreciation and amortisation (EBITDA)</b>	<b>15,265</b>	<b>13,742</b>	<b>1,523</b>	<b>+11.1</b>
Cancellation of non-monetary items included in EBITDA	(1,253)	(1,796)		
Net financial expenses disbursed	(1,062)	(1,209)		
Income taxes paid	(389)	(771)		
Other items including dividends received from associates and joint ventures	383	221		
<b>Operating cash flow <sup>(1)</sup></b>	<b>12,944</b>	<b>10,187</b>	<b>2,757</b>	<b>+27.1</b>
Change in working capital	462	1,476		
Net investments <sup>(2)</sup>	(12,107)	(9,810)		
<b>Cash flow after net investments</b>	<b>1,299</b>	<b>1,853</b>		
Dedicated assets	(501)	(1,171)		
<b>Cash flow before dividends <sup>(3)</sup></b>	<b>798</b>	<b>682</b>		
Dividends paid in cash	(1,278)	(891)		
<b>Group cash flow</b>	<b>(480)</b>	<b>(209)</b>		
Other monetary changes	(111)	3,855		
<b>(Increase)/decrease in net indebtedness, excluding the impact of changes in exchange rate</b>	<b>(591)</b>	<b>3,646</b>		
Effect of change in exchange rates	97	701		
Effect of other non-monetary changes	121	63		
<b>(Increase)/decrease in net indebtedness</b>	<b>(373)</b>	<b>4,410</b>		
<b>Net indebtedness at beginning of period</b>	<b>33,015</b>	<b>37,425</b>		
<b>NET INDEBTEDNESS AT END OF PERIOD</b>	<b>33,388</b>	<b>33,015</b>		

(1) Operating cash flow is not an aggregate defined by IFRS as a measure of financial performance, and is not directly comparable with indicators of the same name reported by other companies. This indicator, also known as Funds From Operations ("FFO"), is equivalent to net cash flow from operating activities excluding changes in working capital after adjustment where relevant for the impact of non-recurring effects, less net financial expenses disbursed and income taxes paid.

(2) Net investments are operating investments and financial investments for growth, net of disposals. They also include net debts acquired or transferred in acquisitions or disposals of securities, investment subsidies received, non-Group partner investments, Linky, new developments and the assets disposal plan of the Group.

(3) Cash flow before dividends is not an aggregate defined by IFRS as a measure of financial performance, and is not comparable with indicators of the same name reported by other companies. It is equal to the operating cash flow defined in note (1) after the change in working capital, net investments defined in note (2), and net allocations to dedicated assets.

#### 5.1.5.2.1 Operating cash flow

The operating cash flow amounted to €12,944 million in 2018 compared to €10,187 million in 2017, an increase of €2,757 million (+27.1%).

This change mainly reflects:

- the increase of EBITDA (+€1,523 million);
- a decrease in income taxes paid (-€389 million in 2018 versus -€771 million in 2017), mainly due to lower taxable income for the Group in France.

#### 5.1.5.2.2 Change in working capital

Working capital improved by €462 million in 2018.

This change is mainly explained by:

- gains resulting from the working capital improvement plan, essentially on inventories and trade receivables (+€242 million);
- favourable effects relating to the CSPE (+€258 million), principally resulting from excess compensation which was affected by the rise in market prices (expenses on purchase obligations decreased).

The difference between the 2017 and 2018 change in working capital (-€1,014 million) is essentially explained by:

- receipts of margin calls in 2017 in connection with the optimisation and trading activity, compared to payments in 2018 of approximately -€700 million;
- purchases of capacity certificates at high prices (-€201 million).



## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

#### 5.1.5.2.3 Net investments

Net investments amounted to €12,107 million in 2018 compared to €9,810 million in 2017, an increase of €2,297 million (+23.4%). Details are as follows:

(in millions of euros)	2018	2017	Variation	Variation (%)
France – Generation and supply activities	5,275	5,849	(574)	-9.8
France – Regulated activities	3,345	3,212	133	+4.1
EDF Renewables	458	701	(243)	-34.7
Dalkia	293	339	(46)	-13.6
Framatome	261	-	261	n.a.
United Kingdom	568	643	(75)	-11.7
Italy	438	511	(73)	-14.3
Other international	252	553	(301)	-54.4
Other activities	45	160	(115)	-71.9
<b>NET INVESTMENTS EXCLUDING LINKY, NEW DEVELOPMENTS AND GROUP ASSETS DISPOSAL PLAN</b>	<b>10,935</b>	<b>11,968</b>	<b>(1,033)</b>	<b>-8.6</b>
<b>LINKY, NEW DEVELOPMENTS AND GROUP ASSETS DISPOSAL PLAN</b>	<b>1,172</b>	<b>(2,158)</b>	<b>3,330</b>	<b>n.a.</b>
<b>NET INVESTMENTS</b>	<b>12,107</b>	<b>9,810</b>	<b>2,297</b>	<b>+23.4</b>

n.a.: not applicable.

#### 5.1.5.2.3.1 Net investments excluding Linky, new developments and Group assets disposal plan

Net investments by the **France – Generation and supply activities** segment decreased by €574 million or -9.8%. This change is mainly attributable to investments in the Bouchain thermal power plant in 2017, and lower expenses in 2018 than 2017 on emergency diesel generators. The Group's takeover of its supplier Framatome also contributed to the decrease in net investments.

Net investments by the **France – Regulated activities** segment were up by €133 million (+4.1%), primarily as a result of higher numbers of connections for residential customers and an increase in regulatory obligations.

Net investments by **EDF Renewables** decreased by €243 million (-34.7%), mainly as a result of the substantial increase between 2017 and 2018 in sales of structured assets (especially the wind farm sale in the United Kingdom), which was partly counterbalanced by the acquisition during 2018 of development rights for the "Neart na Gaoithe1" offshore wind farms in Scotland.

In the **United Kingdom**, the decrease of €75 million or -11.7% is explained, among other factors, by lower investments in coal-fired plants, and the slower pace of investment in smart metering, and to a lesser extent in renewable energies.

In **Italy**, net investments were down by €73 million, principally due to lower investments in the exploration-production activity.

In the **Other international** segment, net investments were down by €301 million or -54.4%. This is explained by the lower level of expenditures on construction of the EPR at the Taishan nuclear power plant in China, which started commercial operation in December 2018, slower-paced investment in the SINOP project in Brazil, and the sale of the Polish entities in 2017.

Net investments by the **Other activities** segment were down by €115 million. This decrease is attributable in particular to the lower investments by Dunkerque LNG due to its sale during 2018, and disposals of real estate assets in recent years.

#### 5.1.5.2.3.2 Linky, new developments and the Group assets disposal plan

Investments in the Linky programme, which was stepped up from 2017, amounted to €792 million in 2018.

New developments correspond to the Group's significant development projects, which do not immediately generate EBITDA, and significant acquisitions. In 2018,

these new developments essentially concerned New Nuclear investments in the United Kingdom totalling €1,646 million (progress on the Hinkley Point C project), acquisitions by Edison totalling €402 million (principally Edison Énergie<sup>(1)</sup> and Zephyro), and to a lesser degree, offshore wind farm projects in France.

Asset disposals essentially concerned the sale by EDF of its stake in Dunkerque LNG, which contributed to a reduction of €1,468 million in the net indebtedness.

#### 5.1.5.2.4 Dedicated assets

In compliance with the French Law no. 2006-739 of 28 June 2006 on the sustainable management of radioactive materials and waste, EDF has built up a portfolio of dedicated assets for secure financing of its long-term nuclear obligations which amounted to €26,232 million at 31 December 2018.

Overall, the changes in dedicated assets comprise:

- allocations to reach full coverage of obligations;
- reinvestment of financial income (dividends and interest) generated by these assets;
- withdrawals of assets corresponding to the costs incurred over the period to meet long-term nuclear obligations falling within the scope of the Law of 28 June 2006;
- exceptional withdrawals proposed to the governance bodies in charge of managing dedicated assets when the value of the portfolio exceeds the amount of the obligations to be financed; such withdrawals must be validated by these bodies.

The net change of -€501 million in dedicated assets in 2018 corresponds to the first three categories above.

#### 5.1.5.2.5 Cash flow before dividends

The cash flow before dividends in 2018 amounted to €798 million (compared to €682 million in 2017) and is mainly explained by the following factors:

- operating cash flow of €12,944 million;
- net investments of -€12,107 million;
- a net allocation to dedicated assets of -€501 million;
- a favourable change of €462 million in working capital.

(1) Formerly Gas Natural Vendita Italia.

The €116 million difference from 2017 essentially results from a favourable change in operating cash flow, and also in dedicated assets. However, these developments were partly counterbalanced by a €2,297 million rise in net investments and a smaller improvement in working capital (-€1,014 million).

#### 5.1.5.2.6 Dividends paid in cash

Dividends paid in cash during 2018 (-€1,278 million) comprise:

- the balance of the 2017 dividend (-€60 million), mostly paid in the form of shares;
- the interim dividend for 2018 (-€451 million) decided by the Board of Directors on 6 November 2018 and paid on 10 December 2018 at the rate of €0.15 per share;
- payments made in 2018 to bearers of perpetual subordinated bonds for the "hybrid" bond issues of January 2013 and January 2014 (-€584 million);
- dividends paid by Group subsidiaries to their minority shareholders (-€183 million).

#### 5.1.5.2.7 Group cash flow

The Group cash flow amounted to -€480 million, versus -€209 million in 2017.

#### 5.1.5.2.8 Effect of change in exchange rates

The foreign exchange effect had a favourable impact of +€97 million on the Group's net indebtedness at 31 December 2018.

#### 5.1.5.2.9 Other monetary changes

Other monetary changes had an unfavourable impact of -€3,966 million on the Group's net indebtedness at 31 December 2018, principally in line with the EDF SA's capital increase that took place in 2017, for which there was no equivalent in 2018.

## 5.1.6 MANAGEMENT AND CONTROL OF MARKET RISKS

### 5.1.6.1 Management and control of financial risks

This section sets forth the policies and principles for management of the Group's financial risks defined in the Strategic financial management framework (liquidity, interest rate, foreign exchange rate and equity risks), and the Group counterparty risk management policy set up by the EDF group. These principles apply only to EDF and operationally controlled subsidiaries or subsidiaries that do not benefit by law from specific guarantees of independent management such as Enedis. In compliance with IFRS 7, the following paragraphs describe the nature of risks resulting from financial instruments, based on analyses of sensitivities and credit (counterparty) risks.

Since 2002, a dedicated body – the Financial Risks Control Department (*département Contrôle des Risques Financiers et Investissements* – CRFI) – has been

in charge of financial risk control at Group level, mainly by ensuring correct application of the principles of the Strategic Financial Management Framework (July 2015). This department, which has reported to the Group's Risk Division since 2008, is an independent unit that also has the task of carrying out a second-level check of the risk of counterparty default (methodology and organisation) for EDF entities and operationally controlled Group subsidiaries (excluding Enedis), and a first-level check of financing activities by EDF SA's Trading room. The CRFI Department also carries out a second-level check of management activities concerning the dedicated asset portfolio.

The CRFI Department issues daily and weekly monitoring reports of risk indicators relevant to activities in EDF SA's trading room.

Regular internal audits are carried out to ensure controls are actually applied and are effective.

#### 5.1.6.1.1 Liquidity position and management of liquidity risk

##### 5.1.6.1.1.1 Liquidity position

At 31 December 2018, the Group's liquidities, consisting of liquid assets, cash and cash equivalents, totalled €23,828 million and available credit lines amounted to €11,393 million.

For 2019, the Group's scheduled debt repayments (principal and interest) are forecast at 31 December 2018 at €11,749 million, including €5,583 million for bonds (excluding hybrid bonds).

No Group company was in default on any borrowing at 31 December 2018.

##### 5.1.6.1.1.2 Management of liquidity risk

On 19 September 2018, EDF raised \$3.75 billion through three senior bonds:

- a \$1.8 billion bond, with 10-year maturity and a fixed coupon of 4.5%;
- a \$650 million bond, with 20-year maturity and a fixed coupon of 4.875%;
- a \$1.3 billion bond, with 30-year maturity and a fixed coupon of 5.0%.

In addition, on 25 September 2018 EDF launched a €1 billion senior bond, with 12-year maturity and a fixed coupon of 2%.

These operations enable the EDF group to further reinforce the structure of its balance sheet, and to refinance upcoming financial obligations.

Details of the Group's bond borrowings are given in note 38.2 to the 2018 consolidated financial statements "Loans and other financial liabilities".

The average maturity of the Group's gross debt was 13.6 years at 31 December 2018, compared to 13.7 years at 31 December 2017. For EDF SA, the average maturity was 14.2 years at 31 December 2018, against 14.3 years at 31 December 2017.

At 31 December 2018, the residual maturities of financial liabilities (including interest payments) are as follows under IAS 39 (valued on the basis of exchange and interest rates at 31 December 2018):

31 December 2018 (in millions of euros)	Hedging instruments <sup>(1)</sup>			Guarantee given on borrowings
	Debts	Interest rate swaps	Currency swaps	
2018	11,749	(521)	(140)	138
2019-2022	20,007	(1,855)	(426)	335
2023 and later	67,993	(3,020)	(1,997)	501
<b>TOTAL</b>	<b>99,749</b>	<b>(5,396)</b>	<b>(2,563)</b>	<b>974</b>
debt repayment	57,849			
interest expense	41,900			

(1) Data on hedging instruments include both assets and liabilities.

## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

The EDF group was able to meet its financing needs by conservative liquidity management, and has obtained financing on satisfactory terms.

A range of specific levers are used to manage the Group's liquidity risk:

- the Group's cash pooling system, which centralises cash management for controlled subsidiaries. The subsidiaries' cash balances are made available to EDF SA in return for interest, so as to optimise the Group's cash management and provide subsidiaries with a system that guarantees them market-equivalent financial terms;
- centralisation of financing for controlled subsidiaries at the level of the Group's Cash Management Department. Changes in subsidiaries' working capital are financed by this department in the form of stand-by credit lines provided for subsidiaries, which may also be granted revolving credit from the Group. EDF SA and the investment subsidiary EDF Investissements Groupe (EDF IG), set up in partnership with the bank Natixis Belgique Investissements, also provide medium and long-term financing for EDF group operations outside France, arranged by EDF SA and EDF IG on a totally independent basis: each company sets its own terms, which are the same as the subsidiary would have in an arm's-length market transaction;

- active management and diversification of financing sources used by the Group: the Group has access to short-term resources on various markets through programmes for French commercial paper (*billets de trésorerie*) and US commercial paper. For EDF, the ceilings for these programmes are €6 billion for its French commercial paper and \$10 billion for its US commercial paper.

At 31 December 2018, the amount of the Group's commercial paper outstanding was €955 million for French commercial paper, and US\$1,193 million for US commercial paper. EDF has access to the world's main bond markets: the Euro markets through its EMTN programme, which currently has a ceiling of €45 billion, particularly for Euro and sterling issues; and the domestic markets used for stand-alone issues in US dollars (144A bonds), yen (Samurai bonds) and Swiss francs.

The Group's main borrowings at 31 December 2018 are as follows:

#### Type of borrowing

(in millions of currency units)

	Entity	Issue date <sup>(1)</sup>	Maturity	Nominal amount	Currency	Rate
Bond	EDF	01/2009	01/2019	2,000	USD	6.50%
Bond	EDF	01/2014	01/2019	1,250	USD	2.15%
Bond	EDF	01/2010	01/2020	1,400	USD	4.60%
Euro MTN	EDF	05/2008	05/2020	1,200	EUR	5.38%
Bond	EDF	10/2015	10/2020	1,500	USD	2.35%
Euro MTN	EDF	01/2009	01/2021	2,000	EUR	6.25%
Euro MTN (green bond)	EDF	11/2013	04/2021	1,400	EUR	2.25%
Euro MTN	EDF	01/2012	01/2022	2,000	EUR	3.88%
Euro MTN	EDF	09/2012	03/2023	2,000	EUR	2.75%
Euro MTN	EDF	09/2009	09/2024	2,500	EUR	4.63%
Bond (green bond)	EDF	10/2015	10/2025	1,250	USD	3.63%
Euro MTN	EDF	11/2010	11/2025	750	EUR	4.00%
Euro MTN (green bond)	EDF	10/2016	10/2026	1,750	EUR	1.00%
Bond	EDF	01/2017	01/2027	107,900	JPY	1.09%
Euro MTN	EDF	03/2012	03/2027	1,000	EUR	4.13%
Bond	EDF	09/2018	09/2028	1,800	USD	4.50%
Euro MTN	EDF	04/2010	04/2030	1,500	EUR	4.63%
Euro MTN	EDF	10/2018	10/2030	1,000	EUR	2.00%
Euro MTN	EDF	07/2001	07/2031	650	GBP	5.88%
Euro MTN	EDF	02/2003	02/2033	850	EUR	5.63%
Euro MTN	EDF	06/2009	06/2034	1,500	GBP	6.13%
Euro MTN	EDF	10/2016	10/2036	750	EUR	1.88%
Bond	EDF	09/2018	09/2038	650	USD	4.88%
Bond	EDF	01/2009	01/2039	1,750	USD	6.95%
Euro MTN	EDF	11/2010	11/2040	750	EUR	4.50%
Euro MTN	EDF	10/2011	10/2041	1,250	GBP	5.50%
Bond	EDF	01/2014	01/2044	1,000	USD	4.88%
Bond	EDF	10/2015	10/2045	1,500	USD	4.75%
Bond	EDF	10/2015	10/2045	1,150	USD	4.95%
Bond	EDF	09/2018	09/2048	1,300	USD	5.00%
Euro MTN	EDF	09/2010	09/2050	1,000	GBP	5.13%
Euro MTN	EDF	10/2016	10/2056	2,164	USD	4.99%
Bond	EDF	01/2014	01/2114	1,350	GBP	6.00%

(1) Date funds were received.

At 31 December 2018, EDF has an overall amount of €10,292 million in available credit facilities (syndicated credit and bilateral lines):

- the syndicated credit line amounts to €4 billion and expires in December 2023. No drawings had been made on this syndicated credit line at 31 December 2018;
- bilateral lines represent an available amount of €6,162 million, with expiry dates extending to September 2023. The level of this available financing is very frequently reviewed to ensure the Group has sufficient backup credit facilities;
- the amount available from the credit lines with the European Investment Bank is €130 million. €70 million had been drawn on one credit line of €200 million at

31 December 2018. Three other credit lines were fully drawn at 31 December 2018 for amounts of €225 million, €500 million and €500 million.

EDF Investissements Groupe has a syndicated credit facility for €400 million (expiring in September 2020). At 31 December 2018, there were no drawings on this credit facility.

Edison has a credit line with the European Investment Bank for €268 million (which is fully drawn) and a credit line with a pool of banks for €350 million, on which no drawings had been made at 31 December 2018.

### 5.1.6.1.2 Credit rating

The financial ratings agencies Standard & Poor's, Moody's and Fitch Ratings attributed the following long-term and short-term ratings to EDF group entities at 31 December 2018:

Company	Agency	Long-term rating	Short-term rating
EDF	Standard & Poor's	A-, negative outlook <sup>(1)</sup>	A-2
	Moody's	A3, stable outlook	P-2
	Fitch Ratings	A-, stable outlook	F2
EDF Trading	Moody's	Baa2, stable outlook	n.a.
EDF Energy	Standard & Poor's	BBB-, negative outlook <sup>(2)</sup>	A-3
	Standard & Poor's	BBB-, stable outlook <sup>(3)</sup>	A-3
Edison	Moody's	Baa3, stable outlook	n.a.

n.a.: not applicable.

(1) S&P revised EDF's outlook from stable to negative on 20 November 2017.

(2) S&P revised EDF Energy's outlook from stable to negative on 20 November 2017.

(3) S&P revised EDISON's long-term rating from BB+ to BB- and short-term rating from B to A-3 on 19 June 2018.

### 5.1.6.1.3 Management of foreign exchange risk

Due to the diversification of its activities and geographical locations, the Group is exposed to the risk of exchange rate fluctuations, which may have an impact on the translation differences affecting balance sheet items, Group financial expenses, equity and net income.

To limit exposure to foreign exchange risks, the Group has introduced the following management principles:

- local currency financing: to the extent possible given the local financial markets' capacities, each entity finances its activities in its own functional currency. When financing is contracted in other currencies, derivatives may be used to limit foreign exchange risk;
- matching of assets and liabilities: the net assets of subsidiaries located outside the Euro zone expose the Group to a foreign exchange risk. The foreign exchange risk in the consolidated balance sheet is managed by market hedging involving use of financial derivatives. Hedging of net assets in foreign currencies complies

with risk/return targets, and the hedging ratio varies depending on the currency, ranging from 31% to 72% for the principal exposures. If no hedging instruments are available, or if hedging costs are prohibitive, the foreign exchange positions remain open and the risk on such positions is monitored by sensitivity calculations;

- hedging of operating cash flows in foreign currencies: in general, the operating cash flows of EDF and its subsidiaries are in the relevant local currencies, with the exception of flows related to fuel purchases which are primarily in US dollars, and certain flows related to purchases of equipment, which concern lower amounts. Under the principles laid down in the Strategic financial management framework, EDF and the main subsidiaries concerned by foreign exchange risks (EDF Energy, EDF Trading, Edison, EDF Renewables) are required to hedge firm or highly probable commitments related to these future operating cash flows.

As a result of the financing and foreign exchange risk hedging policy, the Group's gross debt at 31 December 2018 breaks down as follows by currency after hedging:

### GROSS DEBT STRUCTURE BY CURRENCY BEFORE AND AFTER HEDGING

31 December 2018 (in millions of euros)	Initial debt structure	Impact of hedging instruments <sup>(1)</sup>	Debt structure after hedges	% of debt
Borrowings in EUR	26,783	21,438	48,221	81%
Borrowings in USD	20,546	(17,564)	2,982	5%
Borrowings in GBP	9,250	(2,414)	6,836	12%
Borrowings in other currencies	2,609	(1,460)	1,149	2%
<b>TOTAL DEBT</b>	<b>59,188</b>	<b>-</b>	<b>59,188</b>	<b>100%</b>

(1) Hedges of liabilities and net assets of foreign subsidiaries.

## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

The table below presents the impact on equity of a variation in exchange rates on the Group's gross debt at 31 December 2018:

#### EXCHANGE RATE SENSITIVITY OF THE GROUP'S GROSS DEBT

<b>31 December 2018</b> <i>(in millions of euros)</i>	<b>Debt after hedging instruments converted into euros</b>	<b>Impact of a 10% unfavourable variation in exchange rates</b>	<b>Debt after a 10% unfavourable variation in exchange rates</b>
Borrowings in EUR	48,221	-	48,221
Borrowings in USD	2,982	298	3,280
Borrowings in GBP	6,836	684	7,520
Borrowings in other currencies	1,149	115	1,264
<b>TOTAL DEBT</b>	<b>59,188</b>	<b>1,097</b>	<b>60,285</b>

Due to the Group's hedging policy for foreign exchange risk on the Group's gross debt, the income statement for companies controlled by the Group is marginally exposed to foreign exchange rate risk.

The table below sets forth the foreign exchange position relating to net assets in foreign currencies of the Group's subsidiaries.

#### NET ASSET POSITION

<b>31 December 2018 <sup>(1)</sup></b> <i>(in millions of euros)</i>	<b>Net assets</b>	<b>Bonds</b>	<b>Derivatives</b>	<b>Net assets after management</b>
USD	4,937	1,350	1,480	2,107
CHF (Switzerland)	710	-	508	202
GBP (United Kingdom)	16,164	5,435	(356)	11,085
CLP (Chile)	(6,663)	-	-	(6,663)
PLN (Poland)	307	-	153	154
BRL (Brazil)	1,164	-	-	1,164
CNY (China)	9,932	-	-	9,932

(1) Net assets as stated at 31 December 2018; bonds and derivatives as stated at 31 December 2018. The net positions shown exclude certain non-significant exposures.

The above table shows the assets of the Group's foreign subsidiaries in foreign currencies, adjusted for changes in the fair value of cash flow hedges and of debt and equity instruments recorded in equity, and changes in the fair value of financial instruments recorded in income.

The following table sets forth the risk for equity of foreign exchange losses on net assets in foreign currencies of the Group's principal subsidiaries at 31 December 2018, assuming unfavourable, uniform exchange rate variations of 10% against the Euro. Net assets are converted at the closing rate and impacts are reported in absolute value.

#### EXCHANGE RATE SENSITIVITY OF NET ASSETS

<i>(in millions of currency units)</i>	<b>At 31 December 2018</b>			<b>At 31 December 2017</b>		
	<b>Net assets after management into currency</b>	<b>Net assets after management converted into euros</b>	<b>Impact on equity of a 10% variation in exchange rates</b>	<b>Net assets after management into currency</b>	<b>Net assets after management converted into euros</b>	<b>Impact on equity of a 10% variation in exchange rates</b>
USD	2,107	1,840	184	2,606	2,173	217
CHF (Switzerland)	202	179	18	245	209	21
GBP (United Kingdom)	11,085	12,392	1,239	9,153	10,316	1,032
CLP (Chile)	(6,663)	(8)	(1)	1,135	2	-
PLN (Poland)	154	36	4	35	8	1
BRL (Brazil)	1,164	262	26	1,066	268	27
CNY (China)	9,932	1,261	126	10,028	1,285	129

The foreign exchange risk on available-for-sale securities is mostly concentrated in EDF's dedicated asset portfolio, which is discussed in section 5.1.6.1.6 "Management of financial risk on EDF SA's dedicated asset portfolio".

The foreign exchange risk associated with short-term investments and operating liabilities in foreign currencies remains restricted for the Group at 31 December 2018.

##### 5.1.6.1.4 Management of interest rate risk

The exposure of the Group's net indebtedness to interest rate fluctuations covers two types of risk: a risk of change in the net financial expenses on floating-rate

financial assets and liabilities, and a risk of change in the value of financial assets invested at fixed rates. These risks are managed by monitoring the floating-rate portion of net indebtedness, defined by reference to the risk/return for net financial expenses, taking into consideration expected movements in interest rates.

Some of the debt is variabilised and the Group may use interest rate derivatives for hedging purposes. The distribution of exposure between fixed and floating rates is monitored.

The Group's debt after hedging instruments at 31 December 2018 comprised 57.2% at fixed rates and 42.8% at floating rates.



A 1% uniform annual rise in interest rates would generate an approximate €253 million increase in financial expenses at 31 December 2018, based on gross floating-rate debt after hedging.

The average cost of Group debt (weighted interest rate on outstanding amounts) was 2.87% at the end of 2018.

The table below sets forth the structure of Group debt and the impact of a 1% variation in interest rates at 31 December 2018. The impact of the change in interest rates is stable in comparison to 2017.

## STRUCTURE AND INTEREST RATE SENSITIVITY OF GROUP'S DEBT

31 December 2018 (in millions of euros)	Initial debt structure	Impact of hedging instruments	Debt structure after hedging	Impact on income of a 1% variation in interest rates
Fixed rate	55,810	(21,949)	33,861	-
Floating rate	3,378	21,949	25,327	253
<b>TOTAL</b>	<b>59,188</b>	<b>-</b>	<b>59,188</b>	<b>253</b>

Concerning financial assets, the table below presents the interest rate risk on the floating-rate notes and short-term deposits held by EDF, and their sensitivity to interest rate risks (impact on net income).

## INTEREST RATE SENSITIVITY OF FLOATING RATE INSTRUMENTS

31 December 2018 (in millions of euros)	Value	Impact on income of a 1% variation of interest rates	Value after a 1% variation in interest rates
<b>FLOATING-RATE INSTRUMENTS</b>	<b>2,165</b>	<b>(22)</b>	<b>2,143</b>

The Group's interest rate risk notably relates to the value of the Group's long-term nuclear obligations (see note 29 to the 2018 consolidated financial statements) and its pension and other specific employee benefit obligations (see note 31 to the 2018 consolidated financial statements), which are adjusted to present value using discount rates that depend on interest rates at various time horizons, and debt securities held in connection with the management of the dedicated assets set aside to cover these obligations (see section 5.1.6.1.6 "Management of financial risk on EDF's dedicated asset portfolio").

### 5.1.6.1.5 Management of equity risks

The equity risk is concentrated in the following areas:

#### Coverage of EDF's nuclear obligations

Analysis of the equity risk is presented in section 5.1.6.1.6 "Management of financial risk on EDF SA's dedicated asset portfolio".

#### Coverage of employee benefit obligations for EDF SA, EDF Energy and British Energy

Assets covering EDF's employee benefit liabilities are partly invested on the international and European equities markets. Market trends therefore affect the value of these assets, and a downturn in equity prices would lead to a rise in balance sheet provisions.

28% of the assets covering EDF's employee benefit obligations were invested in equities at 31 December 2018, representing an amount of €3.1 billion of equities.

At 31 December 2018, the two pension funds sponsored by EDF Energy (EDF Energy Pension Scheme and EDF Energy group Electricity Supply Pension Scheme) were invested to the extent of 22.9% in equities and 8.1% in equity funds, representing an amount of £258 million of equities.

At 31 December 2018, the British Energy pension funds were invested to the extent of 8.1% in equities and equity funds, representing an amount of £505 million of equities.

#### CENG fund

CENG is exposed to equity risks in the management of its funds established to cover nuclear decommissioning expenses.

#### EDF's long term cash management

As part of its long-term cash management policy, EDF has continued its strategy to reduce the portion of equity-correlated investments, resulting in a non-significant position well below €1 million at 31 December 2018.

### 5.1.6.1.6 Management of financial risk on EDF's dedicated asset portfolio

Dedicated assets have been built up progressively by EDF since 1999 for secure financing of its long-term nuclear obligations. The Law of 28 June 2006 and its implementing regulations defined provisions not related to the operating cycle, which must therefore be covered by dedicated assets; they are listed in note 45 to the 2018 consolidated financial statements, "EDF's dedicated assets".

The dedicated asset portfolio is managed under the supervision of the Board of Directors and its Advisory Committees (Nuclear Commitments Monitoring Committee, Audit Committee).

The **Nuclear Commitments Monitoring Committee (CSEN)** is a specialised Committee set up by EDF's Board of Directors in 2007.

A **Nuclear Commitments Financial Expertise Committee (CEFEN)** exists to assist the Company and its governance bodies on questions of matching assets and liabilities and asset management. The members of this Committee are independent of EDF. They are selected for their skills and diversity of experience, particularly in the fields of asset/liability management, economic and financial research, and asset management.

#### Governance and management principles

The governance principles setting forth the structure of dedicated assets, and the relevant decision-making and control processes for their management, are validated by EDF's Board of Directors. These principles also lay down rules for the asset portfolio's structure, selection of financial managers, and the legal, accounting and tax structure of the funds.

Strategic asset allocation is based on asset/liability reviews carried out to define the most appropriate target portfolio for financing long-term nuclear expenses. Strategic allocation is validated by EDF's Board of Directors and reviewed every three years unless circumstances require otherwise. A new strategic allocation was validated during 2018. This target allocation consists of a yield portfolio, a growth portfolio and a fixed-income portfolio, respectively accounting for 30%, 40% and 30% of the total portfolio. The yield portfolio consists of real estate assets and infrastructure assets; the growth portfolio consists of equities and equity funds (both listed and unlisted); the fixed-income portfolio consists of bonds, debt funds (both listed and unlisted), the CSPE receivable and cash. These portfolios are managed by the Listed Asset Management Division and by EDF Invest (formed in 2013 following the decree of 24 July 2013).

## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

The "cash" pocket of the portfolio exists to provide secure coverage for future disbursements related to the purpose of the asset covered, and may be reinforced tactically, particularly when a conservative approach is required in the event of a market crisis.

The CSPE receivable was allocated to dedicated assets on 13 February 2013 (see note 45 to the 2018 consolidated financial statements).

Tactical management of the growth assets and fixed-income assets has several focal areas:

- monitoring of exposure between growth assets and fixed-income assets;
- within each sub-portfolio, allocation by "secondary asset class";
- selection of investment funds, aiming for diversification:
  - by style (growth securities, unlisted securities, yield securities),
  - by capitalisation (major stocks, medium and small stocks),
  - by investment process (macroeconomic and sector-based approach, selection of securities on a "quantitative" basis, etc.),
  - by investment vehicle (for compliance with maximum investment ratios);

- for bonds, a choice of securities held directly, through brokers, or via investment funds incorporating the concern for diversification:

- by type of issue (fixed income, indexed income),
- by type of instrument (government or supranational bonds, covered bonds and similar, corporate bonds),
- by issuer and by maturity.

The allocation policy between growth assets and fixed-income assets was developed by the Operational Management Committee <sup>(1)</sup> on the basis of the economic and financial outlook for each market and geographical area, a review of market appreciation in different markets and market segments, and risk analyses produced by the CRFI Department.

### Content and performance of EDF's dedicated asset portfolio

#### BREAKDOWN OF THE PORTFOLIO

	31/12/2018	31/12/2017
Yield assets	19.3%	18.5%
Growth assets	36.5%	35.9%
Fixed-income assets	44.2%	45.6%
<b>TOTAL</b>	<b>100%</b>	<b>100%</b>

At 31 December 2018, the total value of the portfolio was €27,689 million compared to €28,115 million in 2017.

The content of the financial portfolio is also presented in note 45 to the 2018 consolidated financial statements, "Dedicated assets".

#### PORTFOLIO CONTENT UNDER THE CLASSIFICATION FROM ARTICLE 4, DECREE 2007 243 OF 23 FEBRUARY 2007

Categories (in millions of euros)	31/12/2018		31/12/2017	
	Net book value <sup>(1)</sup>	Realisable value	Net book value <sup>(1)</sup>	Realisable value
CTE (the holding company that holds 100% of RTE) <sup>(2)</sup>	2,705	2,738	2,705	2,705
Other unlisted securities	2,333	2,618	2,221	2,505
<b>YIELD ASSETS</b>	<b>5,038</b>	<b>5,356</b>	<b>4,926</b>	<b>5,210</b>
Funds not exclusively invested in OECD bonds	9,370	9,844	8,372	9,942
Hedges, deposits, amounts receivable	20	45	-	30
Other unlisted securities	198	219	132	127
<b>GROWTH ASSETS</b>	<b>9,588</b>	<b>10,108</b>	<b>8,504</b>	<b>10,099</b>
OECD government bonds and similar	4,362	4,443	4,261	4,363
OECD corporate (non-government) bonds	946	950	618	636
Funds investing in the above two categories	4,580	4,647	4,210	4,387
CSPE after funding	2,060	2,080	3,294	3,349
Other unlisted securities	114	105	74	71
<b>FIXED-INCOME ASSETS</b>	<b>12,062</b>	<b>12,225</b>	<b>12,457</b>	<b>12,806</b>
<b>TOTAL DEDICATED ASSETS</b>	<b>26,688</b>	<b>27,689</b>	<b>25,887</b>	<b>28,115</b>

(1) Net book value in the parent company financial statements.

(2) In 2018 and 2017, dedicated assets include 50.1% of Coentreprise de Transport d'Électricité (CTE).

(1) A permanent internal Committee for evaluation, consultation and operational decision-making in the management of dedicated assets.

The table below presents the performance by portfolio at 31 December 2018 and 31 December 2017:

#### PERFORMANCE OF EDF'S DEDICATED ASSET PORTFOLIO

	31/12/2018	Performance for 2018	31/12/2017	Performance for 2017
(in millions of euros)	Stock market or realisable value	Portfolio	Stock market or realisable value	Portfolio
Yield assets	5,356	7.0%	5,210	9.1%
Growth assets	10,108	-7.0%	10,099	12.7%
Fixed-income assets	12,225	-0.4%	12,806	1.4%
<b>TOTAL DEDICATED ASSETS</b>	<b>27,689</b>	<b>-1.6%</b>	<b>28,115</b>	<b>6.6%</b>

#### BREAKDOWN OF PORTFOLIO PERFORMANCE UNDER THE CLASSIFICATION FROM ARTICLE 4, DECREE 2007-243 OF 23 FEBRUARY 2007

	31/12/2018	Performance for 2018	31/12/2017	Performance for 2017
(in millions of euros)	Stock market or realisable value	Portfolio	Stock market or realisable value	Portfolio
CTE (the holding company that holds 100% of RTE) <sup>(1)</sup>	2,738	7.0%	2,705	7.3%
Other unlisted securities <sup>(2)</sup>	2,942	7.9%	2,703	11.2%
Equity funds including derivatives	9,889	-7.4%	9,972	12.9%
Bonds and bond funds	10,010	-0.8%	9,282	2.1%
Monetary funds	30	-0.3%	104	-0.1%
CSPE after funding	2,080	0.4%	3,349	0.4%
<b>TOTAL DEDICATED ASSETS</b>	<b>27,689</b>	<b>-1.6%</b>	<b>28,115</b>	<b>6.6%</b>

(1) In 2018 and 2017, dedicated assets include 50.1% of Coentreprise de Transport d'Électricité (CTE).

(2) EDF Invest without CTE.

#### Changes in the portfolio during 2018

For the financial markets, 2018 had two phases. Until the end of the summer, volatility remained generally low and the equity markets were steady, particularly thanks to the American market which broke new records. The situation was more unsettled at the end of the year which brought substantial readjustment, especially in the month of December. This readjustment was accompanied by a notable rise in volatility. The credit markets, which also reached record levels in 2018 with the narrowest spreads since 2007, were subject to tensions that grew stronger towards the end of the year. The Fed continued its policy of gradually raising rates, causing tension on US Government bonds, which reached a 10-year rate of 3.25% before the falling equity markets brought those rates down by more than 0.50%. In Europe, Italian rates reacted strongly to tensions relating to the Italian budget: the 10-year rate rose from 1.80% in April to more than 3.60% in October, before dropping back to 2.70% at the end of the year.

EDF made significant investments following repayment of some of the CSPE receivable, but took a prudent approach in this unsettled context. EDF Invest was nonetheless able to continue building up its portfolio, consisting of three classes of assets: infrastructures, real estate and investment funds.

In the yield assets, in November 2018 EDF Invest completed the purchase from EDF Renewables of a minority interest in six UK companies (Bicker Fen, Fallago Rig, Fenland, Glass Moor II, Green Rigg, Rusholme) which between them own 131 onshore wind farms with total capacity of 310MW.

In December 2018, part of EDF International's minority stake in Nam Theun Power Company (NTPC) was sold to EDF Invest, which will acquire the rest in 2019. NTPC is a hydroelectric dam in operation in Laos, with installed capacity of 1,070MW. It is operated under a long-term concession agreement. Income is generated by long-term electricity sales contracts signed with EGAT (Electricity Generating Authority of Thailand) and Électricité du Laos.

These new investments were added to EDF Invest's "infrastructures" asset class alongside investments in CTE, Terega (formerly TIGF), Porterbrook, Madrileña Red de Gas, Géosel, Thyssengas, Aéroports de la Côte d'Azur, Autostrade per l'Italia and Q-Park, diversifying EDF Invest's portfolio into renewable energies.

EDF Invest's annual performance (excluding CTE) for 2018 was 7.9%, or 7.5% including CTE. The value of the portfolio including CTE was €5.7 billion at 31 December 2018.

In the growth assets, protection purchases were introduced in late June, in the form of put spreads on the S&P 500. These options, with original maturity of 1 year, are still held. They played their protective role in the growth pocket when the markets fell sharply at the end of the year. The -7% performance by growth assets remains, however, largely attributable to listed equities. The policy begun five years ago of investing in listed assets is to be continued by reinforcing index-linked management, particularly on the US market.

In the fixed-income assets, the portfolio also took a very prudent positioning on three levels: maintaining low overall sensitivity in order to limit the duration risk in a low-rate environment, selling a large portion of the Investment Grade credit portfolio, and substantially reducing exposure to the risk on Italian state instruments. It was only at the end of the year that the very large monetary amounts accumulated by these operations began to be reinvested in credit assets, still prioritising short maturities in order to take advantage of portage arrangements while limiting risks.

In 2018, the overall after-tax performance of dedicated assets (impacts on reserves and net income) was -€23 million, comprising +€31 million for the CSPE (+€46 million before tax), +€283 million for the CTE shares allocated to dedicated assets, and -€337 million for other securities (-€641 million before tax).

#### Dedicated assets' exposure to risks

EDF is exposed to equity risks, interest rate risks and foreign exchange risks through its dedicated asset portfolio.

The market value of the listed equities in EDF's dedicated asset portfolio was €9,889 million at 31 December 2018. The volatility of the listed equities at the same date was 14.3% based on 52 weekly performances, compared to 6.0% at 31 December 2017. Applying this volatility to the value of listed equity assets at the same date, the Group estimates the annual volatility of the equities portion of dedicated assets at €1,414 million.

## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

At 31 December 2018, the sensitivity of the listed bonds (€10,010 million) was 5.3, i.e. a uniform 100 base point rise in interest rates would result in a €530 million decline in market value. This sensitivity was 5.1 at 31 December 2017.

#### 5.1.6.1.7 Management of counterparty/credit risks

Counterparty risk is defined as the total loss that the EDF group would sustain on its business and market transactions if a counterparty defaulted and failed to perform its contractual obligations.

The Group has a counterparty risk management policy which applies to EDF and all operationally controlled subsidiaries. This policy sets out the governance associated with monitoring for this type of risk, and organisation of the counterparty risk management and monitoring. The policy also involves monthly

consolidation of the Group's exposures, updated monthly for financial and energy market activities and quarterly for Other activities. The CRFI (Financial Risks Control) Department closely monitors Group counterparties (daily review of alerts, special cautionary measures for certain counterparties).

The Group's counterparty risk has increased now that PG&E has filed for bankruptcy in the US. EDF Renewables' exposure amounts to several hundred million euros due to existing PPAs, and the difficulties of the GE group.

The table below gives details, by rating, of the EDF group's consolidated exposure to counterparty risk. At 30 September 2018, 90% of the Group's exposure concerns "investment grade" counterparties, mainly as a result of the predominance of exposures generated by the cash and asset management activity, as most short-term investments concern low-risk assets:

	Good credit rating	Poor credit rating	No internal rating	Total
31/03/2018	91%	7%	2%	100%
30/09/2018	90%	8%	2%	100%

The exposure to counterparty risk by nature of activity is distributed as follows:

	Purchases	Insurance	Distribution and sales	Cash and asset management	Fuel purchases and energy trading	Total
31/03/2018	6%	1%	9%	78%	6%	100%
30/09/2018	6%	1%	11%	75%	7%	100%

Exposure in the energy trading activities is concentrated in EDF Trading, where each counterparty is assigned a limit that depends on its financial robustness. A range of methods are used to reduce counterparty risk at EDF Trading, primarily position netting agreements, cash-collateral agreements and establishment of guarantees from banks or affiliates.

For counterparties dealing with EDF's trading room, the CRFI Department has drawn up a framework specifying counterparty authorisation procedures and the methodology for calculation of allocated limits. The level of exposure can be consulted in real time and is systematically monitored on a daily basis. The suitability of limits is reviewed without delay in the event of an alert or unfavourable development affecting a counterparty.

As the political and financial situation in the Euro zone is still uncertain, EDF has continued to apply a conservative management policy for its cash investments in non-core countries. Only banking, sovereign and corporate counterparties with good credit ratings are authorised, for limited amounts and maturities.

#### 5.1.6.2 Management and control of energy market

##### 5.1.6.2.1 Management and control of energy market risks

In keeping with the opening of the final customer market, the growth of wholesale markets and its international development, the EDF group is exposed to price variations on the energy market which can significantly affect its financial statements.

Consequently, the Group has an "energy markets" risk policy for all energy commodities, applicable to EDF and entities over which it has operational control.

The purpose of this policy is to:

- define the general framework for management of energy market risks, governing the various Group entities' asset portfolio management activities (energy generation, optimisation and sale), and trading for EDF Trading;

- define the responsibilities of asset managers and traders, and the various levels of control of activities;
- implement a coordinated Group-wide hedging policy that is coherent with the Group's financial commitments;
- consolidate the exposure of the various entities operationally controlled by EDF on the structured energy-related markets.

At entities not operationally controlled by EDF, the risk management framework is reviewed by the governance bodies.

##### 5.1.6.2.2 Organisation of risk control and general risk hedging principle

The process for controlling energy market risks for entities operationally controlled by the Group is based on:

- a governance and market risk exposure measurement system, clearly separating management and risk control responsibilities;
- an express delegation to each entity, defining hedging strategies and establishing the associated risk limits. This enables the Executive Committee to set out and monitor an annual Group risk profile consistent with the financial objectives, and thus direct operational management of energy market risks over market horizons (generally three years).

The basic principle for hedging is:

- netting of upstream/downstream positions; wherever possible, sales to final customers are hedged by Internal sales;
- gradual closing of positions before the end of the budget year, based on a predefined hedging trajectory <sup>(1)</sup> that captures an average price, potentially with overweighting of year N-1 in view of liquidity constraints on the forward markets.

(1) The risk management frameworks, which are approved annually by the Group for each entity with exposure to energy market risks, may include acceleration or deceleration plans allowing departures from these trajectories if predefined price thresholds are exceeded. Since these plans do not comply with the general principle of gradual hedging, they can only be applied under strict conditions.

On the French electricity market, EDF is exposed to very high uncertainty over its net exposure due to the fact that the ARENH system is optional. Since the volumes subscribed are only known shortly before the delivery period, EDF is obliged to use assumptions for ARENH subscriptions, which include prudence margins. EDF thus remains subject to risks that the assumptions may not correspond to reality, such that during the year it could find itself obliged to sell reserved volumes that in the end were not actually subscribed, or conversely to purchase volumes sold before the ARENH bids took place on the assumption that there would be no subscriptions. This risk is particularly high as the energy + capacity price on the wholesale market is close to the ARENH price (€42/MWh).

Given its close interaction with the decisions made in the generation, supply and trading activities, the energy risk management process involves Group management and is based on a risk indicator and measurement system incorporating escalation procedures in the event risk limits are exceeded.

The Group's exposure to energy market risks through operationally controlled entities is reported four times a year to the Executive Committee. The control processes are regularly evaluated and audited.

### 5.1.6.2.3 Principles for operational management and control of energy market risks

The principles for operational management and control of energy market risks for the Group's operationally controlled entities are based on strict segregation of responsibilities for managing those risks, distinguishing between management of assets (generation and supply) and trading.

Managers of generation and supply assets are responsible for implementing a risk management strategy that minimises the impact of energy market risks on the variability of their financial statements (the accounting classifications of these hedges are described in note 41 to the 2018 consolidated financial statements, "Derivatives and Hedge accounting"). However, a residual risk remains that cannot be hedged on the market due to factors such as insufficient liquidity or market depth, and uncertainty over volumes.

For operationally controlled entities in the Group, positions on the energy markets are taken predominantly by EDF Trading, the Group's trading entity, which operates on the markets on behalf of other Group entities and for the purposes of its own trading activity associated with the Group's industrial assets. Consequently, EDF Trading is subject to a strict governance and control framework, particularly the European regulations on trading companies.

EDF Trading trades on organised or OTC markets in derivatives such as futures, forwards, swaps and options (regardless of the accounting classification applied at Group level). Its exposure on the energy markets is strictly controlled through daily limit monitoring overseen by the subsidiary's management and by the Division in charge of energy market risk control at Group level. Automatic escalation procedures also exist to inform members of EDF Trading's Board of Directors of any breach of risk limits (value at risk limit) or losses (stop-loss limits). Value at Risk (VaR) is a statistical measure of the potential maximum loss in market value on a portfolio in the event of unfavourable market movements, over a given time horizon and with a given confidence interval<sup>(1)</sup>. Specific Capital at Risk (CaR) limits are also used in certain areas (operations on illiquid markets, long-term contracts and structured contracts) where VaR is difficult to apply. The stop-loss limit stipulates the acceptable risk for the trading business, setting a maximum level of loss over a rolling three-month period. If these limits are exceeded, EDF Trading's Board of Directors takes appropriate action, which may include closing certain positions.

In 2018, EDF Trading's commitment on the markets was subject to a VaR limit of €35 million, a CaR limit for long-term contracts and a CaR limit for operations on illiquid markets of €250 million each, and a stop-loss limit of €180 million.

These limits were not exceeded and EDF Trading managed its risks within the boundaries of its mandate from EDF at all times. The stop-loss has never been triggered since its introduction.

For an analysis of fair value hedges of the Group's commodities, see note 41.4.3 to the 2018 consolidated financial statements. For details of commodity derivatives not classified as hedges by the Group, see note 42.3 to the same consolidated financial statements.

### 5.1.6.3 Management of insurable risks

The EDF group has insurance programmes that cover EDF SA and its controlled subsidiaries as they are integrated. The coverage, exclusions, excesses and limits are appropriate to each business and the specificities of these subsidiaries.

The main insurance programmes cover:

- **conventional damage to Group property:** EDF is a member of the international mutual insurance company for energy operators, OIL<sup>(2)</sup>. Additional insurance coverage is provided by EDF's captive insurance company Wagram Insurance Company DAC<sup>(3)</sup>, as well as other insurers and reinsurers;
- **damage to the EDF group's nuclear facilities:** EDF's membership of OIL provides insurance coverage for physical damage in the cold area in both France and the United Kingdom (excluding damage caused by a nuclear accident), of 60% of US\$400 million above an excess of US\$15 million;
- until 30 September 2018, in addition to that coverage, physical damage (including following a nuclear accident) to EDF's nuclear plants in France and EDF Energy's nuclear plants in the United Kingdom, and nuclear decontamination costs, were covered by a common insurance policy principally involving the British atomic pool National Risk Insurers (NRI), Axa and Allianz (reinsured by the French nuclear pool Assuratome), and the European Mutual Association for Nuclear Insurance (EMANI), for a total capacity of €1,760 million above an amount of €240 million;
- from 1 October 2018:
  - in France, the coverage provided by OIL is complemented in the event of a nuclear accident, including site decontamination costs, by insurance coverage of €90 million above an excess of €10 million, provided by EMANI, Axa and Allianz (reinsured by Assuratome), and Wagram Insurance Company DAC (reinsured by the Group's captive insurer Océane Re),
  - in the United Kingdom, additional insurance for the consequences of a nuclear accident, including site decontamination costs, is provided through an insurance programme with total capacity of €1,510 million above an amount of €240 million, provided by EMANI, NRI and Northcourt, a group of specialist British insurers.

In connection with CENG's operations in the United States, EDF Inc. is a member of NEIL<sup>(4)</sup>.

- **damage to merchandise transported:** this programme covers damage to goods in transit, for all Group entities and subsidiaries;
- **nuclear operator's civil liability:**

In France, EDF's insurance policies comply with French laws 68-943 of 30 October 1968, 90-488 of 16 June 1990 and 2006-686 of 13 June 2006 (the "TSN" law on nuclear transparency and safety) which are now part of the French Environment Code. These laws transposed the civil liability obligations imposed on nuclear facility operators by the Paris convention (for more information in the regulations concerning the nuclear operator's civil liability, see section 1.5.6.2.2 "Specific regulations applicable to basic nuclear facilities" on Reference Document).

(1) EDF Trading estimates the VaR by the "Monte Carlo" method, which is based on volatilities and historical correlations measured using observed market prices over the 40 most recent business days. The VaR limit applies to the total EDF Trading portfolio.

(2) Oil Insurance Limited.

(3) An Irish insurance company fully-owned by EDF.

(4) Nuclear Electric Insurance Limited.



## 5. THE GROUP'S PERFORMANCE IN 2018 AND FINANCIAL OUTLOOK

### Operating and financial review

The Law on the Energy Transition for Green Growth enacted on 17 August 2015 amended the provisions of Articles L. 597-28 and L. 597-32 of the French Environment Code. Among the changes, the civil liability limits for nuclear operators were raised with effect from 18 February 2016 to €700 million for nuclear facilities, €70 million for reduced-risk facilities, and €80 million for risks during transport.

To meet the new legal requirements regarding insurance levels, EDF published a contract notice on 10 August 2015 entitled "EDF SA Nuclear Civil Liability Insurance Programme" to obtain and set up the insurance coverage needed for its nuclear civil liability and management of the associated claims.

With the insurance obtained in response to this notice, the Group meets its obligations. The coverage took effect on 18 February 2016 for a three-year term and is shared between the nuclear insurance market (Axa, reinsured by the French nuclear pool Assuratome) the Group's captive insurance companies, and the nuclear mutual insurance company ELINI.

In view of probable changes to nuclear operators' obligations during this period (particularly the application of protocols amending the Paris and Brussels Conventions), withdrawal clauses were included in the contract.

Management of claims is the responsibility of ELINI, which has a computerised claim processing system, and EQUAD, which has the necessary human and network resources.

In the **United Kingdom**, where EDF Energy operates nuclear power plants, the nuclear operator's civil liability rules are similar to French rules. On 4 May 2016, the British parliament approved the Nuclear Installations Order (for transposition of the protocols of February 2004 amending the existing conventions) which in substance introduced the same changes as the French TSN law of 2006, but will mostly only come into force at the same time as the protocols.

This Order raised the British operators' obligations from the current limit of £140 million to the equivalent of €700 million, and they will be progressively increased over a five-year period to reach a ceiling equal to the sterling equivalent of €1.2 billion.

EDF Energy is currently insured by ELINI and Wagram Insurance Company DAC. The Group's captive insurer Océane Re also bears the risk *via* a reinsurance contract for Wagram Insurance Company DAC.

The entry into force of France's Energy Transition law on 18 February 2016 led to a 40% increase in the Group's insurance premiums for the nuclear operator's civil liability. The forthcoming implementation of the protocols amending the Paris and Brussels Conventions will also lead to a substantial increase in the Group's insurance premiums;

- **general civil liability:** this programme covers the Group against the possible financial consequences for third parties of the (non-nuclear) risks inherent to the EDF group's businesses;
- **civil liability of Directors and senior executives:** EDF's insurance programme covers defence costs and other financial consequences arising from third party claims of liability against the Group's managers and key executives in connection with their duties;
- **construction risks:** EDF takes out insurance policies covering specific worksite risks (general worksite risks/general assembly and testing risks). These policies are not part of a Group programme but are purchased on an *ad hoc* basis for major projects such as the Flamanville and Hinkley Point C EPRs, or construction or renovation of generation or distribution units. The Group has put framework agreements in place for work on similar facilities (source substations, hydropower plants);
- **Enedis' overhead distribution network:** to renew its insurance cover for storm and gale damage, on 27 June 2016 Enedis signed a parametric insurance contract for significant storm damage to the overhead distribution network. In the event of damage, this innovative five-year contract with total capacity of €275 million provides pay-outs based on a composite parametric index referring to wind speeds recorded by Météo France weather stations, weighted by the distribution network's vulnerability for each region included in the scope of Enedis' concession;
- **cyber risk:** Cyber risk cover was been put in place on 1 July 2017, with a €100 million two-year insurance policy covering all entities of EDF SA and Group subsidiaries for the costs of handling major disruption caused by a cyber-attack on the Group's information systems.

The total value of the Group's insurance premiums for all types of coverage was €248 million in 2018.

### 5.1.7 INFORMATIONS ON INVOICE SETTLEMENT TIMES (ACCOUNT PAYABLE AND RECEIVABLE REQUIRED BY ARTICLE L. 441-6-1 OF THE FRENCH COMMERCIAL CODE)

As required by the LME law, modified by law 2015-990 for economic growth, activity and equal opportunities, EDF SA reports below the amounts (including taxes) of payables and receivables that are due at the year-end, by period overdue, and as

a percentage of the total amount of purchases and sales for the year (including taxes).

Article D. 441 I.-1: invoices received and due at the year-end but not yet settled							Article D. 441 I.-2: invoices issued and due at the year-end but not yet settled						
	0 day	1-30 days	31-60 days	61-90 days	91 days and more	Total (1 day and more)		0 day	1-30 days	31-60 days	61-90 days	91 days and more	Total (1 day and more)
<b>(A) PERIOD OVERDUE</b>													
Number of invoices	80,869	-	-	-	-	4,967	3,703,114	-	-	-	-	-	7,076,458
Total amount of invoices (including taxes) (in millions of euros)	2,323	9	5	1	-	15	1,056	250	71	56	631		1,008
% of the total amount of purchases of the year	4.7	-	-	-	-	-							
% of total amount of sales of the year (including taxes)							1.8	0.4	0.1	0.0	1.1		1.7
<b>(B) INVOICES EXCLUDED FROM (A) RELATING TO PAYABLES AND RECEIVABLES IN DISPUTE OR UNRECOGNISED</b>													
Number of invoices excluded						0							0
Total amount of invoices excluded						0							0
<b>(C) PAYMENT TERMS APPLIED (CONTRACTUAL OR STATUTORY OF THE FRENCH COMMERCIAL CODE)</b>													
Payment terms used for calculating periods overdue	contractual and statutory						statutory						

### 5.1.8 INFORMATIONS ON EXISTING BRANCHES REQUIRED BY ARTICLE L. 232-1 OF THE COMMERCIAL CODE

At 31 December 2018, the Group had 181 secondary establishments registered with the French Commercial Court registries stated in the Company's "K-bis" document, and operated on French territory through several thousand different offices which do not fulfil the independent management criterion to qualify as a branch.

EDF SA's branches <sup>(1)</sup> outside mainland France are listed below:

- Saint-Barthélemy;
- Saint-Pierre-et-Miquelon;
- Saint Martin;
- United Arab Emirates: Abu Dhabi;
- Bahrain;
- Benin;
- Cambodia;
- China:
  - Taishan,
- South Africa;
- Cape Verde;
- Qatar.

(1) In fiscal terms, this is a list of permanent establishments located outside France.

## 5.2 SUBSEQUENT EVENTS

- Mid-February 2019, EDF Renewables announced that it had started exclusive negotiations for the acquisition of 100% of the solar energy supplier Luxel. Luxel Group – which has its registered office in the Department of Hérault, France - has facilities with 90MWp gross, operates close on 130MWp (mainly in the south of France) and has a project portfolio of around 900MWp. Through this acquisition, EDF group wishes to give itself additional means to implement its Solar Plan which aims to achieve 30% market share in the solar sector in France between 2020 and 2035 (see EDF Renewables PR of 15 February 2019).
- On 5 March 2019, Edison and Ansaldo Energia announced an agreement for an investment in a new combined cycle gas in Italy on the Marghera Levante (Venetia) site, with a generation capacity of 780MW and an energy return of 63%. The total investment, of around €300 million, will contribute to reducing the average CO<sub>2</sub> and NO<sub>x</sub> emissions of the Italian thermoelectric park (see Edison and Ansaldo Energia PR of 5 March 2019).

### 5.3 CHANGES IN MARKET PRICES IN JANUARY AND FEBRUARY 2019

Spot prices for day-to-day electricity in France reached on average a base load price of €54.3/MWh and a peak demand price in January-February 2019 of €62.6/MWh, up respectively by €12.8/MWh and €12.9/MWh compared with the same period in 2018. This increase was driven by the surge in January (base load +€26.2/MWh vs. January 2018) when consumption increased by 5.2TWh compared with 2018 due to temperatures falling below those of January 2018 by 3.7°C. It was also due to the increase in the price of CO<sub>2</sub>, pushing up the operating costs of thermal power plants. In contrast, base load prices in February fell by €2.1/MWh compared with 2018 due to milder temperatures in 2019, thus reducing consumption (-6.5TWh vs. February 2018). This fall was mitigated by the increase in the price of CO<sub>2</sub>. German spot prices settled on average at a base load price of €46.3/MWh and a peak demand price of €55.5/MWh, up respectively by €11.8/MWh and €12.8/MWh compared with January-February 2018, driven in particular by the increase in the price of CO<sub>2</sub> and the fall in temperatures in January.

At the end of February 2019, the prices of French annual contracts for base load and peak demand deliveries in 2020 were €51.3/MWh and €66.2/MWh. A year earlier, forward electricity prices for delivery in France in 2019 closed in February at a base load price of €39.3/MWh and a peak demand price of €50.8/MWh. This increase in prices is mainly due to the increase in commodities prices, particularly that of CO<sub>2</sub>.

Over the period January-February 2019, gas spot prices in the French market reached €20.2/MWh on average, up by €0.5/MWh compared with the January-February 2018 average price, in spite of higher storage levels this year. This slight increase masks very high variations between January and February. In January 2019, the price increased by €3.2/MWh compared with the same month in 2018. Demand was higher in 2019 due to average temperatures being below those of January 2018 by 3.7°C. In contrast, February 2019 was warmer than the same month 2018 by 4.6°C, reducing the demand for gas and thus putting downward pressure on prices (-€2.4/MWh vs. February 2018).

The Brent oil price at the end of February 2019 was \$66.0/bbl, a slight increase compared with the end of February 2018 (+\$0.3/bbl). After an almost continuous

increase between July 2017 and September 2018, exceeding \$85/bbl in early October, oil prices thereafter fell, reaching \$50.5/bbl by Christmas. This decrease is due to the decline in global financial markets, fear of a glut following forecasts of a decline in global growth and thus in demand, and an increase in production in Russia and the United States. Oil prices recovered at the end of December due to cuts in production by OPEC members, in particular Saudi Arabia, and sanctions against Venezuela's oil, to again exceed \$65/bbl in February.

The price of coal for delivery in Europe in 2020 ended February 2019 at \$80.8/t, up by \$1.5/t compared to the 2019 contract closed at the end of February 2018. Following a decline between February and March 2018, due to the decline in oil prices and excess supply in Asia, the price of coal surged until September, driven by the recovery of oil prices and an increase in demand in China and India. Having reached close to the \$100/t mark on 3<sup>rd</sup> October 2018, prices declined in the last quarter following the fall in oil prices, import restrictions in China and significant stockpiles at ports in the Benelux countries. This downward trend was maintained in early 2019 due to Chinese medium-term demand being sluggish and short-term demand being lower than expected, due to a milder winter.

The price of CO<sub>2</sub> emissions certificates for delivery in December 2019 closed in February 2019 at €21.7/t against €10.1/t at the end of February 2018 for December 2018 delivery contracts. Prices witnessed a sharp increase between January and September 2018 due to the EU-ETS reform for the 2021-2030 periods, aimed at reducing the number of quotas in circulation. An increase which intensified with the return of speculators to the market. Since September, prices have been highly volatile, ranging between €15/t and €25/t depending on the progress of Brexit negotiations. Furthermore, prices were pulled downward at the end of January following Germany's coal exit commission's recommendation of a gradual phasing out of all German coal and lignite facilities, with the possibility of decommissioning starting in 2022.

### 5.4 OUTLOOK

Profit forecast and estimates included in section « 5.4 Outlook » have been prepared and consolidated on a basis which is comparable with historical financial information and consistent with EDF group's accounting policies as of 31 December 2018. As a consequence, they do not include the effect of IFRS 16 « Leases » that will be applied on January 1<sup>st</sup> 2019.

#### Targets 2019 <sup>(1)</sup>

- **EBITDA** <sup>(2)</sup>: between €15.3 billion and €16.0 billion;
- **Operating expenses** <sup>(3)</sup>: around €1.1 billion decrease compared with 2015;
- **Cash flow** excluding Hinkley Point C and Linky: > 0.

#### 2019-2020 Ambitions <sup>(1)</sup>

- **Total net investments** <sup>(4)</sup> excluding acquisitions and 2019-2020 Group disposals: around €15 billion per year;
- **2019-2020 Group disposals**: between €2 billion and €3 billion;
- **Net financial debt/EBITDA** <sup>(2)</sup>: ≤ 2.5x;
- **Targeted payout ratio**, based on net income excluding non-recurring items <sup>(5)</sup> <sup>(6)</sup>: 45% - 50%.

(1) Before IFRS 16 application. At constant legal and regulatory framework in France.

(2) On the basis of the scope and exchange rates at 1 January 2019 and of an assumption of a 395TWh France nuclear output. At prevailing price conditions beginning of February 2019 (around €50/MWh) for the unhedged 2020 France volumes.

(3) Sum of personnel expenses and other external expenses. At comparable scope and exchange rates. At constant pension discount rates. Excluding change in operating expenses of the service activities.

(4) In accordance with the Group's anticipations regarding the Flamanville 3 project completion costs and schedule.

(5) French State committed to scrip for the balance of the 2018 dividend and dividends relating to 2019 and 2020 full year.

(6) Adjusted for the remuneration of hybrid bonds accounted for in equity.



## 6. FINANCIAL STATEMENTS

<b>6.1 CONSOLIDATED FINANCIAL STATEMENTS</b>	<b>314</b>
Consolidated income statement	314
Consolidated statement of comprehensive Income	315
Consolidated balance sheet	316
Consolidated cash flow statement	317
Change in consolidated equity	318
<b>NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS</b>	<b>322</b>
<b>6.2 STATUTORY AUDITORS' REPORT ON THE CONSOLIDATED FINANCIAL STATEMENTS</b>	<b>430</b>
<b>6.3 FINANCIAL STATEMENTS</b>	<b>433</b>
Income statement	433
Balance sheet	434
Cash flow statement	436
<b>NOTES TO THE FINANCIAL STATEMENTS</b>	<b>437</b>
<b>6.4 STATUTORY AUDITORS' REPORT ON THE FINANCIAL STATEMENTS</b>	<b>490</b>
<b>6.5 TABLE OF RESULTS FOR THE LAST FIVE FISCAL YEARS</b>	<b>493</b>
<b>6.6 DIVIDEND POLICY</b>	<b>494</b>
6.6.1 Dividends and interim dividends paid in the last three fiscal years	494
6.6.2 Distribution policy, increased dividend	494
6.6.3 Unclaimed dividends	494
<b>6.7 SIGNIFICANT CHANGE IN THE FINANCIAL OR TRADING POSITION</b>	<b>495</b>
<b>6.8 INFORMATION RELATING TO THE ALLOCATION OF FUNDS RAISED THROUGH GREEN BONDS ISSUED BY EDF</b>	<b>495</b>
Use of proceeds	495
Evaluation and selection of eligible projects financed	495
Management of proceeds	495
Reporting	495

### 6.1 CONSOLIDATED FINANCIAL STATEMENTS

In application of Article 28 of European Commission regulation 809/2004/EC, the following information is incorporated by reference in this Reference Document:

- the EDF group's consolidated financial statements (under international accounting standards) for the year ended 31 December 2017 and the Statutory Auditors' report on those financial statements, which are to be found in chapter 6, sections 6.1 (pages 296 to 408) and 6.2 (pages 409 and 412) of the EDF group's 2017 Reference Document;
- the EDF group's consolidated financial statements (under international accounting standards) for the year ended 31 December 2016 and the Statutory

Auditors' report on those financial statements, which are to be found in chapter 6, sections 6.1 (pages 320 to 436) and 6.2 (pages 437 and 438) of the EDF group's 2016 Reference Document.

The Group's consolidated financial statements for the year ended 31 December 2018, prepared under IAS-IFRS, are presented below. They will be submitted for approval at the General Shareholders' Meeting to be held on 16 May 2019.

#### CONSOLIDATED INCOME STATEMENT

(in millions of euros)	Notes	2018	2017 restated <sup>(1)</sup>
Sales	7	68,976	64,892
Fuel and energy purchases	8	(33,012)	(32,901)
Other external expenses	9	(9,364)	(8,739)
Personnel expenses	10	(13,690)	(12,456)
Taxes other than income taxes	11	(3,697)	(3,541)
Other operating income and expenses	12	6,052	6,487
<b>Operating profit before depreciation and amortisation</b>		<b>15,265</b>	<b>13,742</b>
Net changes in fair value on Energy and Commodity derivatives, excluding trading activities		(224)	(355)
Net depreciation and amortisation		(9,006)	(8,537)
Net increases in provisions for renewal of property, plant and equipment operated under concessions		(50)	(58)
(Impairment)/reversals	13	(598)	(518)
Other income and expenses	14	(105)	1,363
<b>Operating profit</b>		<b>5,282</b>	<b>5,637</b>
Cost of gross financial indebtedness	15.1	(1,716)	(1,778)
Discount effect	15.2	(3,486)	(2,959)
Other financial income and expenses	15.3	393	2,501
<b>Financial result</b>	<b>15</b>	<b>(4,809)</b>	<b>(2,236)</b>
<b>Income before taxes of consolidated companies</b>		<b>473</b>	<b>3,401</b>
Income taxes	16	149	(147)
Share in net income of associates and joint ventures	23	569	35
<b>CONSOLIDATED NET INCOME</b>		<b>1,191</b>	<b>3,289</b>
<b>EDF net income</b>		<b>1,177</b>	<b>3,173</b>
<b>Net income attributable to non-controlling interests</b>		<b>14</b>	<b>116</b>
<b>Earnings per share (EDF share) in euros:</b>	<b>17</b>		
Basic earnings per share		0.20	0.98
Diluted earnings per share		0.20	0.98

(1) The comparative figures at 31 December 2017 have been restated according to IFRS 15 (note 2.1). For IFRS 9, applicable from 1 January 2018, the comparative figures have not been restated, as allowed by the standard's transition measures.

## CONSOLIDATED STATEMENT OF COMPREHENSIVE INCOME

	2018			2017		
	EDF net income	Net income attributable to non-controlling interests	Total	EDF net income	Net income attributable to non-controlling interests	Total
<i>(in millions of euros)</i>						
<b>Group net income</b>	<b>1,177</b>	<b>14</b>	<b>1,191</b>	<b>3,173</b>	<b>116</b>	<b>3,289</b>
Gross change in fair value of hedging instruments <sup>(1)</sup>	34	(19)	15	1,513	4	1,517
Related tax effect	(89)	-	(89)	(361)	(2)	(363)
Associates' and joint ventures' share of fair value of hedging instruments	(7)	-	(7)	6	-	6
<b>Change in fair value of hedging instruments</b>	<b>(62)</b>	<b>(19)</b>	<b>(81)</b>	<b>1,158</b>	<b>2</b>	<b>1,160</b>
Translation adjustments – controlled entities	(38)	(79)	(117)	(970)	(169)	(1,139)
Translation adjustments – associates and joint ventures	117	-	117	(531)	-	(531)
<b>Translation adjustments</b>	<b>79</b>	<b>(79)</b>	<b>-</b>	<b>(1,501)</b>	<b>(169)</b>	<b>(1,670)</b>
Gross change in fair value of debt instruments <sup>(1) (2)</sup>	(115)	-	(115)	-	-	-
Related tax effect	42	-	42	-	-	-
Associates' and joint ventures' share of fair value of debt instruments	(1)	-	(1)	-	-	-
Gross change in fair value of available-for-sale financial assets <sup>(1)</sup>	-	-	-	107	-	107
Related tax effect	-	-	-	(61)	-	(61)
Associates' and joint ventures' share of fair value of available-for-sale financial assets	-	-	-	77	-	77
<b>Change in fair value of debt instruments and available-for-sale financial assets</b>	<b>(74)</b>	<b>-</b>	<b>(74)</b>	<b>123</b>	<b>-</b>	<b>123</b>
<b>Gains and losses recorded in equity with recycling</b>	<b>(57)</b>	<b>(98)</b>	<b>(155)</b>	<b>(220)</b>	<b>(167)</b>	<b>(387)</b>
Gross change in fair value of equity instruments <sup>(2)</sup>	(37)	-	(37)	-	-	-
Related tax effect	-	-	-	-	-	-
Associates' and joint ventures' share of fair value of equity instruments	-	-	-	-	-	-
<b>Change in fair value of equity instruments</b>	<b>(37)</b>	<b>-</b>	<b>(37)</b>	<b>-</b>	<b>-</b>	<b>-</b>
Gross change in actuarial gains and losses on post-employment benefits <sup>(3)</sup>	3,141	11	3,152	1,061	60	1,121
Related tax effect	(309)	(1)	(310)	(337)	(12)	(349)
Associates' and joint ventures' share of change in actuarial gains and losses on post-employment benefits	69	-	69	16	-	16
<b>Change in actuarial gains and losses on post-employment benefits</b>	<b>2,901</b>	<b>10</b>	<b>2,911</b>	<b>740</b>	<b>48</b>	<b>788</b>
<b>Gains and losses recorded in equity with no recycling</b>	<b>2,864</b>	<b>10</b>	<b>2,874</b>	<b>740</b>	<b>48</b>	<b>788</b>
<b>Total gains and losses recorded in equity</b>	<b>2,807</b>	<b>(88)</b>	<b>2,719</b>	<b>520</b>	<b>(119)</b>	<b>401</b>
<b>CONSOLIDATED COMPREHENSIVE INCOME</b>	<b>3,984</b>	<b>(74)</b>	<b>3,910</b>	<b>3,693</b>	<b>(3)</b>	<b>3,690</b>

(1) Gross changes in fair value recycled to profit and loss in respect of debt and equity securities and hedging instruments are presented in notes 36.2 and 41.4.

(2) In accordance with the transition measures of IFRS 9, the comparative figures have not been restated. See note 2.2, for more details on these transition measures.

(3) Gross changes in actuarial gains and losses are presented in note 31.1.2.

## CONSOLIDATED BALANCE SHEET

### ASSETS

<i>(in millions of euros)</i>	Notes	31/12/2018	31/12/17 restated <sup>(1)</sup>
Goodwill	18	10,195	10,036
Other intangible assets	19	9,918	8,896
Property, plant and equipment operated under French public electricity distribution concessions	20	56,515	54,739
Property, plant and equipment operated under concessions for other activities	21	7,339	7,607
Property, plant and equipment used in generation and other tangible assets owned by the Group	22	78,252	75,622
Investments in associates and joint ventures	23	8,287	7,249
Non-current financial assets	36	37,104	36,787
Other non-current receivables	26	1,796	2,168
Deferred tax assets	16.3	978	1,220
<b>Non-current assets</b>		<b>210,384</b>	<b>204,324</b>
Inventories	24	14,227	14,138
Trade receivables	25	15,910	16,843
Current financial assets	36	31,143	24,953
Current tax assets		869	673
Other current receivables	26	7,346	7,219
Cash and cash equivalents	37	3,290	3,692
<b>Current assets</b>		<b>72,785</b>	<b>67,518</b>
Assets classified as held for sale	43	-	-
<b>TOTAL ASSETS</b>		<b>283,169</b>	<b>271,842</b>

### EQUITY AND LIABILITIES

<i>(in millions of euros)</i>	Notes	31/12/2018	31/12/17 restated <sup>(1)</sup>
Capital	27	1,505	1,464
EDF net income and consolidated reserves		42,964	39,893
<b>Equity (EDF share)</b>		<b>44,469</b>	<b>41,357</b>
Equity (non-controlling interests)	27.5	8,177	7,341
<b>Total equity</b>	<b>27</b>	<b>52,646</b>	<b>48,698</b>
Provisions related to nuclear generation – back-end of the nuclear cycle, plant decommissioning and last cores	28	49,204	46,410
Other provisions for decommissioning	28	2,033	1,977
Provisions for employee benefits	31	17,627	20,630
Other provisions	28	2,908	2,356
<b>Non-current provisions</b>	<b>28</b>	<b>71,772</b>	<b>71,373</b>
Special French public electricity distribution concession liabilities	33	46,924	46,323
Non-current financial liabilities	38	52,129	51,365
Other non-current liabilities	35	4,896	4,864
Deferred tax liabilities	16.3	1,987	2,362
<b>Non-current liabilities</b>		<b>177,708</b>	<b>176,287</b>
Current provisions	28	6,010	5,484
Trade payables	34	13,421	13,994
Current financial liabilities	38	17,167	11,142
Current tax liabilities		205	187
Other current liabilities	35	16,012	16,050
<b>Current liabilities</b>		<b>52,815</b>	<b>46,857</b>
Liabilities related to assets classified as held for sale	43	-	-
<b>TOTAL EQUITY AND LIABILITIES</b>		<b>283,169</b>	<b>271,842</b>

(1) The comparative figures at 31 December 2017 have been restated according to IFRS 15 (note 2.1.3.2).

## CONSOLIDATED CASH FLOW STATEMENT

<i>(in millions of euros)</i>	Notes	2018	2017
<b>Operating activities:</b>			
<b>Income before taxes of consolidated companies</b>		<b>473</b>	<b>3,401</b>
Impairment/(reversals)		598	518
Accumulated depreciation and amortisation, provisions and changes in fair value		13,180	9,980
Financial income and expenses		729	764
Dividends received from associates and joint ventures		387	243
Capital gains/losses		(1,014)	(2,739)
Change in working capital	44.1	462	1,476
<b>Net cash flow from operations</b>		<b>14,815</b>	<b>13,643</b>
Net financial expenses disbursed		(1,062)	(1,209)
Income taxes paid		(389)	(771)
<b>Net cash flow from operating activities</b>		<b>13,364</b>	<b>11,663</b>
<b>Investing activities:</b>			
Acquisitions of equity investments, net of cash acquired		(484)	(2,463)
Disposals of equity investments, net of cash transferred <sup>(1)</sup>		1,261	2,472
Investments in intangible assets and property, plant and equipment	44.2	(16,186)	(14,747)
Net proceeds from sale of intangible assets and property, plant and equipment		611	1,140
Changes in financial assets		(2,367)	1,885
<b>Net cash flow used in investing activities</b>		<b>(17,165)</b>	<b>(11,713)</b>
<b>Financing activities:</b>			
EDF capital increase		-	4,005
Transactions with non-controlling interests <sup>(2)</sup>		1,548	481
Dividends paid by parent company	27.3	(511)	(109)
Dividends paid to non-controlling interests		(183)	(183)
Purchases/sales of treasury shares		(3)	(6)
<b>Cash flows with shareholders</b>		<b>851</b>	<b>4,188</b>
Issuance of borrowings		5,711	2,901
Repayment of borrowings		(2,844)	(6,304)
Issuance of perpetual subordinated bonds	3.5	1,243	-
Redemptions of perpetual subordinated bonds	3.6	(1,329)	-
Payments to bearers of perpetual subordinated bonds	27.4	(584)	(565)
Funding contributions received for assets operated under concessions		131	144
Investment subsidies		351	348
<b>Other cash flows from financing activities</b>		<b>2,679</b>	<b>(3,476)</b>
<b>Net cash flow from financing activities</b>		<b>3,530</b>	<b>712</b>
<b>Net increase/(decrease) in cash and cash equivalents</b>		<b>(271)</b>	<b>662</b>
<b>CASH AND CASH EQUIVALENTS – OPENING BALANCE</b>		<b>3,692</b>	<b>2,893</b>
Net increase/(decrease) in cash and cash equivalents		(271)	662
Effect of currency fluctuations		(95)	(13)
Financial income on cash and cash equivalents		13	21
Effect of reclassifications		(49)	129
<b>CASH AND CASH EQUIVALENTS – CLOSING BALANCE</b>	<b>37</b>	<b>3,290</b>	<b>3,692</b>

(1) In 2018, this item includes an amount of €966 million relating to the sale of Dunkerque LNG (see note 3.3).

In 2017, this item includes an amount of €1,282 million relating to the partial sale of the CTE (see note 3.11.3).

(2) Contributions via capital increases or capital reductions and acquisitions of additional interests or disposals of interests in controlled companies. In 2018, this item includes an amount of €797 million relating to the sale of 49% of EDF Renewables' wind farms (see note 3.8.2), and an amount of €743 million relating to CGN's payment for the NNB Holding Ltd. and Sizewell C Holding Co capital increases (€501 million at 31 December 2017).



## CHANGE IN CONSOLIDATED EQUITY

Details of the change in equity between 1 January and 31 December 2018 are as follows:

<i>(in millions of euros)</i>	Capital	Treasury shares	Translation adjustments <sup>(1)</sup>	Fair value adjustment of financial instruments (OCI with recycling) <sup>(2)</sup>	Other consolidated reserves and net income <sup>(3)</sup>	Equity (EDF share)	Equity (non-controlling interests)	Total equity
<b>EQUITY AS PUBLISHED AT 31/12/2016</b>	<b>1,055</b>	<b>(29)</b>	<b>1,637</b>	<b>(1,587)</b>	<b>33,362</b>	<b>34,438</b>	<b>6,924</b>	<b>41,362</b>
Gains and losses recorded in equity	-	-	(1,501)	1,281	740	520	(119)	401
Net income	-	-	-	-	3,173	3,173	116	3,289
<b>Consolidated comprehensive income</b>			<b>(1,501)</b>	<b>1,281</b>	<b>3,913</b>	<b>3,693</b>	<b>(3)</b>	<b>3,690</b>
Payments on perpetual subordinated bonds	-	-	-	-	(565)	(565)	-	(565)
Dividends paid	-	-	-	-	(1,532)	(1,532)	(183)	(1,715)
Purchases/sales of treasury shares	-	(11)	-	-	-	(11)	-	(11)
Capital increase by EDF <sup>(4)</sup>	409	-	-	-	5,018	5,427	-	5,427
Other changes <sup>(5)</sup>	-	-	-	-	(93)	(93)	603	510
<b>EQUITY AS PUBLISHED AT 31/12/2017</b>	<b>1,464</b>	<b>(40)</b>	<b>136</b>	<b>(306)</b>	<b>40,103</b>	<b>41,357</b>	<b>7,341</b>	<b>48,698</b>
IFRS 9 restatements (see note 2.2.2.5)	-	-	-	(1,414)	1,414	-	-	-
<b>EQUITY RESTATED AT 01/01/2018</b>	<b>1,464</b>	<b>(40)</b>	<b>136</b>	<b>(1,720)</b>	<b>41,517</b>	<b>41,357</b>	<b>7,341</b>	<b>48,698</b>
Gains and losses recorded in equity	-	-	79	(136)	2,864	2,807	(88)	2,719
Net income	-	-	-	-	1,177	1,177	14	1,191
<b>Consolidated comprehensive income</b>			<b>79</b>	<b>(136)</b>	<b>4,041</b>	<b>3,984</b>	<b>(74)</b>	<b>3,910</b>
Payments on perpetual subordinated bonds	-	-	-	-	(584)	(584)	-	(584)
Issuance/Redemption of perpetual subordinated bonds (see notes 3.5 and 3.6)	-	-	-	-	(86)	(86)	-	(86)
Dividends paid	-	-	-	-	(1,360)	(1,360)	(183)	(1,543)
Purchases/sales of treasury shares	-	(16)	-	-	-	(16)	-	(16)
Capital increase by EDF <sup>(6)</sup>	41	-	-	-	806	847	-	847
Other changes <sup>(7)</sup>	-	-	-	-	327	327	1,093	1,420
<b>EQUITY AT 31/12/2018</b>	<b>1,505</b>	<b>(56)</b>	<b>215</b>	<b>(1,856)</b>	<b>44,661</b>	<b>44,469</b>	<b>8,177</b>	<b>52,646</b>

(1) Changes in translation adjustments amount to €79 million at 31 December 2018, mainly relating to the rise of the dollar against the euro, partly offset by the decline of the pound sterling against the euro.

(2) Changes in reserves recorded in OCI (Other Comprehensive Income) with recycling are shown in the Statement of Comprehensive Income. They correspond to the effects of fair value adjustments of debt securities and financial instruments hedging cash flows and net foreign investments, and amounts recycled to profit and loss in respect of terminated contracts and debt instruments transferred.

(3) Fair value changes recorded in OCI with no recycling are presented in the "Other consolidated reserves and net income" column.

(4) In 2017, the changes in capital and other consolidated reserves (issue premium) relate to EDF's capital increase amounting to €4,005 million net of expenses and payment of the balance of the scrip dividend for 2016 totalling €1,024 million and the scrip interim dividend for 2017 totalling €398 million.

(5) In 2017, "Other changes" in equity (non-controlling interests) include the effect of capital increases funded by CGN for NNB Holding Ltd. and Sizewell C Holding Co. amounting to €501 million.

They also include the effects of the acquisition of Framatome, amounting to €209 million (see note 3.11.2), with minority shareholders owning 24.5% of the capital.

(6) In 2018, the changes in capital and other consolidated reserves (issue premium) relate to payment of the balance of the scrip dividend for 2017 totalling €847 million (see note 27.3).

(7) In 2018, the changes in consolidated reserves and equity (non-controlling interests) include in particular the effect of the sale of 49% of EDF Renewables' wind farms (see note 3.8.2). "Other changes" in equity (non-controlling interests) also include the capital increases funded by CGN for NNB Holding Ltd. and Sizewell C Holding Co amounting to €743 million, and the effects of the sale of Dunkerque LNG amounting to €(433) million.

## NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS

<b>Note 1</b>	<b>Group accounting policies</b>	<b>323</b>	<b>Note 6</b>	<b>Segment reporting</b>	<b>352</b>
1.1	Declaration of conformity and Group accounting policies	323	6.1	Reporting by operating segment	352
1.2	Changes in accounting standards at 31 December 2018	323	6.2	Sales to external customers, by product and service group	354
1.3	Summary of the principal accounting and valuation methods	324		<b>INCOME STATEMENT</b>	<b>355</b>
<b>Note 2</b>	<b>Comparability</b>	<b>339</b>	<b>Note 7</b>	<b>Sales</b>	<b>355</b>
2.1	IFRS 15 – Revenue from contracts with customers	339	<b>Note 8</b>	<b>Fuel and energy purchases</b>	<b>355</b>
2.2	IFRS 9 – Financial Instruments	340	<b>Note 9</b>	<b>Other external expenses</b>	<b>355</b>
<b>Note 3</b>	<b>Significant events and transactions</b>	<b>342</b>	<b>Note 10</b>	<b>Personnel expenses</b>	<b>356</b>
3.1	The first of two EPR reactors at China's Taishan nuclear power plant begins commercial operation	342	10.1	Personnel expenses	356
3.2	Sale of a portfolio of more than 200 real estate and business assets by the EDF group to Colony Capital	342	10.2	Average workforce	356
3.3	Completion of the sale of EDF's stake in Dunkerque LNG	342	<b>Note 11</b>	<b>Taxes other than income taxes</b>	<b>356</b>
3.4	Senior bond issues: EDF raises \$3.75 billion and €1 billion	343	<b>Note 12</b>	<b>Other operating income and expenses</b>	<b>357</b>
3.5	Issuance of perpetual subordinated bonds	343	12.1	Operating subsidies	357
3.6	Redemption of certain series of hybrid bonds	343	12.2	Net income on deconsolidation and gains on disposal of fixed assets	357
3.7	Syndication of an innovative ESG-Indexed Revolving Credit Facility	343	12.3	Other items	357
3.8	EDF Renewables	343	<b>Note 13</b>	<b>Impairment/reversals</b>	<b>358</b>
3.9	Confirmation of the European Commission decision on the tax treatment of provisions established between 1987 and 1996 for renewal of general network facilities	344	13.1	Impairment by category of asset	358
3.10	Flamanville 3 EPR Project	344	13.2	Impairment tests on goodwill, intangible assets and property, plant and equipment	358
3.11	Significant events and transactions of 2017	345	<b>Note 14</b>	<b>Other income and expenses</b>	<b>361</b>
<b>Note 4</b>	<b>Regulatory changes in France</b>	<b>346</b>	<b>Note 15</b>	<b>Financial result</b>	<b>361</b>
4.1	France's multi-year energy programme (PPE)	346	15.1	Cost of gross financial indebtedness	361
4.2	Regulated electricity sales tariffs in France – "Blue" tariffs	346	15.2	Discount effect	361
4.3	"Turpe" network access tariffs	347	15.3	Other financial income and expenses	361
4.4	Compensation for public energy service charges (CSPE)	348	<b>Note 16</b>	<b>Income taxes</b>	<b>362</b>
4.5	French capacity mechanism	349	16.1	Breakdown of tax expense	362
4.6	Energy savings certificates	349	16.2	Reconciliation of the theoretical and effective tax expense (tax proof)	362
4.7	ARENH	349	16.3	Change in deferred tax assets and liabilities	363
			16.4	Breakdown of deferred tax assets and liabilities by nature	363
<b>Note 5</b>	<b>Changes in the scope of consolidation</b>	<b>350</b>	<b>Note 17</b>	<b>Basic earnings per share and diluted earnings per share</b>	<b>364</b>
5.1	Framatome – Final recognition of the business combination	350		<b>OPERATING ASSETS AND LIABILITIES, EQUITY</b>	<b>365</b>
5.2	Acquisition of a 450MW offshore wind project in Scotland	351	<b>Note 18</b>	<b>Goodwill</b>	<b>365</b>
5.3	Acquisition by Edison of Edison Energie (formerly Gas Natural Vendita Italia)	351	18.1	Changes in goodwill	365
			18.2	Goodwill by operating segment	365

<b>Note 19 Other intangible assets</b>	<b>366</b>	<b>Note 29 Provisions related to nuclear generation – back-end of the nuclear cycle, plant decommissioning and last cores</b>	<b>380</b>
<b>Note 20 Property, plant and equipment operated under French public electricity distribution concessions</b>	<b>367</b>	29.1 Nuclear provisions in France	380
20.1 Net value of property, plant and equipment operated under French public electricity distribution concessions	367	29.2 EDF Energy's nuclear provisions	386
20.2 Movements in property, plant and equipment operated under French public electricity distribution concessions (excluding assets in progress)	367	<b>Note 30 Other provisions for decommissioning</b>	<b>388</b>
<b>Note 21 Property, plant and equipment operated under concessions for other activities</b>	<b>368</b>	<b>Note 31 Provisions for employee benefits</b>	<b>389</b>
21.1 Net value of property, plant and equipment operated under concessions for other activities	368	31.1 EDF group	389
21.2 Movements in property, plant and equipment operated under concessions for other activities (excluding assets in progress)	368	31.2 France (regulated activities, and generation and supply)	390
		31.3 United Kingdom	393
<b>Note 22 Property, plant and equipment used in generation and other tangible assets owned by the Group</b>	<b>369</b>	<b>Note 32 Other provisions</b>	<b>396</b>
22.1 Net value of property, plant and equipment used in generation and other tangible assets owned by the Group	369	<b>Note 33 Special French public electricity distribution concession liabilities</b>	<b>396</b>
22.2 Movements in property, plant and equipment used in generation and other tangible assets owned by the Group (excluding assets in progress and finance-leased assets)	369	<b>Note 34 Trade payables</b>	<b>396</b>
22.3 Finance lease contracts	370	<b>Note 35 Other liabilities</b>	<b>397</b>
<b>Note 23 Investments in associates and joint ventures</b>	<b>371</b>	35.1 Advances and progress payments received	397
23.1 Coentreprise de transport d'électricité (CTE)	371	35.2 Tax liabilities	397
23.2 CENG	372	35.3 Deferred income on long-term contracts	397
23.3 Taishan	373	35.4 Other items	397
23.4 Alpiq	373	35.5 Contract liabilities	397
<b>Note 24 Inventories</b>	<b>374</b>	<b>FINANCIAL ASSETS AND LIABILITIES</b>	<b>398</b>
<b>Note 25 Trade receivables</b>	<b>375</b>	<b>Note 36 Current and non-current financial assets</b>	<b>398</b>
25.1 Trade receivables due and not yet due	375	36.1 Breakdown between current and non-current financial assets	398
25.2 Assignment of receivables	375	36.2 Debt and equity securities	398
25.3 Contract assets	375	36.3 Loans and financial receivables	399
<b>Note 26 Other receivables</b>	<b>376</b>	36.4 Change in financial assets other than derivatives	399
<b>Note 27 Equity</b>	<b>377</b>	<b>Note 37 Cash and cash equivalents</b>	<b>400</b>
27.1 Share capital	377	<b>Note 38 Current and non-current financial liabilities</b>	<b>401</b>
27.2 Treasury shares	377	38.1 Breakdown between current and non-current financial liabilities	401
27.3 Dividends	377	38.2 Loans and other financial liabilities	401
27.4 Equity instruments	377	38.3 Net indebtedness	404
27.5 Non-controlling interests (minority interests)	378	<b>Note 39 Other information on financial assets and liabilities</b>	<b>405</b>
<b>Note 28 Provisions</b>	<b>379</b>	39.1 Fair value of financial instruments	405
		39.2 Offsetting of financial assets and liabilities	406
		<b>Note 40 Management of market and counterparty risks</b>	<b>407</b>

<b>Note 41 Derivatives and hedge accounting</b>	<b>408</b>	<b>Note 46 Off-balance sheet commitments</b>	<b>417</b>
41.1 Fair value hedges	408	46.1 Commitments given	417
41.2 Cash flow hedges	408	46.2 Commitments received	420
41.3 Hedges of net investments in foreign entities	408	<b>Note 47 Contingent liabilities</b>	<b>421</b>
41.4 Impact of hedging derivatives on equity	409	47.1 Tax inspections	421
41.5 Commodity-related fair value hedges	410	47.2 Labour litigation	422
<b>Note 42 Non-hedging derivatives</b>	<b>411</b>	47.3 Enedis –Litigation with photovoltaic producers	422
42.1 Interest rate derivatives held for trading	411	<b>Note 48 Related parties</b>	<b>423</b>
42.2 Currency derivatives held for trading	411	48.1 Transactions with entities included in the scope of consolidation	423
42.3 Non-hedging commodity derivatives	412	48.2 Relations with the French State and State-owned entities	423
<b>ASSETS HELD FOR SALE AND RELATED LIABILITIES</b>	<b>412</b>	48.3 Management compensation	424
<b>Note 43 Assets held for sale and related liabilities</b>	<b>412</b>	<b>Note 49 Environment</b>	<b>425</b>
<b>CASH FLOWS AND OTHER INFORMATION</b>	<b>413</b>	49.1 Greenhouse gas emission rights	425
<b>Note 44 Cash flows</b>	<b>413</b>	49.2 Energy savings certificates	425
44.1 Change in working capital	413	49.3 Renewable energy certificates	425
44.2 Investments in intangible and tangible assets	413	<b>Note 50 Subsequent events</b>	<b>425</b>
<b>Note 45 EDF's dedicated assets</b>	<b>414</b>	<b>Note 51 Scope of consolidation at 31 December 2018</b>	<b>426</b>
45.1 Regulations	414	51.1 Fully consolidated companies	426
45.2 Portfolio contents and measurement	414	51.2 Company held in the form of a joint operation	427
45.3 Valuation of EDF's dedicated assets	415	51.3 Companies accounted for by the equity method	428
45.4 Coverage of long-term nuclear obligations	415	51.4 Companies in which the EDF group's voting rights differ from its percentage ownership	428
45.5 Changes in dedicated assets in 2018	416	<b>Note 52 Statutory Auditors' fees</b>	<b>429</b>
45.6 Dedicated assets of Framatome and SOCODEI	416		

### NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS

Electricité de France (EDF or the "Company") is a French *société anonyme* governed by French law, and registered in France.

The consolidated financial statements reflect the accounting position of the Company and its subsidiaries (which together form the "Group") and the Group's interests in associates, joint arrangements classified as joint operations, and joint ventures, for the year ended 31 December 2018.

The Group is an integrated energy operator engaged in all aspects of the energy business: generation, transmission, distribution, supply, energy trading and services.

As of 31 December 2017, it includes the activities of Framatome: services and production of equipment and fuel for reactors (see note 3.11.2).

The Group's consolidated financial statements at 31 December 2018 were prepared under the responsibility of the Board of Directors and approved by the Directors at the Board meeting held on 14 February 2019. They will become final after approval at the General Shareholders' Meeting to be held on 16 May 2019.



## **NOTE 1 GROUP ACCOUNTING POLICIES**

### **1.1 DECLARATION OF CONFORMITY AND GROUP ACCOUNTING POLICIES**

Pursuant to European regulation 1606/2002 of 19 July 2002 on the adoption of international accounting standards, the EDF group's consolidated financial statements at 31 December 2018 are prepared under the presentation, recognition and measurement rules set out in the international accounting standards published by the IASB and approved by the European Union for application at 31 December 2018. These international standards are IAS (International Accounting Standards), IFRS (International Financial Reporting Standards), and SIC and IFRIC interpretations.

The Group has not opted for early application of standards and interpretations that were not yet mandatory in 2018.

### **1.2 CHANGES IN ACCOUNTING STANDARDS AT 31 DECEMBER 2018**

The accounting and valuation methods applied by the Group in the consolidated financial statements at 31 December 2018 are identical to those used in the consolidated financial statements at 31 December 2017, with the exception of the following changes:

#### **1.2.1 IFRS 15 "Revenue from contracts with customers" and IFRS 9 "Financial Instruments"**

These two new standards adopted by the European Union are applicable for financial years beginning on or after 1 January 2018. The information required by IAS 8 concerning the effects of their application by the Group is given in note 2.

#### **1.2.2 IFRIC 22 "Foreign Currency Transactions and Advance Consideration"**

IFRIC 22, applicable for financial years beginning on or after 1 January 2018, was adopted by the European Union on 28 March 2018. This interpretation requires payment or receipt of a non-monetary advance in a foreign currency to be translated at the exchange rate of the transaction date, with no subsequent adjustment. Prospective application of IFRIC 22 does not have a significant impact on the EDF group's consolidated financial statements.

#### **1.2.3 Other amendments and improvements to standards applicable from 1 January 2018**

The following IASB publications have no impact on the Group's consolidated financial statements:

- amendments to IAS 40 "Investment property" entitled "Transfers of investment property", adopted on 14 March 2018;
- amendments to IFRS 2 "Share-based Payment" entitled "Classification and measurement of share-based payment transactions", adopted on 26 February 2018;
- amendments to IFRS 4 "Insurance Contracts" entitled "Applying IFRS 9 'Financial Instruments' with IFRS 4 'Insurance Contracts'", adopted on 3 November 2017;
- annual improvements to IFRS, 2014-2016 cycle, adopted on 7 February 2018.

### **1.2.4 Standards and amendments adopted by the European Union but only applicable after 31 December 2018**

#### **1.2.4.1 IFRS 16 – Leases**

IFRS 16 "Leases" was adopted by the European Union on 31 October 2017 and will be mandatory for financial years beginning on or after 1 January 2019.

IFRS 16 requires all leases other than short-term leases and leases of low-value assets to be recognised in the lessee's balance sheet in the form of a "right-of-use" asset, with a corresponding financial liability. Existing contracts classified as "operating leases" are currently reported as off-balance sheet items (see note 46.1.1.3).

The EDF group's lease contracts essentially concern real estate assets (office and residential properties), industrial installations (land, wind farms) and to a lesser extent vehicles and IT equipment.

The Group identified the potential impacts of the application of IFRS 16 via questionnaires sent to all its subsidiaries to collect information about the features of operating leases in existence at 31 December 2017. Based on the results, it was decided to apply the "modified" retrospective approach.

In compliance with the standard, the incremental borrowing rate is used to discount the lease liability to present value at the transition date. This rate is EDF's incremental indebtedness rate, based on zero-coupon EDF bond rates, adjusted for the currency risk, a country risk premium, the term of the contracts and the subsidiary's credit risk.

The Group also decided to apply the two exemptions allowed by IFRS 16, and therefore does not recognise:

- leases with a duration of 12 months or less (and for the transition, leases terminating within 12 months of the first application of the standard);
- leases of assets with individual value when new of less than USD5,000.

Based on the work done at 30 June 2018, application of IFRS 16 in the Group's financial statements at 31 December 2017 under the modified retrospective approach would have resulted in an increase of €4.3 billion in net indebtedness (including Framatome) and would have had a positive impact of approximately €0.5 billion on the operating income before depreciation and amortisation (excluding Framatome and including a partial cancellation of realised gains on sale amounting to €0.2 billion), and the consolidated net income would not have been significantly different.

At 31 December 2018, the impacts of IFRS 16 were reviewed. Under the modified retrospective approach, application of the standard results in an increase of approximately €4.5 billion in net indebtedness at 31 December 2018; also, according to the Group's calculations, application of IFRS 16 under the modified retrospective approach would have had a positive impact of approximately €0.5 billion on the operating income before depreciation and amortisation for 2018 (including a partial cancellation of realised gains on sale amounting to €0.2 billion), and the consolidated net income would not have been significantly different. The above effects on operating income before depreciation and amortisation and on the consolidated net income are reported for information purposes in compliance with IAS 8.30, due to use of the modified retrospective approach.

The difference between the lease liability estimated at 31 December 2017 and 31 December 2018 results from new lease contracts, revisions and updates of existing lease contracts, partly offset by repayments of the lease liability and deconsolidation of one entity.

The differences at 31 December 2018 between operating lease commitments presented in accordance with IAS 17 and the lease liability under IFRS 16 are explained as follows:

(in billions of euros)	31/12/2018
<b>Operating lease commitments as lessee at 31/12/2018 (note 46.1.1.3)</b>	<b>4.4</b>
Unrecognised contracts (IFRS 16 exemptions)	(0.1)
Differences in the durations applied for termination and extension options that are reasonably certain to be exercised	1.1
Leases signed in 2018 for an asset available after 1 January 2019	(0.3)
Other	(0.1)
<b>Estimated non-discounted lease liability under IFRS 16 at 31/12/2018</b>	<b>5.0</b>
Discount effect	(0.5)
<b>Estimated discounted lease liability under IFRS 16 at 31/12/2018</b>	<b>4.5</b>

### 1.2.4.2 Amendments to IFRS 9

The amendments to IFRS 9 entitled "Prepayment Features with Negative Compensation", adopted on 22 March 2018 by the European Union, will be applicable from 1 January 2019. Based on the operations completed to date, no impact is anticipated for the Group.

### 1.2.4.3 IFRIC 23 "Uncertainty over income tax treatments"

IFRIC 23 "Uncertainty over income tax treatments", adopted by the European Union on 23 October 2018, will be applicable from 1 January 2019.

This interpretation clarifies application of the provisions of IAS 12 "Income taxes" regarding recognition and measurement of income tax when fiscal uncertainty exists. Based on the Group's analyses in 2018, implementation of IFRIC 23 should not have any material impacts for the Group.

### 1.2.4.4 Amendments to IAS 28 "Long term Interests in Associates and Joint Ventures"

The amendments to IAS 28, adopted by the European Union on 8 February 2019, clarify that an entity should first apply IFRS 9 "Financial Instruments" to other interests in an associate or joint venture that form part of its net investment in that associate and joint venture but are not accounted for by the equity method. This standard is not expected to generate any significant impacts for the Group.

## 1.2.5 Standards and interpretations published by the IASB but not yet adopted by the European Union

The following IASB publications have not yet been adopted by the European Union but are expected to be applicable for financial years beginning on 1 January 2019, 1 January 2020 or 1 January 2021. Analyses are in process to estimate their potential impact on the Group's financial statements:

- amendments to IAS 19 entitled "Plan Amendment, Curtailment or Settlement". IAS 19 already required actuarial assumptions to be updated and the net liability (or asset) on defined-benefit plans to be revalued. These amendments clarify that a company must update its actuarial assumptions during the accounting period to estimate the current service cost and the net interest expense on defined benefits from the date of the change affecting the plan;
- annual improvements to IFRS, 2015-2017 cycle, containing amendments to:
  - IFRS 3 and IFRS 11: when one partner in a joint operation acquires additional interests that lead it to obtain exclusive control, its previous

interest in the assets and liabilities of the joint operation must be restated at fair value through profit and loss,

- IAS 12: the tax impacts of dividend distributions must be recognised in profit and loss, in other components of comprehensive income or in equity, consistent with the treatment of the operations that generated them,
- IAS 23: when a company has a specific borrowing for an asset under construction, the interest on that borrowing is allocated to the asset concerned until it is practically ready for its intended use, at which time the interest is included in the interest on all non-specific borrowings;
- amendments to IFRS 3 entitled "Definition of a business", which clarify the distinction between the purchase of a business and the purchase of a group of assets;
- amendments to the conceptual framework, published on 29 March 2018;
- amendments to IAS 1 and IAS 8, entitled "Definition of material";
- IFRS 17 "Insurance Contracts".

## 1.3 SUMMARY OF THE PRINCIPAL ACCOUNTING AND VALUATION METHODS

The following accounting methods have been applied consistently through all the periods presented in the consolidated financial statements.

### 1.3.1 Valuation

The consolidated financial statements are prepared on a historical cost basis, with the exception of assets acquired and liabilities assumed through business combinations, and of certain financial instruments, which are stated at fair value.

### 1.3.2 Management judgements and estimates

The preparation of the financial statements requires the use of judgments, best estimates and assumptions in determining the value of assets and liabilities, income and expenses recorded for the period, considering positive and negative contingencies existing at year-end. The figures in the Group's future financial statements could differ significantly from current estimates due to changes in these assumptions or economic conditions.

In a context characterised by financial market volatility, the parameters used to prepare estimates are based on macro-economic assumptions appropriate to the very long-term cycle of Group assets.

The principal operations for which the Group uses estimates and judgments are the following:

### 1.3.2.1 Depreciation period of nuclear power plants in France

In the specific case of the depreciation period of its French nuclear power plants, the EDF group's industrial strategy is to continue operation beyond 40 years, in optimum conditions as regards safety and efficiency.

The depreciation period of 900MW series power plants was extended from 40 years to 50 years in 2016 (except for Fessenheim) since all the technical, economic and governance conditions were fulfilled. The depreciation period of other Group series in France (1300MW and 1450MW), which are more recent, is currently unchanged at 40 years, as the conditions for extension are not yet fulfilled.

These depreciation periods take into account the date of recoupling with the network after the most recent 10-year inspection.

As explained in note 4.1, under the proposed new multi-year energy programme (PPE), two nuclear reactors would, subject to certain conditions, be shut down in 2027 and 2028, ahead of their fifth 10-year inspection. If this is confirmed in the final PPE adopted, it could lead to prospective modification of the depreciation period for the two units concerned. As this situation would bring forward the shutdown of two reactors in the Group's fleet by a few years, the potential effect on the annual depreciation expense, which will depend on the reactors selected for shutdown, is expected to be limited.

The proposed PPE also stipulates that the closure of the two reactors at Fessenheim should take place "by spring 2020, in application of the cap on installed electronuclear power, so that the Flamanville EPR can be put into operation". The depreciation period for Fessenheim, which is currently due to end in November 2019, will be modified prospectively in accordance with the provisions of the final PPE.

### 1.3.2.2 Nuclear provisions

The measurement of provisions for the back-end of the nuclear cycle, decommissioning and last cores is sensitive to assumptions concerning technical processes, costs, inflation rates, long-term discount rates, the depreciation period of plants currently in operation and disbursement schedules.

As explained in note 4.1, under the proposed new PPE, two nuclear reactors would, subject to certain conditions, be shut down in 2027 and 2028, ahead of their fifth 10-year inspection. If this is confirmed in the final PPE adopted, it could lead to a change in the amount of corresponding nuclear provisions. As this situation would bring forward the shutdown of two reactors in the Group's fleet by a few years, the potential impact on nuclear provisions could be an increase of some tens of millions of euros, with an adjustment to the relevant balance sheet assets.

These parameters are therefore re-estimated at each closing date to ensure that the amounts accrued correspond to the best estimate of the costs eventually to be borne by the Group.

The Group considers that the assumptions used at 31 December 2018 are appropriate and justified. However, any future change in assumptions could have a significant impact on the Group's balance sheet and income statement.

The main assumptions and sensitivity analyses relating to nuclear provisions are presented in note 29.1.5.

The calculation of provisions incorporates a level of risks and unknowns as appropriate to the operations concerned. The valuation of costs carries uncertainty factors such as:

- changes in the regulations, particularly on safety, security and environmental protection, and financing of nuclear expenses;
- changes in the regulatory decommissioning process and the time necessary for issuance of administrative authorisation;
- future methods for storing long-lived radioactive waste and provision of storage facilities by the French agency for radioactive waste management ANDRA (*Agence nationale pour la gestion des déchets radioactifs*);
- changes in certain financial parameters such as discount rates, notably in relation to the regulatory limit, inflation rates, or changes in the contractual terms of spent fuel management.

### 1.3.2.3 Pensions and other long-term and post-employment benefit obligations

The value of pensions and other long-term and post-employment benefit obligations is based on actuarial valuations that are sensitive to all the actuarial assumptions used, particularly concerning discount rates, inflation rates and wage increase rates.

The principal actuarial assumptions used to calculate these post-employment and long-term benefits at 31 December 2018 are presented in note 31. These assumptions are updated annually. The Group considers the actuarial assumptions used at 31 December 2018 appropriate and well-founded, but future changes in these assumptions could have a significant effect on the amount of the obligations and the Group's equity and net income. Sensitivity analyses are therefore presented in note 31.

### 1.3.2.4 Impairment of goodwill and long-term assets

Impairment tests on goodwill and long-term assets are sensitive to the macro-economic and segment assumptions used – particularly concerning energy price movements – and medium-term financial forecasts. The Group therefore revises the underlying estimates and assumptions based on regularly updated information.

These assumptions, which are specific to Group companies, are presented in note 13.

### 1.3.2.5 Financial instruments

In measuring the fair value of unlisted financial instruments (essentially energy contracts), the Group uses valuation models based on a certain number of assumptions subject to unforeseeable developments.

### 1.3.2.6 Energy supplied but not yet measured and billed

As explained in note 1.3.7, the quantities of energy supplied but not yet measured and billed are calculated at the reporting date based on consumption statistic models and selling price estimates. Determination of the unbilled portion of sales revenues at the year-end is sensitive to the assumptions used to prepare these statistics and estimates.

### 1.3.2.7 Obligations concerning French public distribution concession assets to be replaced

In view of the specific nature of French public electricity distribution concessions, the Group has opted to present its obligation to replace concession assets in the balance sheet at a value based on the amount of contractual commitments as calculated and disclosed to the grantors in the annual business reports (see note 1.3.13.2.1). An alternative approach would be to value the obligations based on the present value of future payments necessary to replace these assets at the end of their industrial useful life. The impacts this alternative approach would have had on the accounts are shown in note 1.3.23 for information. Whatever valuation method is used, measurement of the concession liability concerning assets to be replaced is notably subject to unforeseeable developments in terms of costs, useful life and disbursement dates.

### 1.3.2.8 Deferred tax assets

The use of estimates and assumptions over recovery horizons is particularly important in the recognition of deferred tax assets.

### 1.3.2.9 Other judgements

- For the application of IFRS 10 and IFRS 11, the Group uses judgment to assess control or classify the type of partnership arrangement represented by a jointly-controlled entity.

In particular, EDF has set up "reserved" investment funds for some of its funds set aside for secure financing of nuclear plant decommissioning expenses and long-term storage expenses for radioactive waste (see note 45.3). In view of the funds' characteristics, the prerogatives exercised by their managers and the procedures for defining the management strategies applicable to them, the Group considers that it does not have control, as defined by IFRS 10, over these funds. They are consequently treated as debt or equity securities, in application of IFRS 9.

Furthermore, through its subsidiary Edison, since 2014 the Group has held a 30% investment in Edens, with F2i. However, the governance arrangements and contractual agreements introduced for Edens in connection with this transaction give Edison exclusive control over the company. In application of IFRS 10, Edens is therefore fully consolidated (*via* Edison) in the Group's consolidated financial statements.

- When there is no standard or interpretation applicable to a specific transaction, the Group exercises judgment to define and apply accounting methods that supply relevant and reliable information for preparation of its financial statements.

### 1.3.3 Consolidation methods

A list of the main subsidiaries, associates and joint ventures is presented in note 51.

#### 1.3.3.1 Controlled entities

Subsidiaries are companies in which the Group exercises exclusive control and are fully consolidated. The Group controls an entity when the three following conditions are fulfilled:

- it holds power over the entity;
- it is exposed, or has rights, to variable returns from its involvement with the entity;
- it has the ability to use its power to affect the amount of the investor's returns.

The Group considers all facts and circumstances when assessing control. All substantive potential voting rights exercisable, including by another party, are also taken into consideration.

#### 1.3.3.2 Investments in associates and joint ventures

An associate is an entity in which the Group exercises significant influence on financial and operational policies without having exclusive or joint control. Significant influence is presumed to exist when the Group's investment is at least 20%.

A joint venture is a partnership in which the parties (joint venturers) that exercise joint control over the entity have rights to the entity's net assets. Joint control is the contractually agreed sharing of control of an entity operated jointly by a limited number of partners or shareholders, such that the financial and operational policies result from unanimous consent of the parties.

Investments in associates and joint ventures are accounted for by the equity method. They are carried in the balance sheet at historical cost, adjusted for the share in net assets generated after the acquisition, less any impairment. The share in the net income for the period is reported in "Share in net income of associates and joint ventures" in the income statement.

#### 1.3.3.3 Investments in joint operations

A joint operation is a joint arrangement in which the parties (joint operators) that exercise joint control over the entity have direct rights to its assets, and obligations for its liabilities. The Group, as an operator in a joint operation, reports the assets and liabilities and income and expenses related to its investment line by line.

### 1.3.4 Financial statement presentation rules

Assets and liabilities contributing to working capital used in the entity's normal operating cycle are classified as current in the consolidated balance sheet. Other assets and liabilities are classified as current if they mature within one year of the closing date, and non-current if they mature more than one year after the closing date.

The income statement presents items by nature. The heading "Other income and expenses" presented below the operating profit before depreciation and amortisation comprises items of an unusual nature or amount.

### 1.3.5 Translation methods

#### 1.3.5.1 Reporting currency

The parent company's functional currency is the Euro. The Group's financial statements are presented in millions of euros.

#### 1.3.5.2 Functional currency

An entity's functional currency is the currency of the economic environment in which it primarily operates. In most cases, the local currency is the functional currency. But for some entities, a functional currency other than the local currency may be used when it reflects the currency used in the principal transactions.

#### 1.3.5.3 Translation of the financial statements of foreign companies whose functional currency is not the Euro

The financial statements of foreign companies whose functional currency is not the Euro are translated as follows:

- balance sheets are translated into Euros at the closing rate;
- income statements and cash flows are translated at the average rate for the period;
- resulting differences are recognised in equity under the heading "Translation adjustments".

Translation adjustments affecting a monetary item that is an integral part of the Group's net investment in a consolidated foreign company are included in consolidated equity until the disposal or liquidation of the net investment, at which date they are recognised as income or expenses in the income statement, in the same way as other exchange differences concerning the company.

#### 1.3.5.4 Translation of transactions in foreign currencies

In application of IAS 21, transactions expressed in foreign currencies are initially translated and recorded in the functional currency of the entity concerned, using the rate in force at the transaction date.

At each reporting date, monetary assets and liabilities expressed in foreign currencies are translated at the closing rate. The resulting foreign exchange differences are taken to the income statement.

In application of IFRIC 22, any payment or receipt of a non-monetary advance in a foreign currency must be translated at the exchange rate of the transaction date, with no subsequent adjustment.

### 1.3.6 Related parties

Related parties include the French State, companies in which the State holds majority ownership and certain of their subsidiaries, and companies in which the EDF group exercises joint control or significant influence. They also include members of the Group's management and governance bodies.

### 1.3.7 Sales

Sales essentially comprise income from energy sales (to final customers and as part of trading activities), delivery services related to use of the transmission and distribution network, and connection services. They also comprise income from other services and deliveries of goods, mainly engineering, operating and maintenance services, services related to energy sales, design, delivery and commissioning services for power plants or their major components.

Income on energy sales is recognised as deliveries are made to customers.

The quantities of energy supplied but not yet measured and billed are calculated using consumption statistics and selling price estimates, and are recognised in sales on that basis.

In accordance with the provisions of IFRS 15 on the principal/agent distinction, energy delivery services are recognised in sales in the following cases:

- either when these services are not distinct from the energy supply service;
- or when they are distinct from the energy supply service and the entity concerned is acting as a principal, notably because it bears the risk of execution of the service or is able to set the tariff for delivery to the final customer.

Energy trading operations and optimisation transactions carried out by certain group entities under its risk management policy are recognised net of purchases.

The sales revenue from other services or deliveries of goods is recognised over time in the three following cases, based on a contractual analysis:

- when the customer simultaneously receives and consumes all the benefits generated as the service is performed by the Group (this is notably the case of operations and maintenance services);
- when the good or service to be supplied cannot be reallocated to another customer, and the Group is entitled to payment for the work done so far (this is notably the case of certain design, delivery and commissioning activities for power plants or major components designed specifically for a customer);
- when the service creates or enhances an asset (good or service) for which the customer acquires control as performance of the service progresses.

### 1.3.7.1 Capacity mechanism

Capacity mechanisms have been set up in France and the UK to ensure secure power supplies during peak periods.

- **French system:** French law 2010-1488 of 7 December 2010 on the new organisation of the electricity market introduced an obligation in France to contribute to power supply security from January 2017.

Operators of electricity generation facilities and load-shedding operators must have their capacities certified by RTE, and commit to a forecast level of availability for a given year of delivery. In return, they are awarded capacity certificates. Meanwhile, electricity suppliers and purchasers of power to compensate for networks losses (obligated actors) must have capacity certificates equivalent to consumption by their customers in peak periods. Suppliers pass on the cost of the capacity mechanism to final customers through their sale prices.

The system is completed by registers for capacity trading between actors. Capacity auctions are held several times a year.

The Group is concerned by both aspects of this system, both as an operator of electricity plants (EDF SA, Dalkia, EDF Renewables (formerly EDF Énergies Nouvelles)) and as an electricity supplier (EDF SA, Électricité de Strasbourg) and a purchaser of power to compensate for networks losses (Enedis and Électricité de Strasbourg).

The operations are recorded as follows:

- sales of certificates are recognised in income when the auctions or over-the-counter sales take place;
- the cost of the capacity mechanism passed on to final customers through regulated sales tariffs and market-price offers is recognised in sales revenues as and when the electricity is delivered. However, the ARENH price has included a capacity value since 1 January 2017 when the capacity mechanism took effect, as the terms of transfer for the capacity guarantees associated with the ARENH system were defined by the CRE;
- stocks of certificates are stated either at their certification value (i.e. cost of certification by RTE) or at their purchase value on the markets;
- decreases in the stock of certificates are valued at the weighted average unit cost. The timing of recognition depends on the actor:
  - operators of installations: when the auction sales take place,
  - obligated actors: spread on a straight-line basis over the 5-month peak period;

- for obligated actors, if there is a shortfall in the stocks of capacity certificates, a provision is recorded equivalent to the best estimate of the expense necessary to extinguish the obligation;

- at the closing date, if the realisable value of the stock of capacity certificates is lower than its net book value, impairment is recognised.

- **British system:** The British capacity mechanism is based on a system of auctions for operators, organised by the network operator 4 years prior to delivery. Capacity operators which have acquired certificates are remunerated in the year of delivery out of a fund consisting of contributions from electricity suppliers.

The electricity suppliers' contribution to this mechanism is proportional to their sales to customers in the peak period and the cost of capacity is passed on to final customers through their sale price.

EDF Energy is concerned by both aspects of this system, as an operator of electricity plants and a supplier.

For accounting purposes, the remuneration received in its capacity as an operator is recognised in sales revenues in the year of delivery and the contribution paid to the mechanism in its capacity as an electricity supplier is recognised in expenses over the peak period. The cost of the capacity mechanism passed on to final customers is recognised in sales revenues as and when the electricity is delivered.

On 15 November 2018, the UK's Capacity Market was suspended after a ruling by the European Court of Justice concluding that it did not comply with EU rules on state aid. The British government is aiming to set up a new mechanism in time for further auctions in summer 2019 for the delivery period 2019/2020. No capacity market revenues have been recognised for the suspension period of 2018.

### 1.3.8 Income taxes

Income taxes include the current tax expense (income) and the deferred tax expense (income), calculated under the tax legislation in force in the countries where earnings are taxable.

In compliance with IAS 12, current and deferred taxes are generally recorded in the income statement or in equity symmetrically to the underlying operation.

Under IAS 32, income taxes on distributions to holders of equity instruments (notably dividends and the remuneration paid to holders of perpetual subordinated bonds) must be recognised in accordance with IAS 12. The Group considers that these distributions are paid out of previous years' accumulated profits and as a result the associated tax effects are included in the net income for the period.

The current tax expense (income) is the estimated amount of tax due on the taxable income for the period, calculated using the tax rates adopted at the year-end.

Deferred taxes result from temporary differences between the book value of assets and liabilities and their tax basis. No deferred taxes are recognised for temporary differences generated by:

- goodwill which is not tax deductible;
- the initial recognition of an asset or liability in a transaction which is not a business combination and does not affect the accounting profit or taxable profit (tax loss) at the transaction date;
- investments in subsidiaries and associates, investments in branches and interests in joint arrangements, when the Group controls the timing of reversal of the temporary differences, and it is probable that the temporary differences will not reverse in the foreseeable future.

Deferred tax assets and liabilities are valued at the expected tax rate for the period in which the asset will be realised or the liability extinguished, based on tax rates adopted at the year-end. If the tax rate changes, deferred taxes are adjusted to the new rate and the adjustment is recorded in the income statement, unless it relates to an underlying for which changes in value are recorded in equity, for example in accounting for actuarial gains and losses or fair value on hedging instruments and debt or equity securities.



Deferred taxes are reviewed at each closing date, to take into account changes in tax legislation and the prospects for recovery of deductible temporary differences. Deferred tax assets are only recognised when it is probable that the Group will have sufficient taxable profit to utilise the benefit of the asset in the foreseeable future, or beyond that horizon, if there are deferred tax liabilities with the same maturity.

Deferred tax assets and liabilities are reported on a net basis, determined at the level of a tax entity or tax group.

### 1.3.9 Earnings per share and diluted earnings per share

Earnings per share is calculated by dividing the Group's share of net income by the weighted average number of shares outstanding over the period. This weighted average number of shares outstanding is the number of ordinary shares at the beginning of the year, adjusted by the number of shares redeemed or issued during the year.

This number, and the earnings per share, are adjusted whenever necessary to reflect the impact of translation or exercise of dilutive potential shares (stock options, stock warrants and convertible bonds issued, etc.).

In compliance with IAS 33, earnings per share and diluted earnings per share are based on the net income for the year after deduction of payments to bearers of perpetual subordinated bonds.

### 1.3.10 Business combinations

In application of IFRS 3 business combinations arising since 1 January 2010 are measured and recognised under the following principles.

At the date of acquisition, the identifiable assets acquired and liabilities assumed, measured at fair value, and any non-controlling interests in the company acquired (minority interests) are recorded separately from goodwill.

Non-controlling interests may be valued either at fair value (full goodwill method) or their share in the fair value of the net assets of the acquired company (partial goodwill method). The decision is made individually for each transaction.

Any acquisition or disposal of an investment in a subsidiary that does not affect control is considered as a transaction between shareholders and must be recorded directly in equity.

If additional interests are acquired in a joint venture, joint operation or associate without resulting in acquisition of control, the value of the previously-acquired assets and liabilities remains unchanged in the consolidated financial statements.

If control is acquired in stages, the cost of the business combination includes the fair value, at the date control is acquired, of the purchaser's previously-held interest in the acquired company.

Related costs directly attributable to an acquisition leading to control are treated as expenses for the periods in which they were incurred, except for issuance costs for debt securities or equity instruments, which must be recorded in compliance with IAS 32 and IFRS 9.

IFRS 3 does not apply to common control business combinations, which are examined on a case-by-case basis to determine the appropriate accounting treatment.

Commitments given by the Group to purchase minority interests in Group-controlled companies are included in liabilities. For commitments of this kind given since 1 January 2010, the date of the Group's first application of IAS 27 (amended) and IFRS 3 (revised), the differential between the value of the non-controlling interests and the liability corresponding to the commitment is recorded in equity.

### 1.3.11 Goodwill and other intangible assets

#### 1.3.11.1 Goodwill

##### 1.3.11.1.1 Determination of goodwill

In application of IFRS 3, "Business combinations", goodwill is the difference between:

- the sum of the following items:
  - the acquisition-date fair value of the price paid to acquire control,
  - the value of non-controlling interests in the entity acquired, and
  - for acquisitions achieved in stages, the acquisition-date fair value of the Group's share in the acquired entity before it acquired control; and
- the net value of the assets acquired and liabilities assumed, measured at fair value at the acquisition date.

When this difference is negative it is immediately included in net income.

The fair values of assets and liabilities and the resulting goodwill are finalised within twelve months of the acquisition.

##### 1.3.11.1.2 Measurement and presentation of goodwill

Goodwill on acquisition of subsidiaries is disclosed separately in the balance sheet. Impairment on this goodwill is reported under the heading "Impairment" in the income statement. After initial recognition, goodwill is carried at cost less any impairment recognised.

Goodwill on acquisition of associates and joint ventures is included in the investment's net book value. Impairment on this goodwill is included under the heading "Share in income of associates and joint ventures".

Goodwill is not amortised, but impairment tests are carried out as soon as there is an indication of possible loss of value, and at least annually, as described in note 1.3.15.

#### 1.3.11.2 Other intangible assets

##### 1.3.11.2.1 Research and development expenses

Research expenses are recognised as expenses in the financial period incurred.

Development costs that qualify for capitalisation under IAS 38 are included in intangible assets and amortised on a straight-line basis over their foreseeable useful life.

##### 1.3.11.2.2 Other self produced or purchased intangible assets

Other intangible assets mainly comprise:

- software, which is amortised on a straight-line basis over its useful life;
- purchased brands with an indefinite useful life, or amortised on a straight-line basis over their useful life;
- operating or usage rights for power plants, which are amortised on a straight-line basis over the useful life of the underlying asset;
- rights or licenses relating to hydrocarbon concessions, which are amortised under the Unit Of Production (UOP) method, and exploration expenses amortised over the year (see note 1.3.11.2.3);
- intangible assets related to environmental regulations (greenhouse gas emission rights and renewable energy certificates acquired for a consideration – see note 1.3.27);
- the positive value of energy purchase/sale contracts stated at fair value as part of a business combination governed by IFRS 3: this value is amortised as the contractual deliveries take place;
- assets related to concession contracts governed by IFRIC 12, under the "intangible model" (see note 1.3.13.2.4);

- technology related to activities as designer and supplier of nuclear steam supply systems and manufacturer of control rod clusters and nuclear fuel (Framatome) including codes and methods, EPR technology, patents and manufacturing processes, all amortised over their useful life;
- purchased customer contracts and relations, amortised over their useful life.

### 1.3.11.2.3 Hydrocarbon prospecting, exploration and generation

The Group applies IFRS 6, "Exploration for and Evaluation of Mineral Resources".

Prospection and exploration costs and costs incurred in connection with geological surveys, exploration tests, geological and geophysical mapping and exploratory drilling are recognised as intangible assets and fully amortised in the year they are incurred.

Development costs related to commercially viable mineral wells and investments in facilities to extract and store hydrocarbons are recognised as "Property, plant and equipment used in generation and other tangible assets owned by the Group" or "Property, plant and equipment operated under concessions for other activities" as appropriate.

They are amortised under the Unit Of Production (UOP) method.

## 1.3.12 Concession assets, generation assets and other property, plant and equipment

The Group's property, plant and equipment is reported under three balance sheet headings, as appropriate to the business and contractual circumstances of their use:

- property, plant and equipment operated under French public electricity distribution concessions;
- property, plant and equipment operated under concessions for other activities;
- property, plant and equipment used in generation and other tangible assets owned by the Group.

### 1.3.12.1 Initial measurement

Property, plant and equipment is recorded at acquisition or production cost.

- The cost of facilities developed in-house includes all labour and materials costs, and all other production costs that can be included in the construction of the asset.
- Borrowing costs attributable to the financing of an asset incurred during the construction period are included in the value of the asset provided it is a qualifying asset as defined by IAS 23 "Borrowing costs".
- The cost of property, plant and equipment also includes the initial estimate of decommissioning costs. These assets are associated with the provisions recorded to cover decommissioning obligations. At the date of commissioning, property, plant and equipment is measured and recorded in the same way as the corresponding provision (see note 1.3.21).
- Decommissioning costs for nuclear generation installations also include last core costs (see note 1.3.21).

When some of the decommissioning costs for a plant are to be borne by a partner, the expected reimbursement is recognised as accrued income in the assets. The difference between the provision and the accrued income is recorded in Property, plant and equipment, and subsequent payments by the partner are deducted from the accrued income.

The Group capitalises safety expenses incurred as a result of legal and regulatory obligations sanctioning non-compliance by an administrative ban from operation.

Strategic safety spare parts for generation facilities are treated as property, plant and equipment, and depreciated over the residual useful life of the installations.

The costs of major inspections that are necessary for continued operation by generation assets are capitalised and amortised over a period corresponding to the time elapsing between two inspections.

When a part of an asset has a different useful life from the overall asset's useful life, it is identified as an asset component and depreciated over a specific period.

### 1.3.12.2 Depreciation

Items of property, plant and equipment are depreciated on a straight-line basis over their useful life, defined as the period during which the Group expects to draw future economic benefits from their use.

Depending on each country's specific regulations and contractual arrangements, the expected useful lives for the main facilities are as follows:

- hydroelectric dams 75 years
- electromechanical equipment used in hydropower plants 50 years
- fossil-fired power plants 25 to 45 years
- nuclear generation facilities:
  - in France 40 to 50 years
  - outside France 35 to 60 years
- transmission and distribution installations (lines, substations) 20 to 50 years
- wind farm and photovoltaic facilities 20 to 25 years
- other general plant and machinery 10 to 20 years.

## 1.3.13 Concession agreements

### 1.3.13.1 Accounting treatment

The accounting treatment of public and private agreements depends on the nature of the agreements and their specific contractual features.

For most of its concessions, other than concessions for heat generation and distribution, the Group considers that in substance the grantors do not have the characteristic features of control over infrastructures as defined in IFRIC 12.

### 1.3.13.2 French concessions

In France, the Group is the operator for four types of public service concessions:

- public electricity distribution concessions in which the grantors are local authorities (municipalities or syndicated municipalities);
- hydropower concessions with the State as grantor;
- the public transmission network operated under concession from the State;
- concessions from public grantors for heat generation and distribution.

### 1.3.13.2.1 Public electricity distribution concessions General background

Since the enactment of the French Law of 8 April 1946, EDF, and then Enedis, has been the operator of most of the public distribution networks in France.

In accordance with France's Energy Code and Local Authorities Code, the public distribution of electricity is principally operated under a specific system of public service concessions. The authorities granting the concessions (local authorities or public establishments for cooperation between local authorities) organise the public electricity distribution service through concession agreements with specifications that define the respective rights and obligations of the grantor and the operator. Enedis thus distributes electricity to 95% of the population of mainland France. The other 5% are served by Local Distribution Companies.

The accounting treatment of concessions is based on the concession agreements, with particular reference to their special clauses. It takes into consideration the possibility that the EDF group may one day lose its status as the sole authorised State concession operator.

### Concession agreement models

Enedis' concession agreements correspond to different models depending on the date of signature.

#### 1992 concession agreement model (updated in 2007)

The 1992 concession specifications model (updated in 2007) was negotiated with the FNCCR (National federation of licensing authorities) and approved by the public authorities. This model places Enedis under an obligation to record industrial depreciation and establish provisions for renewal.

#### 2017 concession agreement model

On 21 December 2017, a framework agreement for a new concession agreement model was signed with FNCCR and France Urbaine. This new model modernises the relationship between Enedis and concession grantors in the long term and reflects the parties' attachment to the principles of French concessions for electricity distribution: public service, regional solidarity and national optimisation. The FNCCR and France Urbaine represent the grantors, particularly towns, syndicated municipalities, boroughs and major cities when they are the authorities with competence to grant public electricity distribution concessions.

As of 2018, newly-signed concession agreements apply the concession agreement model validated on 21 December 2017. At the effective date of a new agreement, the existing special concession liabilities recorded in application of the previous concession agreement to represent the grantor's rights in the concession assets remain in the accounts. Like earlier concession agreements signed since 2011, the contractual obligation to establish provisions for renewal no longer applies, and the governance of investments is different.

To provide an effective public service, the distribution network operator and the concession grantor now agree to jointly set up a governance system to oversee investments in the public electricity distribution network over the area covered by the concession, including replacement of infrastructures. This system mainly takes the form of a master plan taking a long-term view of developments in the network over the concession area, and multi-year investment plans (PPIs) for 4 and 5-year periods that are medium-term applications of the master plan. PPIs contain detailed objectives for each investment purpose, concerning a selection of quantified, localised investments with financial valuations for the duration of the plan. If it is observed at the end of a PPI that some of the planned investments have not been made, the concession grantor would be entitled in certain circumstances to order Enedis to deposit a sum equal to 7% of the investments still to be made. This deposit would then be returned or retained after a two-year period, depending on the investments made by that time.

### Recognition of assets as property, plant and equipment operated under French public electricity distribution concessions

All assets used by the EDF group in public electricity distribution concessions in France, whether they are owned by the grantor or the operator, are reported together on a specific line in the balance sheet assets at acquisition cost, or their estimated value at the transfer date when supplied by the grantor.

#### 1.3.13.2.2 Hydropower concessions

Hydropower concessions follow standard rules approved by decree. Hydropower concession assets consist solely of hydropower generation equipment (dams, pipes, turbines, etc) for initial concessions. In other concessions, they comprise hydropower generation equipment and switching facilities (alternators, etc).

Assets used in these concessions, whether operated under the concession agreement or owned by the EDF group, are recorded under "Property, plant and equipment operated under concessions for other activities" at acquisition cost.

Hydropower concessions have an initial term of 75 years pursuant to the French Law of 16 October 1919 relating to hydropower use. Most hydropower concessions that expired before 2012 were renewed for terms of 30 to 50 years. However, the French government has not yet renewed 12 concessions that have expired. Since their expiry these concessions have thus been in the "rolling extension" situation defined by the law, which stipulates that at the expiry date of a concession, if no new concession has been established "the concession is extended on the existing terms until such time as a new concession is granted", so as to ensure continuity of operations in the meantime (Article L. 521-16 par. 3 of the French Energy Code).

#### 1.3.13.2.3 Public transmission concession

Under French law, assets assigned to the public transmission concession belong to Réseau de Transport d'Électricité (RTE). These assets are included in calculating the equity value of CTE in the consolidated balance sheet.

#### 1.3.13.2.4 Heat generation and distribution concessions

Heat generation and distribution concession agreements signed by Dalkia with public authorities confer the right to operate facilities remitted by or constructed at the request of those authorities for a limited period, under the grantor's supervision.

These agreements set the terms for remuneration and transfer of the facilities to the grantor or another operator succeeding the grantor at the end of the agreement.

The assets are recorded as intangible assets, in accordance with IFRIC 12 "Service concession agreements".

### 1.3.13.3 Foreign concessions

Foreign concessions are governed by a range of contracts and national laws. Most assets operated under foreign concessions are recorded under "Property, plant and equipment operated under concessions for other activities". Foreign concessions essentially concern Edison in Italy, which operates hydrocarbon generation sites, gas storage sites, local gas distribution networks and hydropower generating plants under concessions. Edison owns all the assets except for some items of property, plant and equipment on the hydropower generation sites, which will be returned to the grantor for nil consideration or with an indemnity when the concession ends. In compliance with IFRIC 12, certain concession agreements are recorded as intangible assets.

Hydropower generation assets which will be returned for nil consideration at the end of the concession are depreciated over the duration of the concession. Hydrocarbon generation sites are recorded in compliance with the rules applicable to the sector (see note 1.3.11.2.3).

### 1.3.14 Leases

In the course of its business the Group uses assets made available to it, or makes assets available to lessees, under lease contracts. These contracts are analysed in the light of the situations described and indicators provided in IAS 17 in order to determine whether they are finance leases or operating leases.

#### 1.3.14.1 Finance leases

Contracts that effectively transfer substantially to the lessee all risks and benefits inherent to ownership of the leased item are classified as finance leases. The main criteria examined in determining whether substantially all the risks and benefits are transferred by an agreement are the following:

- the ratio of the duration of the lease to the leased asset's economic life;
- total discounted future payments as a ratio of the fair value of the financed asset;
- whether ownership is transferred at the end of the lease;
- whether the purchase option is attractive;
- the features specific to the leased asset.

Assets used under finance leases are derecognised from the lessor's balance sheet and included in the relevant category of property, plant and equipment in the lessee's accounts. Such assets are depreciated over their useful life, or the term of the lease contract when this is shorter.

A corresponding financial liability is booked by the lessee, and a financial asset by the lessor.

If the Group performs a sale and leaseback operation resulting in a finance lease agreement, this is recognised in accordance with the principles described above. If the transfer price is higher than the asset's book value, the surplus is deferred and recognised as income progressively over the term of the lease.

### 1.3.14.2 Operating leases

Lease agreements that do not qualify as finance leases are classified and recognised as operating leases. Rental charges are spread over the duration of the lease agreement on a straight-line basis.

### 1.3.14.3 Arrangements containing a lease

In compliance with IFRIC 4, the Group identifies arrangements that do not have the legal form of a lease contract but nonetheless convey the right to control the use of an asset or group of specific assets to the purchaser.

Such arrangements are treated as leases, and analysed with reference to IAS 17 for classification as either finance or operating leases.

### 1.3.15 Impairment of goodwill, intangible assets and property, plant and equipment

At the year-end and at each interim reporting date, in application of IAS 36, the Group assesses whether there is an indication that an asset could have been significantly impaired. An impairment test is also carried out at least once a year on cash-generating units (CGUs) or groups of CGUs including an intangible asset with an indefinite useful life, or to which goodwill has been partly or totally allocated.

Impairment tests are carried out as follows:

- the Group measures any long-term asset impairment by comparing the carrying value of these assets and goodwill, grouped into CGUs where necessary, and their recoverable amount;
- CGUs are groups of homogeneous assets that generate identifiable independent cash flows. They reflect the way activities are managed in the Group: they may be subgroups when the activity is optimised across the whole subgroup, or CGUs formed by parts of subgroups corresponding to different types of activity that are managed separately (fossil-fired generation, renewable energy production, services). Goodwill is allocated to the CGUs that benefit from synergies resulting from the acquisition;
- the recoverable value of these CGUs is the higher of fair value net of disposal costs, and value in use. When this recoverable value is lower than the carrying amount in the balance sheet, an amount equal to the difference is booked under the heading "Impairment". The loss is allocated first to goodwill, and any surplus to the other assets of the CGU concerned;
- fair value is the asset's potential sale price in a normal transaction between economic actors;
- value in use is calculated based on projected future cash flows:
  - over a horizon that is coherent with the asset's useful life and/or operating life,
    - for certain intangible assets with an indefinite useful life (such as brands), beyond the horizon that can be observed or modelled, a terminal value is determined by discounting to infinity a normative cash flow,
  - excluding development projects other than those that have been decided at the valuation date,
  - and discounted at a rate that reflects the risk profile of the asset or CGU;
- the discount rates used are based on the weighted average cost of capital (WACC) for each asset or group of assets concerned, determined by geographical area and by business segment under the CAPM. WACC is calculated after taxes;
- future cash flows are calculated on the basis of the best available information at the valuation date;

- for the first few years, the flows correspond to the Medium-Term Plan (MTP). Over the MTP horizon, energy and commodity prices are determined based on available forward prices, taking hedges into consideration,
- beyond the MTP horizon, cash flows are estimated based on long-term assumptions prepared for each country and each energy, using a process that is updated annually. Medium and long-term electricity prices are constructed analytically by assembling blocks of assumptions, e.g. economic growth, commodity prices (oil, gas, coal) and CO<sub>2</sub>, demand for electricity, interconnections, and developments in the energy mix (rise of renewable energies, installed nuclear capacity, etc) with fundamental models of supply-demand balance. The Group refers in particular to external analyses for each assumption object (for example, for commodities and CO<sub>2</sub>, which are primary factors in electricity prices, the Group compares its own scenarios with scenarios developed by organisations such as the IAE, IHS or Wood Mackenzie, bearing in mind that each of these analysts itself proposes a cone of scenarios corresponding to different macro-economic environments),
- Income from capacity market mechanisms is also taken into consideration in valuing generation assets, starting from the MTP horizon where relevant, provided the countries concerned have introduced or announced the future introduction of a capacity remuneration mechanism.

These calculations may be influenced by several variables:

- changes in discount rates;
- changes in market prices for energy and commodities and tariff regulations;
- changes in demand and the Group's market share, and the attrition rate on customer portfolios;
- the useful life of facilities, or the duration of concession agreements where relevant;
- the growth rates used beyond the medium-term plans and where relevant the terminal values taken into consideration.

Impairment recognised on goodwill is irreversible.

### 1.3.16 Financial assets and liabilities

Classification and measurement of financial instruments depend on the business model and the instruments' contractual characteristics. In application of IFRS 9, upon initial recognition, financial assets are carried at amortised cost, fair value through other comprehensive income (OCI), or fair value through profit and loss.

In the Group, financial assets comprise equity instruments (particularly non-consolidated investments), debt securities, loans and receivables at amortised cost including trade receivables, and the positive fair values of derivatives.

Financial instruments allocated to dedicated assets are presented in note 45.

Financial liabilities comprise loans and other financial liabilities, trade payables, bank credit and the negative fair value of derivatives.

Financial assets and liabilities are recorded in the balance sheet as current if they mature within one year and non-current if they mature after one year, apart from derivatives held for trading, which are all classified as current.

#### 1.3.16.1 Valuation and classification of financial assets and liabilities

Financial instruments are stated at fair value, which corresponds to the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction on the principal or most advantageous market at the measurement date.

The valuation methods for each level are generally as follows:

- level 1 (unadjusted quoted prices): prices accessible to the entity at the measurement date on active markets, for identical assets or liabilities;
- level 2 (observable data): data concerning the asset or liability, other than the market prices included in initial level 1 input, which are directly observable (such as a price) or indirectly observable (i.e. deducted from observable prices);
- level 3 (non-observable data): data that are not observable on a market, including observable data that have been significantly adjusted.

### 1.3.16.1.1 Financial assets carried at fair value through OCI

Financial assets carried at fair value through OCI comprise:

- certain non-consolidated investments for which the Group has elected the irrevocable option to recognise subsequent fair value changes in OCI, with no recycling to profit and loss in the event of sale. Only dividends received from these investments are recognised in the income statement, under "Other financial income";
- debt securities (such as bonds) invested under a mixed "collect and sell" business model for which contractual cash flows consist entirely of principal and interest payments reflecting the time value of money and the credit risk associated with the instrument (the IFRS 9 "SPPI" test – Solely Payment of Principal and Interest). Changes in fair value are recorded directly in OCI with recycling and transferred to profit and loss when the securities are sold. For these debt securities, interest income is calculated at the effective interest rate and credited to the income statement under the heading "Other financial income".

Upon initial recognition, these financial assets are recorded at fair value plus transaction costs attributable to their acquisition. They are subsequently adjusted at each reporting date to fair value based on quoted prices where possible or using the discounted future cash flow method, or by reference to external sources otherwise.

### 1.3.16.1.2 Financial assets carried at fair value through profit and loss

Financial assets carried at fair value through profit and loss are classified as such at the inception of the operation when they are:

- assets acquired from inception with the intention of resale in the short term;
- derivatives not classified as hedges (derivatives held for trading);
- equity instruments (non-consolidated investments) for which the Group has not made the irrevocable option to classify them as at fair value through OCI with no recycling;
- debt securities that are not managed under the "collect and sell" business model and do not meet the requirements of the SPPI test. This chiefly concerns shares in investment funds, which are debt securities that do not pass the SPPI test regardless of the business model.

These assets are recorded at the transaction date at fair value, which is generally equal to the amount of cash paid out. Transaction costs directly attributable to the acquisition are recorded in the income statement. At each subsequent reporting date they are adjusted to fair value, based on quoted prices, or using recognised valuation techniques such as the discounted cash flow method or reference to external sources for other financial instruments.

Changes in fair value other than those concerning commodity contracts are recorded in the income statement under the heading "Other financial income and expenses".

Changes in the fair value of commodity trading contracts are recorded in the income statement under "Sales".

Changes in the fair value of certain non-trading commodity transactions are reported separately on a specific line of the income statement, "Net changes in fair value on Energy and Commodity derivatives, excluding trading activities" below the operating profit before depreciation and amortisation. These are transactions in the scope of IFRS 9, which for accounting purposes are not eligible for hedge accounting or the IFRS 9 "own use" exemption (see note 1.3.16.3).

### 1.3.16.1.3 Loans and financial receivables

Loans and financial receivables are carried at amortised cost if the business model involves holding the instrument in order to collect contractual cash flows which consist entirely of principal and interest.

Interest received is calculated under the effective interest rate method and recorded in "Other financial income" in the income statement.

Loans and financial receivables that do not qualify for classification at amortised cost are classified as at fair value through profit and loss, via "Other financial income and expenses" in the income statement.

### 1.3.16.1.4 Loans and financial liabilities

When specific hedge accounting treatments are not applied (see note 1.3.16.3 (A)), loans and financial liabilities are recorded at amortised cost, with separation of embedded derivatives where applicable. Interest expenses are calculated at the effective interest rate and recorded in the income statement under the heading "Cost of gross financial indebtedness" over the duration of the loan or financial liability.

### 1.3.16.2 Impairment of financial assets carried at fair value through OCI or at amortised cost

IFRS 9 establishes an impairment model based on expected credit loss (ECL).

For securities in the bond portfolio, the Group applies a rating-based approach for counterparties with low credit risk. In application of the risk management policy, the Group's bond portfolio consists almost entirely of instruments issued by low-risk counterparties rated "Investment Grade".

In this situation, the ECL is estimated over a 12-month horizon following the closing date.

The threshold marking a significant increase in credit risk is reached when the counterparty ceases to be rated "Investment Grade". In such situations, the significant increase in the default risk may lead to reassessment of ECLs over the instrument's residual life.

For loans and receivables, the Group has chosen an approach based on the probability of default by the counterparty and assessment of changes in the credit risk.

### 1.3.16.3 Derivatives

#### 1.3.16.3.1 Scope

The scope of derivatives applied by the Group corresponds to the principles set out in IFRS 9.

In particular, forward purchases and sales for physical delivery of energy or commodities are considered to fall outside the scope of application of IFRS 9 when the contract concerned is considered to have been entered into as part of the Group's normal business activity ("own use"). This is demonstrated to be the case when all the following conditions are fulfilled:

- a physical delivery takes place under all such contracts;
- the volumes purchased or sold under the contracts correspond to the Group's operating requirements;
- the contracts cannot be considered as options as defined by the standard. In the specific case of electricity sale contracts, the contract is equivalent to a firm forward sale or can be considered as a capacity sale.

The Group considers that transactions negotiated with a view to balancing the volumes between electricity purchase and sale commitments are part of its business as an integrated electricity operator, and are outside the scope of IFRS 9.

The Group analyses all its contracts concerning financial liabilities or non-financial items, to identify any "embedded" derivatives. Any component of a contract that affects the cash flows of that contract in the same way as a stand-alone derivative corresponds to the definition of an embedded derivative and is recognised separately at fair value from the contract's inception date.



### 1.3.16.3.2 Measurement and recognition

Derivatives are initially recorded at fair value, based on quoted prices and market data available from external sources. If no quoted prices are available, the Group may refer to recent comparable transactions or if no such transactions exist base its valuation on internal models that are recognised by market participants, giving priority to information directly derived from observable data, such as over-the-counter listings.

Changes in the fair value of these derivatives are recorded in the income statement, unless they are designated as hedges for a cash flow or net investment. Changes in the fair value of such hedging instruments are recorded directly in equity, excluding the ineffective portion of the hedge.

In the specific case of financial instruments entered into as part of the trading business, realised and unrealised gains and losses are reported net under the heading "Sales".

In application of IFRS 13, the fair value of derivatives incorporates the counterparty credit risk for derivative assets and the own credit risk for derivative liabilities. The probabilities of default used to calculate these credit risks are based on historical data.

### 1.3.16.3.3 Derivatives classified as hedges

The EDF group uses derivatives to hedge its foreign exchange and interest rate risks, as well as risks related to certain commodity contracts.

The Group applies the criteria defined by IFRS 9 to identify operations subject to hedge accounting:

- the hedging relationship must only concern eligible hedging instruments and hedged items;
- the hedging relationship must be formally designated as such and have structured documentation from its inception;
- the hedging relationship must meet hedging efficiency requirements, particularly respect of a hedging ratio.

In the case of cash flow hedges, the future transaction being hedged must be highly probable.

The hedging relationship ends when it ceases to satisfy the above criteria. This includes situations in which the hedging instrument expires or is sold, terminated or exercised, or when the risk management objectives initially documented are no longer met.

Only derivatives external to the Group, and internal derivatives that are matched with similar transactions external to the Group, qualify for hedge accounting.

The Group uses the following categories for hedges:

#### (A) Fair value hedges

These instruments hedge the exposure to changes in the fair value of an asset or liability recorded in the balance sheet, or a firm commitment to purchase or sell an asset. Changes in the fair value of the hedged item attributable to the hedged component of that item are recorded in the income statement and offset by corresponding variations in the fair value of the hedging instrument. Only the ineffective portion of the hedge has an impact on income.

Some loans and financial liabilities are covered by a fair value hedge. In application of hedge accounting, their balance sheet value is adjusted for changes in fair value attributable to the hedged risks (foreign exchange and interest rate risks).

#### (B) Cash flow hedges

These instruments hedge exposure to variability in cash flows associated with an asset or liability, or a highly probable future transaction, for which variations in cash flows generated by the hedged item are offset by changes in the value of the hedging instrument.

The effective portion of accumulated changes in the hedge's fair value is recorded in equity, and the ineffective portion (*i.e.* changes in the fair value of the hedging instrument in excess of changes in the fair value of the hedged item) is recorded in the income statement.

When the hedged cash flows materialize, the amounts previously recognised in equity are recycled to profit and loss in the same way as for the hedged item, or are treated as an adjustment to the value of the asset acquired.

### (C) Hedges of a net investment

These instruments hedge exposure to the foreign exchange risk related to a net investment in an entity which does not have the same functional currency as the Group. The effective portion of accumulated changes in the hedge's fair value is recorded in equity until the disposal or liquidation of the net investment, when it is included in the gain or loss on disposal. The ineffective portion (defined in the same way as for cash flow hedges) is recorded directly in the income statement.

The change in fair value resulting from the foreign exchange effect and interest rate effect of derivatives hedging a net investment in a foreign operation is recorded in equity.

### 1.3.16.4 Derecognition of financial assets and liabilities

The Group derecognises a financial asset when:

- the contractual rights to the cash flows generated by the asset expire; or
- the Group transfers the rights to receive contractual cash flows related to the financial asset through the transfer of substantially all of the risks and rewards associated with ownership of the asset.

Any interest created or retained by the Group in transferred financial assets is recorded as a separate asset or liability.

- The Group derecognises a financial liability when its contractual obligations are extinguished, cancelled or expire. When a debt is renegotiated with a lender on substantially different terms, a new liability is recognised.

### 1.3.16.5 Assignment of receivables

When it can be demonstrated that the Group has transferred substantially all the risks and benefits related to assignment of receivables, particularly the credit risk, the items concerned are derecognised.

Otherwise, the operation is considered as a financing operation, and the receivables remain in the balance sheet assets, with recognition of a corresponding financial liability.

## 1.3.17 Inventories

Inventories are recognised at the lower of acquisition cost or net realisable value, except for inventories held for trading activities, which are carried at market value. Inventories consumed are generally valued by the weighted average unit cost method.

Cost includes all direct material costs, labour costs, and a share of indirect production costs.

### 1.3.17.1 Nuclear fuel and materials

Inventory accounts include:

- nuclear materials, whatever their form during the fuel production cycle;
- and fuel components in the warehouse or in the reactor.

The stated value of nuclear fuel and materials and work-in-progress is determined based on direct processing costs including materials, labour and subcontracted services (e.g. fluorination, enrichment, production, etc.).

In accordance with regulatory obligations specific to each country, inventories of fuel (new or not entirely consumed) may also comprise expenses for spent fuel management and long-term radioactive waste management, with corresponding provisions or debts in the liabilities, or full and final payments made when the fuel is loaded.

In France, in application of the concept of "loaded fuel" as defined in the decision of 21 March 2007, the cost of inventories for fuel loaded in the reactors but not yet irradiated includes expenses for spent fuel management and long-term radioactive waste management. The corresponding amounts are taken into account in the relevant provisions.

In compliance with IAS 23, interest expenses incurred in financing inventories of nuclear fuels are charged to expenses for the period provided these inventories are manufactured in large quantities on a repetitive basis.

Nuclear fuel consumption is determined by component (natural uranium, fluorination, enrichment, fuel assembly production) as a proportion of the expected output when the fuel is loaded in the reactor. These quantities are valued at weighted average cost of inventories. Inventories are periodically corrected in view of forecast spent quantities based on neutronic measurements and physical inventories.

### 1.3.17.2 Other operating inventories

Other operating inventories comprise:

- fossil fuels required for operation of fossil-fired power plants;
- operating materials and equipment such as spare parts supplied under a maintenance programme (excluding capitalised strategic safety spare parts);
- certificates issued under the various environmental schemes (see note 1.3.27);
- certificates issued under capacity obligation mechanisms (capacity guarantees in France – see note 4.5);
- goods and services in progress, particularly relating to the businesses of EDF Renewables, Dalkia and Framatome;
- gas stocks.

Other non-trading operating inventories are generally valued at weighted average cost including direct and indirect purchasing costs.

Impairment of spare parts principally depends on the turnover of these parts.

Inventories held for trading purposes are stated at market value.

### 1.3.18 Trade receivables

Trade receivables are initially recognised at the fair value of the consideration received or receivable, and subsequently carried at amortised cost or at fair value through OCI.

Trade receivables also include the value of unbilled receivables for energy already supplied, which are presented net of advances received from customers who pay in regular monthly instalments.

The Group applies IFRS 9's simplified approach to measure expected credit losses on trade receivables, using provision matrices established on the basis of credit loss histories.

### 1.3.19 Cash and cash equivalents

Cash and cash equivalents comprise immediately available liquidities and very short-term investments that are readily convertible into a known amount of cash, usually maturing within three months or less of the acquisition date, and with negligible risk of fluctuation in value.

Securities held short-term and classified as "Cash equivalents" are recorded at fair value, with changes in fair value included in the heading "Other financial income and expenses".

### 1.3.20 Equity

#### 1.3.20.1 Fair value adjustment of financial instruments

The fair value adjustment of financial instruments results from the restatement to fair value of debt and equity securities and certain hedging instruments.

#### 1.3.20.2 Share issue expenses

Share issue expenses correspond exclusively to external costs expressly related to the capital increase. They are charged against the issue premium at their net-of-tax value.

Other expenses are classified as expenses of the period.

### 1.3.20.3 Treasury shares

Treasury shares are shares issued by EDF and held either by that company or by other entities in the consolidated Group. They are valued at acquisition cost and deducted from equity until the date of disposal. Net gains or losses on disposals of treasury shares are directly included in equity and do not affect net income.

### 1.3.20.4 Perpetual subordinated bonds

The perpetual subordinated bonds issued by the Group ("hybrid" bond issue) incorporate options for redemption at the initiative of EDF. These options may be exercised after a minimum period that depends on the specific terms of each issue, and subsequently at each coupon date or in the event of highly specific circumstances (such as a change in IFRS or tax regime). The annual yield is fixed and reviewable based on contractual clauses that vary according to the specific terms of the issuance. There is no obligation for EDF to make any payment, due to the existence of contractual clauses entitling it to defer payment indefinitely. However, those clauses stipulate that any deferred payments must be made in the event of a dividend distribution. All these features give EDF an unconditional right to avoid paying out cash or another financial asset for the principal or interest. Consequently, in compliance with IAS 32, these bonds are recorded as equity instruments and any payment made is treated in the same way as dividends (see notes 3.5, 3.6 and 27.4).

### 1.3.21 Provisions other than employee benefit provisions

The Group recognises provisions when it has a present obligation (legal or constructive) arising from a past event, an outflow of resources will probably be required to settle the obligation, and the obligation amount can be estimated reliably.

If it is anticipated that all or part of the expenses covered by a provision will be reimbursed, the reimbursement is recognised under receivables if and only if the Group is virtually certain of receiving it.

Provisions are determined based on the Group's expectation of the cost necessary to settle the obligation. Estimates are based on management data from the information system, assumptions adopted by the Group, and if necessary experience of similar transactions, or in some cases based on independent expert reports or contractor quotes. The various assumptions are reviewed for each closing of the accounts.

The expected costs are estimated based on year-end economic conditions and spread over a forecast disbursement schedule. They are then adjusted to Euros of the year of payment through application of a forecast long-term inflation rate and discounted to present value using a nominal discount rate. The provisions are based on these discounted future cash flows.

The rate of inflation and the discount rate are based on the economic and regulatory parameters of the country where the economic entity is located, considering the long operating cycle of the Group's assets and the maturities of commitments.

The discount effect generated at each closing to reflect the passage of time is recorded under "Discount effect" in financial expenses.

In extremely rare situations, a provision cannot be booked due to lack of a reliable estimate. In such cases, the obligation is mentioned in the notes as a contingent liability, unless there is little likelihood of an outflow of resources.

**1.3.21.1 Provisions related to nuclear generation**

Provisions related to nuclear generation mainly cover the following:

- back-end nuclear cycle expenses: provisions for spent fuel management, for waste removal and conditioning and long-term radioactive waste management are established in accordance with the obligations and final contributions specific to each country;
- costs for decommissioning power plants and losses relating to fuel in the reactor when the reactor is shut down (provision for last cores).

Last core expenses correspond to the loss on fuel in the reactor that is not totally spent at the time of final reactor shutdown and cannot be reused due to technical and regulatory constraints, and the cost of fuel processing, and removal and storage of the resulting waste.

Changes in provisions resulting from a change in discount rates, a change in the disbursement schedule or a change in contractor quote are recorded:

- as an increase or decrease in the corresponding assets, up to the net book value, if the provision was initially covered by balance sheet assets (decommissioning of plants still in operation, long-term management of the radioactive waste resulting from such decommissioning, and last cores);
- in the income statement in all other cases.

Detailed information on the principles for determining provisions related to nuclear generation in France and the United Kingdom is given in note 29.

**1.3.21.2 Other provisions**

Other provisions primarily concern:

- contingencies related to subsidiaries and investments;
- tax liabilities;
- litigation;
- onerous contracts and losses on completion;
- environmental schemes.

Provisions for onerous contracts primarily relate to multi-year agreements for the purchase or sale of energy:

- losses on energy purchase agreements are measured by comparing the acquisition cost under the contractual terms with the forecast market price;
- losses on energy sale agreements are measured by comparing the estimated income under the contractual terms with the cost of the energy to be supplied.

The revenues and margin on Framatome's long-term contracts are recorded under the percentage-of-completion method. When the estimated result upon completion is negative, the loss is immediately recorded in profit and loss, after deducting the loss already recognised under the percentage-of-completion method, and a provision is booked.

Provisions for environmental schemes may be established to cover the shortfall in greenhouse gas emission quotas, renewable energy certificates, and energy savings certificates, compared to the assigned targets (see note 1.3.27).

In extremely rare cases, description of a specific litigation covered by a provision may be omitted from the notes to the financial statements if such disclosure could cause serious prejudice to the Group.

**1.3.22 Provisions for employee benefits**

The Group grants its employees post-employment benefits (pension plans, retirement indemnities, etc) and other long-term benefits (e.g. long-service awards) in compliance with the specific laws and measures in force in each country where it does business.

**1.3.22.1 Calculation and recognition of employee benefits**

Obligations under defined-benefit plans are calculated by the projected unit credit method, which determines the present value of entitlements earned by employees at year-end under all types of plan, taking into consideration the prospects for wage increases and each country's specific economic conditions.

Post-employment benefit obligations are valued mainly using the following methods and assumptions:

- retirement age, determined on the basis of the applicable rules for each plan, and the requirements to qualify for a full pension;
- career-end salary levels, with reference to employee seniority, projected salary levels at the time of retirement based on the expected effects of career advancement, and estimated trends in pension levels;
- forecast numbers of pensioners, determined based on employee turnover rates and mortality data available in each country;
- reversion pensions where relevant, taking into account both the life expectancy of the employee and his/her spouse and the marriage rate;
- a discount rate that depends on the geographical zone and the duration of the obligations, determined at the year-end date by reference to the market yield on high-quality corporate bonds or the rate on government bonds whose duration is coherent with EDF group's commitments to employees.

The amount of the provision corresponds to the value of obligations less the fair value of the fund assets that cover those obligations.

The net expense booked during the year for employee benefit obligations includes:

- in the income statement:
  - the current service cost, corresponding to additional benefit entitlements earned during the year,
  - the net interest expense, corresponding to interest on obligations net of the return on fund assets, which is calculated using the same discount rate as for the obligations,
  - the past service cost, including the income or expense related to amendments or settlements of benefit plans or introduction of new plans,
  - the actuarial gains and losses relating to other long-term benefits;
- in other components of consolidated comprehensive income:
  - the actuarial gains and losses relating to post-employment benefits,
  - the effect of the limitation to the asset ceiling if any.

**1.3.22.2 Post-employment benefit obligations**

When they retire, Group employees benefit from pensions determined under local rules. They may also be entitled to benefits directly paid by the companies, and additional benefits prescribed by the relevant regulations.

**1.3.22.2.1 French entities covered by the IEG system**

Entities belonging to the specific IEG (electricity and gas) sector system, namely EDF, Enedis, the CTE subgroup, Électricité de Strasbourg, EDF PEI and certain subsidiaries of the Dalkia subgroup, are Group companies where almost all employees benefit from the IEG statutes, including the special pension system and other statutory benefits.

Since the financing reform for the IEG sector system took effect on 1 January 2005, the CNIEG (*Caisse Nationale des IEG*, the sector's specific pension body) has managed not only the special IEG pension system, but also the industrial accident, invalidity and death insurance system for the sector.

The CNIEG is a social security body governed by private law, formed by the Law of 9 August 2004. It has legal entity status and reports to the French government, operating under the joint supervision of France's Ministers for the Budget, Social Security and Energy.

Under the funding arrangements introduced by the Law, IEG sector companies establish pension provisions to cover entitlements not funded by France's standard systems (CNAV, AGIRC and ARRCO), to which the IEG system is affiliated, or by the CTA (*Contribution Tarifaire d'Acheminement*) levy on gas and electricity transmission and distribution services.

As a result of this funding mechanism, any change (whether favourable or unfavourable to employees) in the standard French pension system that is not passed on to the IEG pension system is likely to cause a variation in the amount of the provisions recorded by the Group to cover its obligations.

The obligations concerned by the pensions and for which a provision is recorded thus include:

- specific benefits of employees in the deregulated or competitive activities;
- specific benefits earned by employees from 1 January 2005 for the regulated activities (transmission and distribution) (benefits earned prior to that date are financed by the CTA levy).

In addition to pensions, other benefits are granted to IEG status former employees (not currently in active service), as detailed below:

- benefits in kind: Article 28 of the IEG national statutes entitles such employees and current employees to benefits in kind in the form of supplies of electricity or gas at preferential prices. The obligation for supplies of energy to employees of the EDF and Engie (formerly GDF-Suez) groups corresponds to the probable present value of kWh to be supplied to beneficiaries or their dependants during their retirement, valued on the basis of the unit cost. It also includes the payment made under the energy exchange agreement with Engie;
- retirement gratuities: these are paid upon retirement to employees due to receive the statutory old-age pension, or to their dependants if the employee dies before reaching retirement. These obligations are almost totally covered by an insurance policy;
- bereavement benefit: this is paid out upon the death of an inactive or disabled employee, in order to provide financial assistance for the expenses incurred at such a time (Article 26 - § 5 of the National Statutes). It is paid to the deceased's principal dependants (statutory indemnity equal to three months' pension, subject to a ceiling) or to a third party that has paid funeral costs (discretionary indemnity equal to the costs incurred);
- bonus pre-retirement paid leave: all employees eligible to benefit immediately from the statutory old-age pension and aged at least 55 at their retirement date are entitled to 18 days of bonus paid leave during the last twelve months of their employment;
- other benefits include help with the cost of studies, time banking for pre-retirement leave, and pensions for personnel sent on secondment to subsidiaries not covered by the IEG system.

### 1.3.22.2.2 French and foreign subsidiaries not covered by the special IEG system

Pension obligations principally relate to the British companies and are mostly covered by defined-benefit plans.

In the United Kingdom, EDF Energy has three principal defined-benefit pension plans:

- the British Energy Generation Group (BEGG) plan affiliated to the Electricity Supply Pension Scheme (ESPS), of which the majority of members are employees in Nuclear Generation. The BEGG plan was closed to new members in August 2012;
- the EDF Energy Generation and Supply Group (EEGSG) plan, also affiliated to the ESPS, which was established in December 2010 for the employees remaining with EDF Energy following the transfer of the former Group plan to UK Power Networks as part of the sale of the Networks. The EEGSG plan has not accepted any new members since then;

- the EDF Energy Pension Scheme (EEPS). This scheme was established in March 2004 and membership remains open to new employees.

In 2016 EDF Energy introduced a new defined-benefit section of the EEPS pension plan named EEPS CARE (Career Average Revalued Earnings). Under EEPS CARE, pensions are based on a pensionable salary corresponding to the average salary over the beneficiary's entire career, adjusted for inflation. In December 2017 a CARE section was also introduced in the BEGG pension plan, open to new employees in Nuclear Generation on equivalent terms to the corresponding section of the EEPS pension plan. Pensions for the other sections continue to be based on the beneficiary's most recent pensionable salary.

Each pension plan is financially independent of the others. The BEGG and EEGSG plans are part of the industry-wide ESPS which is one of the largest private-sector pension schemes in the United Kingdom.

The plans are externally managed by separate trusts whose trustees are appointed by the firm and the plan participants to manage the funds in their exclusive interests. The trustees carry out an actuarial review of the plan every three years, defining the funding level, the necessary employer and employee contributions and the payment schedules. The trustees are responsible for defining the plans' investment strategy, in agreement with the firm.

### 1.3.22.3 Other long-term benefit obligations

These benefits concern employees currently in service, and are earned according to local regulations, particularly the statutory regulations for the electricity and gas sector for EDF and French subsidiaries covered by the IEG regime. They include:

- annuities following incapacity, invalidity, industrial accident or work-related illness; like their counterparts in the general national system, IEG employees are entitled to financial support in the event of industrial accident or work-related illness, and invalidity and incapacity annuities and benefits. The obligation is measured as the probable present value of future benefits payable to current beneficiaries, including any possible reversions;
- long-service awards;
- specific benefits for employees who have been in contact with asbestos.

### 1.3.23 Special concession liabilities

These liabilities represent the contractual obligations specific to the concession rules for public electricity distribution concessions in France, recognised in the liabilities as:

- rights in existing assets: these correspond to the grantor's right to recover all assets for nil consideration. This right comprises the value in kind of the facilities – the net book value of assets operated under concession – less any as yet unamortised financing provided by the operator;
- rights in assets to be replaced: these correspond to the operator's obligation to contribute to the financing of assets due for replacement. These non-financial liabilities comprise:
  - depreciation recorded on the portion of assets financed by the grantor,
  - the provision for renewal, exclusively for assets due for renewal before the end of the concession.

When assets are replaced, the provision and amortisation of the grantor's financing recorded in respect of the replaced item are eliminated and transferred to the rights in existing assets, since they are considered as the grantor's financing for the new asset. Any excess provision is taken to income.

During the concession, the grantor's rights in assets to be replaced are thus transferred upon the asset's renewal to become the grantor's rights in existing assets, with no outflow of cash to the benefit of the grantor.

In general, the value of special concession liabilities is determined as follows:

- the grantor's rights in existing assets, representing the share deemed to be held by the grantor in the concession assets, are valued on the basis of the assets recorded in the balance sheet;

- the obligations relating to assets to be replaced are valued on the basis of the estimated value of the relevant assets, measured at each year-end taking into consideration wear and tear on the asset at that date:
  - based on the difference between the asset's replacement value as assessed at year-end and the historical cost for calculation of the provision for renewal. Annual allocations to the provision are based on this difference, less any existing provisions, with the net amount spread over the residual useful life of the assets. Consequently, the expenses recognised for a given item increase over time,
  - based on the share of the asset's historical cost financed by the grantor for amortisation of the grantor's financing.

The Group considers that the obligations related to assets to be replaced are to be valued on the basis of the special clauses contained in the concession agreements. Under this approach, these obligations are stated at the value of the contractual obligations as calculated and reported annually in the reports to the grantors. This contractual value also reflects the possibility that the EDF group may one day lose its status as the concession operator.

If no such clauses existed, an alternative approach would be to state contractual obligations at the present value of future payments required for replacement of assets operated under concession at the end of their industrial useful life.

For information, the Group reports below the impacts of this alternative approach, i.e. the discounting of the future obligation to contribute to financing of assets to be replaced.

The principal assumptions used in preparing this simulation are as follows:

- the basis for calculation of the provision for renewal is the estimated replacement value at the end of the asset's useful life, applying a forecast annual inflation rate of 1.5%, less the asset's historical value. This amount is based on the wear and tear on the asset and discounted at a rate of 3.9%;
- amortisation of the grantor's financing is also discounted at the rate of 3.9%.

The following table shows the impacts of this simulation for Enedis in 2018:

## IMPACTS ON THE INCOME STATEMENT

(in millions of euros, before taxes)

	2018
Operating profit	132
Financial result	(571)
Income before taxes of consolidated companies	(439)

## IMPACTS ON THE BALANCE SHEET – EQUITY

(in millions of euros, before taxes)

	2018
At opening date	1,690
At closing date	1,251

Valuation of concession liabilities under this method is subject to uncertainty over costs and disbursements, and is also sensitive to inflation and discount rates.

### 1.3.24 Investment subsidies

Investment subsidies received by Group companies are included in liabilities under the heading "Other liabilities" and transferred to income as and when the economic benefits of the corresponding assets are utilised.

### 1.3.25 Assets classified as held for sale and related liabilities, and discontinued operations

Assets that qualify as held for sale and related liabilities are disclosed separately from other assets and liabilities in the balance sheet.

When assets or groups of assets are classified as discontinued operations, income and expenses relating to these discontinued operations are disclosed in a single net amount after taxes in the income statement and net changes in cash and cash equivalents of discontinued operations are also reported separately in the cash flow statement.

Impairment is booked when the realisable value is lower than the net book value.

### 1.3.26 Nature and extent of restrictions on the Group's ability to access and use assets or settle liabilities

The main restrictions that may limit the Group's ability to access or use its assets or settle its liabilities concern the following items:

- assets held to fund employee benefits (principally in France and the United Kingdom – see note 1.3.22) and expenses related to nuclear liabilities (principally in France – see note 45 – and the United Kingdom – see note 29.2);
- tangible and intangible assets and the related liabilities associated with concession agreements, whether or not they are subject to regulatory

mechanisms (obligations to supply energy or energy-related services, rules governing investments, an obligation to return concession facilities at the end of the contract, amounts payable at the end of the contract, tariff constraints, etc). These restrictions mainly apply to assets of this type in France (EDF, Enedis and Dalkia), and to a lesser extent Italy (see notes 1.3.13 and 1.3.23);

- the sale of Group investments in certain subsidiaries requires authorisations from State bodies, particularly when they exercise a regulated activity or operate nuclear power plants (this is the case for EDF Nuclear Generation Ltd. in the United Kingdom, Taishan (TNPJVC) in China and CENG in the United States);
- prudential reserves established and measures taken as regards distribution capacity, so that the insurance subsidiaries will meet their prudential ratio requirements;
- the cash of certain entities that use financing arrangements stipulating that dividend distribution is subject to conditions concerning repayment of bank debt (or qualification for loans) and shareholders, or are subject to regulatory limitations in certain countries.

Certain shareholder agreements concerning companies controlled by the Group include clauses to protect minority shareholders, requiring approval from minority shareholders for certain particularly important decisions.

Finally, certain financing loans granted to Group entities contain early repayment clauses (see note 38.2.6), and certain items of cash and cash equivalents are subject to restrictions (see note 37).

### 1.3.27 Environment

#### 1.3.27.1 Greenhouse gas emission rights

The system currently in force is described in note 49.1.

The accounting treatment of emission rights depends on the holding intention. There are two economic models, both of which coexist in the EDF group.

Rights held under the "Trading" model are included in inventories at fair value. The change in fair value observed over the year is recorded in the income statement.



Rights held to comply with regulatory requirements on greenhouse gas emissions (the "Generation" model) are recorded in intangible assets:

- at acquisition cost when purchased on the market;
- at nil value when allocated free of charge (in countries that still have a free allocation system).

When the estimated emissions by a Group entity over a given period are higher than the rights allocated for no consideration for the period less any allocated rights sold on the spot or forward market, a provision is established to cover the excess emissions. This provision is equal to the shortfall in rights held (difference between actual emissions and allocated rights held at the closing date).

If no emission rights are allocated free of charge, a provision is systematically recorded equivalent to the actual emissions at the closing date.

In either case, the provision is measured on the basis of the acquisition cost up to the amount of rights acquired on the spot or forward markets, and on market prices for the balance. It is cancelled when the rights are surrendered to the State.

At the closing date, the portfolio of emission rights and the obligation to surrender rights for the emissions of the year are presented gross, without netting.

If the number of purchased emission rights recorded as intangible assets at the end of the year and not subject to forward sale is higher than the number of purchased rights that will be surrendered to the State for the year's emissions, an impairment test must be applied to the excess. If the realisable value is lower than the net book value, impairment is booked.

### 1.3.27.2 Renewable energy certificates

The system currently in force is described in note 49.3.

The EDF group applies the following accounting treatments:

- for non-obligated electricity producers, certificates obtained based on generation output are recorded in "Other inventories" until they are sold on to suppliers;
- for obligated producers and an entity that both produces and supplies energy and is under an obligation to sell a specified quantity of renewable energy, the Group uses the following accounting treatments for certificates obtained based on generation output:
  - up to the level of the obligation, these certificates are not recognised,
  - certificates in excess of the obligation are recorded in "Other inventories",
  - in the specific situation when an entity is not in a position to meet its obligation at the year-end, the Group applies the following accounting treatment:
    - certificates acquired for a consideration in order to meet the obligation are recorded in intangible assets at acquisition cost, and

- a provision is established equivalent to the shortfall in certificates compared to the obligation at the year-end. The value of this provision is based on the acquisition price of certificates already purchased on the spot or forward market, and market prices or penalty prices for the balance. The provision is cancelled when the certificates are surrendered to the State.

Forward purchases/sales of certificates related to trading activities are recorded in accordance with IFRS 9, stated at fair value in the balance sheet date. The change in fair value is recorded in the income statement.

### 1.3.27.3 Energy savings certificates

The system currently in force is described in note 49.2.

The EDF group fulfils its obligations either by taking measures regarding its assets or actions with its final customers in order to receive energy savings certificates from the State, or by purchasing energy savings certificates directly.

Expenses incurred to meet the cumulative energy savings obligation are treated as:

- property, plant and equipment if the action taken by the entity concerns its own assets and the expenses qualify for recognition as an asset;
- expenses for the year incurred, if they do not meet the requirements for capitalisation or if the action taken is to encourage third parties to save energy.

Expenses incurred in excess of the accumulated obligation at year-end are included in inventories until they are used to cover the obligation. A provision is recognised if the energy savings achieved are lower than the cumulative energy savings obligation. The amount of the provision is equal to the cost of actions still to be taken to meet the obligations related to the energy sales made.

### 1.3.27.4 Environmental expenses

Environmental expenses are identifiable expenses incurred to prevent, reduce or repair damage to the environment that has been or may be caused by the Group as a result of its activities. These expenses are treated as follows:

- they are capitalised if they are incurred to prevent or reduce future damage or protect resources;
- they are booked as environmental liabilities and increases to provisions for environmental risks if they correspond to an obligation that exists at the year-end and it is probable or certain at the reporting date that they will lead to an outflow of resources;
- they are recognised as expenses if they are operating expenses for the bodies in charge of environmental concerns, environmental supervision, environmental duties and taxes, processing of liquid and gas effluents and non-radioactive waste, or research unrelated to an investment.

## NOTE 2 COMPARABILITY

### 2.1 IFRS 15 – REVENUE FROM CONTRACTS WITH CUSTOMERS

IFRS 15 "Revenue from Contracts with Customers" became applicable on 1 January 2018 (see note 1.3.7).

The Group has applied the full retrospective approach, which has no impact on opening equity.

As a result of this change, sales and energy purchases reported at 31 December 2017 have been reduced by €4,740 million, with no impact on Operating profit before depreciation and amortisation. In the balance sheet, due to the new practice of netting unbilled receivables for energy already delivered with advances received from customers (see note 2.1.3.2), the trade receivables, other current receivables and other current liabilities reported at 31 December 2017 have been reduced by €6,568 million, €2,342 million and €8,910 million respectively.

In association with implementation of IFRS 15, the Group is monitoring changes in international standards that could affect the current accounting treatment of regulated-tariff activities.

The operations concerned by changes of accounting treatment are the following:

#### 2.1.1 Recognition of income from energy delivery (the principal-agent distinction)

In France and Belgium, the Group concluded that delivery is a distinct service from the supply of energy, and that the energy supplier is acting as an agent in providing this delivery service.

In Italy and the UK, however, the energy supplier is classified as a principal for delivery services.

In France, the vast majority of electricity delivery services are performed by the French distribution network operator Enedis, which is a regulated subsidiary of the Group. Consequently the principal-agent distinction concerning electricity delivery in France only has an impact on presentation of sales in the reporting by operating segment.

These changes have led to a reduction of €1,527 million in reported sales for 2017 from gas and electricity delivery in Belgium and gas delivery in France (and electricity

deliveries in France by non-Group Distribution Network Operators), and a corresponding equal reduction in delivery expenses (included in fuel and energy purchases).

#### 2.1.2 Recognition of market energy purchase and sale transactions that are part of optimisation activities

The analyses conducted have led the Group to consider that accounting on a net basis provides a more relevant reflection of the economic reality of optimisation transactions. As some Group entities (in Italy, Belgium and in France for Dalkia) previously reported such sales on a gross basis and booked a corresponding entry in energy purchases, this change results in a €2,793 million reduction in the sales and fuel and energy purchases reported at 31 December 2017.

#### 2.1.3 Other impacts

##### 2.1.3.1 Other impacts on the consolidated income statement

Other transactions previously recognised on a gross basis are also now presented on a net basis in application of IFRS 15: agency transactions in Italy and settlements made under the balancing mechanism for the French electricity network, totalling €420 million. These restatements have no impact on the Group's Operating profit before depreciation and amortisation as published at 31 December 2017.

##### 2.1.3.2 Impacts on the consolidated balance sheet

Trade receivables, which include the amount of unbilled receivables for energy already delivered, are now presented net of advances received from customers who pay in regular monthly instalments.

This change causes a €6,568 million reduction in Trade receivables and Other current liabilities at 31 December 2017. The related netting of taxes on these amounts causes a decrease of €2,342 million at 31 December 2017 (reduction in "tax liabilities" in Other current liabilities, with a corresponding change in "tax receivables" in Other current receivables).

#### 2.1.4 Summary of impacts on Group Operating profit before depreciation and amortisation and segment reporting

<i>(in millions of euros)</i>	31/12/2017 as published	Impacts of IFRS 15	31/12/2017 restated
Sales	69,632	(4,740)	64,892
Fuel and energy purchases	(37,641)	4,740	(32,901)
Other external expenses	(8,739)	-	(8,739)
Personnel expenses	(12,456)	-	(12,456)
Taxes other than income taxes	(3,541)	-	(3,541)
Other operating income and expenses	6,487	-	6,487
<b>OPERATING PROFIT BEFORE DEPRECIATION AND AMORTISATION</b>	<b>13,742</b>	<b>-</b>	<b>13,742</b>

The table below summarises the segment information reported at 31 December 2017 and the restatements resulting from application of IFRS 15.

Figures published at 31 December 2017 (in millions of euros)	France – Generation and Supply	France – Regulated activities	United Kingdom	Italy	Other international <sup>(1)</sup>	Other activities <sup>(2)</sup>	Inter-segment eliminations	Total
External sales	34,533	5,732	8,681	9,918	4,649	6,119	-	69,632
Inter-segment sales	1,073	10,164	7	22	173	1,694	(13,133)	-
<b>SALES AS PUBLISHED</b>	<b>35,606</b>	<b>15,896</b>	<b>8,688</b>	<b>9,940</b>	<b>4,822</b>	<b>7,813</b>	<b>(13,133)</b>	<b>69,632</b>
<b>IFRS 15 restatements</b>								
External sales	(10,607)	10,041	-	(2,218)	(1,656)	(300)	-	(4,740)
Inter-segment sales	-	(10,101)	-	-	-	-	10,101	-
<b>SALES</b>	<b>(10,607)</b>	<b>(60)</b>	<b>-</b>	<b>(2,218)</b>	<b>(1,656)</b>	<b>(300)</b>	<b>10,101</b>	<b>(4,740)</b>
<b>Restated figures at 31 December 2017</b>								
External sales	23,926	15,773	8,681	7,700	2,993	5,819	-	64,892
Inter-segment sales	1,073	63	7	22	173	1,694	(3,032)	-
<b>SALES AFTER RESTATEMENTS</b>	<b>24,999</b>	<b>15,836</b>	<b>8,688</b>	<b>7,722</b>	<b>3,166</b>	<b>7,513</b>	<b>(3,032)</b>	<b>64,892</b>

(1) IFRS 15 restatements only concern EDF Luminus (Belgium).

(2) Including EDF Renewables (€1,280 million) and Dalkia (€3,751 million after IFRS 15 restatements).

The reporting by operating segment has also been modified from 1 January 2018, and the comparative figures at 31 December 2017 have been restated accordingly (see note 6).

## 2.2 IFRS 9 – FINANCIAL INSTRUMENTS

IFRS 9 “Financial Instruments” became mandatory on 1 January 2018. It introduces new principles for classification and measurement of financial instruments, impairment for credit risk on financial assets, and hedge accounting, as presented in note 1.3.16.

### 2.2.1 Transition measures

In application of the simplified approach allowed by IFRS 9, the comparative figures for the first year of application have not been restated. Consequently:

- any difference between the book value of financial assets and liabilities at 31 December 2017 and at 1 January 2018 is recorded in the opening balance of consolidated reserves;
- financial assets are not reclassified under IFRS 9 categories in the comparative balance sheet. Consequently, the “Available-for-sale financial assets” category is still shown in the 2017 comparative information (see note 36.1);
- impairment for the comparative period has not been restated;
- the hedge accounting rules of IFRS 9 are applied prospectively. The transition has not resulted in disqualification of any hedging relationship.

The main impacts of application of IFRS 9 are described in more detail below. The impacts on income statement figures published at 31 December 2017 are provided for information and comparability with the income statement at 31 December 2018.

### 2.2.2 Principal impacts of IFRS 9 for the Group

#### 2.2.2.1 Classification and measurement

The Group’s financial assets classified as “Available For Sale” (AFS) under IAS 39 are now carried at fair value through Other comprehensive income (OCI) with recycling or with no recycling) or at fair value through profit and loss.

The main impacts of application of IFRS 9 in the Group concern financial assets held in the form of shares in investment funds, and to a lesser degree the equity instruments (shares) held.

- For shares in **investment funds**, unrealised gains or losses, which were previously recognised in OCI with recycling to profit and loss upon derecognition, are now recorded directly in the Group’s income statement in accordance with their IFRS 9 classification.

These instruments were stated in the balance sheet at 31 December 2017 at the value of €18,382 million. The change in fair value at 1 January 2018, amounting to a total €1,807 million before tax (€1,172 million after tax), which was previously recognised in OCI with recycling under IAS 39, is reclassified in full to other consolidated reserves with no future recycling to profit and loss.

- For **equity instruments** not held for trading, the Group records fair value changes on most of the instruments in the portfolio at 31 December 2017 in profit and loss. However, for some of the securities in the portfolio at 31 December 2017, the Group has exercised the irrevocable option to recognise fair value changes in OCI with no recycling.

These instruments were stated in the balance sheet at 31 December 2017 at the value of €1,679 million. The change in fair value at 1 January 2018, amounting to a total €135 million before tax (€87 million after tax), is reclassified in full to other consolidated reserves with no future recycling to profit and loss.

- The portfolio of **debt securities, particularly bonds**, was stated in the balance sheet at 31 December 2017 at the value of €20,863 million.

Of this total, €20,828 million is managed under the “collect and sell” business model and passes the SPPI test. As a result, fair value changes on this section of the portfolio are recorded in OCI with recycling, continuing the previous accounting treatment.

The change in the fair value of these instruments remaining in OCI with recycling amounts to €245 million before tax (€162 million after tax) at 1 January 2018.

- The balance of the portfolio (€35 million at 31 December 2017) is now carried at fair value through profit and loss.

On these instruments, the change in fair value at 1 January 2018, amounting to a total €3 million before tax (€2 million after tax), is reclassified in full to other consolidated reserves with no future recycling to profit and loss.

A large portion of the financial assets affected by these changes belongs to dedicated asset portfolio (amounting to a total €20,848 million at 31 December 2017 – see note 36.2) held to cover future expenses for the back-end of EDF’s nuclear cycle in France (see note 45).

In general, application of IFRS 9 causes greater volatility in the Group's income statement. Meanwhile, dedicated assets are held to cover provisions for the

back-end of the nuclear cycle, which give rise to a recurring cost of unwinding the discount, which is included in the financial result.

The table below summarises changes in the classification of financial assets held by the Group at 31 December 2017 between IAS 39 and IFRS 9, and the impacts on the Group's financial statements.

Categorie IAS 39 (in millions of euros)	Balances at 31/12/2017 restated <sup>(1)</sup>	IFRS 9 classification				Gross fair value reserve at 01/01/2018	Net fair value reserve (after tax) at 01/01/18 <sup>(2)</sup>
		Amortised cost	Fair value through OCI with recycling	Fair value through OCI with no recycling	Fair value through P&L		
<b>Available-for-sale financial assets</b>	<b>40,924</b>	-	<b>20,828</b>	<b>444</b>	<b>19,652</b>	<b>2,190</b>	<b>1,423</b>
EDF's dedicated assets	20,848	-	4,992	-	15,856	2,114	1,347
EDF's liquid assets	18,963	-	15,815	-	3,148	73	73
Other assets	1,113	-	21	444	648	3	3
<b>Loans and receivables</b>	<b>14,622</b>	<b>14,330</b>	-	-	<b>292</b>	-	-
<b>Trade receivables <sup>(3)</sup></b>	<b>16,843</b>	<b>15,187</b>	<b>1,656</b>	-	-	-	-

(1) See notes 36.2.2 and 36.3 respectively to the 2017 consolidated financial statements for details of available-for-sale financial assets and loans and receivables. The amount of trade receivables has been restated for the impacts of IFRS 15 (see note 2.1.3.2).

(2) Corresponding to the cumulative changes in fair value, after tax, on unrealised gains and losses on shares in investment funds (€1,172 million), equity instruments (€87 million) and debt securities, notably bonds (€164 million).

(3) Trade receivables of Edison (Italy) are managed under the "collect and sell" model and are therefore classified in the "Fair value through OCI with recycling" category.

#### 2.2.2.2 Impairment

Retrospective application of the IFRS 9 impairment model to all the financial assets concerned leads to recognition of an impact of €(34) million (net of tax) in opening reserves.

#### 2.2.2.3 Hedge accounting

Retrospective application of the IFRS 9 hedge accounting rules had no impact on opening reserves since all hedging relationships were continued at 1 January 2018.

#### 2.2.2.4 Debt modification

The accounting treatment under IFRS 9 of debt modifications that do not result in derecognition was clarified by the IASB in July 2017. This standard requires the change in amortised cost of the debt at the modification date to be recorded in profit and loss, in contrast to the current practice of spreading the adjustment over the residual term of the modified debt.

The impact of retrospective application at 1 January 2018 of this clarification of IFRS 9 on the Group's opening reserves amounts to €28 million (net of tax).

#### 2.2.2.5 Summary of impacts in terms of changes in Group equity (after tax) at 1 January 2018

Impacts (in millions of euros (net of tax))	Revaluation differences on financial instruments (OCI with recycling)	Other consolidated reserves and net income <sup>(1)</sup>
<b>Equity as published at 31/12/2017</b>	<b>(306)</b>	<b>40,103</b>
■ Fair value adjustments to financial instruments that no longer transit via OCI with recycling <sup>(2)</sup>	(1,261)	1,261
■ Associates' and joint ventures' share of these fair value adjustments	(159)	159
■ Impairment (see note 2.2.2.2)	6	(34)
■ Debt modification (see note 2.2.2.4)	-	28
	(1,414)	1,414
<b>Equity after restatements at 01/01/2018</b>	<b>(1,720)</b>	<b>41,517</b>

(1) Fair value changes recorded in OCI with no recycling are presented in the column "Other consolidated reserves and net income".

(2) At 31 December 2017, the cumulative changes in fair value, after tax, on unrealised gains and losses on shares in investment funds (€1,172 million), equity instruments subject to the OCI with no recycling option (€87 million) and debt securities, notably bonds (€2 million) (see note 2.2.2.1).

#### 2.2.2.6 Information regarding the impacts on 2017 net income of application of IFRS 9 to financial assets

The impact of application of IFRS 9 instead of IAS 39 on the Group's net income at 31 December 2017 is provided for information and comparability purposes. The main impacts concern financial assets carried at fair value through OCI with no recycling or through profit and loss. On those instruments, all other things being equal, the impact on the financial result would have been €215 million (€176 million on the net income), consisting of:

- non-recognition of the gains or losses on sale realised in 2017 in the amount of €(931) million, including €(985) million related to dedicated assets (see note 15.3);
- recognition in income of changes in the fair value of these instruments during 2017, representing the volatility over the period of €1,146 million including €1,158 million related to dedicated assets.

(in millions of euros)	2017 as published	IFRS 9 restatements	2017 restated
<b>Operating profit before depreciation and amortisation</b>	<b>13,742</b>	-	<b>13,742</b>
<b>Operating profit</b>	<b>5,637</b>	-	<b>5,637</b>
Cost of gross financial indebtedness	(1,778)	-	(1,778)
Discount effect	(2,959)	-	(2,959)
Other financial income and expenses	2,501	215	2,716
<b>Financial result</b>	<b>(2,236)</b>	<b>215</b>	<b>(2,021)</b>
Income taxes	(147)	(96)	(243)
Share in net income of associates and joint ventures <sup>(1)</sup>	35	57	92
<b>GROUP NET INCOME</b>	<b>3,289</b>	<b>176</b>	<b>3,465</b>

(1) Relates to the investment in CENG.

## NOTE 3 SIGNIFICANT EVENTS AND TRANSACTIONS

### 3.1 THE FIRST OF TWO EPR REACTORS AT CHINA'S TAISHAN NUCLEAR POWER PLANT BEGINS COMMERCIAL OPERATION

On 14 December 2018, CGN and EDF announced that Taishan nuclear power plant's unit 1 had become the world's first EPR to begin commercial operation. This last milestone was reached on 13 December 2018 after successful completion of the final statutory test of continuous operation at full power for 168 hours, which showed that all the requirements for the reactor's safe operation were met.

Comprising two 1,750MW EPR reactors, Taishan nuclear power plant is the biggest cooperation project to have taken place between China and France in the energy sector. Taishan's two reactors are capable of supplying the Chinese power grid with up to 24TWh of carbon-free electricity a year, tantamount to the annual electricity consumption of 5 million Chinese users, whilst at the same time preventing the emission of 21 million tonnes of CO<sub>2</sub> a year.

The Taishan project is being led by TNPJVC, a joint venture founded by CGN (51%), EDF (30%) and a regional Chinese utility called Yuedian (19%). The EDF group and its subsidiary Framatome supplied the third-generation EPR technology, which meets the highest international safety standards. EDF also contributed operating experience gained from the construction of its Flamanville 3 EPR, and this was a crucial factor in successfully completing the initial phases of the Taishan 1 construction project.

Taishan 1 is providing its experience in project management and technological expertise for EPRs around the world. The first reactors to benefit from this experience are the two Hinkley Point C units currently being built in the UK. EDF and CGN are partners in two other British projects: the Sizewell C EPR project, and the Bradwell B project which is based on Hualong technology.

### 3.2 SALE OF A PORTFOLIO OF MORE THAN 200 REAL ESTATE AND BUSINESS ASSETS BY THE EDF GROUP TO COLONY CAPITAL

On 28 November 2018, the EDF group, largely via its subsidiary Sofilo, completed the sale of a portfolio of over 200 office buildings and business assets to investment vehicles managed by Colony Capital.

This portfolio, whose assets are located in the Paris area and other regions in France, has a total surface area of approximately 430,000m<sup>2</sup>. The operation was coupled with an operating lease contract to the EDF group.

The closing of this transaction marks the completion of EDF group's €10 billion asset disposal plan for 2015-2020.

### 3.3 COMPLETION OF THE SALE OF EDF'S STAKE IN DUNKERQUE LNG

Following a competitive auction process launched in early 2018, the EDF group announced on 29 June 2018 that it had entered into exclusive negotiations with two groups of investors for the disposal of its 65.01% interest in the share capital of Dunkerque LNG, owner and operator of the liquefied natural gas (LNG) terminal in Dunkirk.

A consortium composed of Fluxys, AXA Investment Managers – Real Assets, on behalf of its clients, and Crédit Agricole Assurances undertook to acquire a stake of 31%, and a consortium of Korean investors, led by IPM Group (comprised of InfraPartners Management Korea Co. Ltd. in Seoul and InfraPartners Management LLP in London) in collaboration with Samsung Asset Management Co., Ltd and consisting of Samsung Securities Co. Ltd., IBK Securities Co. Ltd. and Hanwha Investment & Securities Co. Ltd., acquired a stake of 34.01%.

Based on the prices paid by the two consortia, the average enterprise value for 100% of Dunkerque LNG amounted to €2.4 billion.

This transaction allowed Fluxys, already a 25% shareholder of Dunkerque LNG, to take control of and consolidate Dunkerque LNG with the support of Axa Investment Managers – Real Assets and Crédit Agricole Assurances.

EDF, as a customer of Dunkerque LNG, is still committed in the long term to the terminal, which will continue serving the Group's gas strategy.

The EDF group signed binding agreements for this sale with the same consortia on 12 July 2018.

Once the required regulatory approvals had been given, the EDF group completed the sale of its stake in the Dunkerque LNG terminal on 30 October 2018.

Following this sale, valuation of the long-term agreement between EDF and Dunkerque LNG for reservation of LNG regasification capacities led to recognition of a €737 million increase in provisions for onerous contract (see note 32). Due the gain of €755 million generated, this operation has a net impact of €18 million on other income and expenses (see note 14). It also contributes a €1.5 billion reduction in the EDF group's net financial indebtedness, based on a sale price of approximately €1 billion net of cash transferred.



### 3.4 SENIOR BOND ISSUES: EDF RAISES \$3.75 BILLION AND €1 BILLION

On 19 September 2018, EDF raised US\$3.75 billion through 3 senior bond issues:

- a \$1.8 billion bond, with 10-year maturity and a 4.500% fixed coupon;
- a \$650 million bond, with 20-year maturity and a 4.875% fixed coupon;
- a \$1.3 billion bond, with 30-year maturity and a 5.000% fixed coupon.

In addition, on 25 September 2018 EDF launched a €1 billion senior note offering, with 12-year maturity and a 2% fixed coupon.

These transactions enable the EDF group to further reinforce the structure of its balance sheet, and to refinance upcoming financial obligations.

### 3.5 ISSUANCE OF PERPETUAL SUBORDINATED BONDS

On 25 September 2018, EDF successfully launched a €1.25 billion "reset perpetual 6 year non-call hybrid note" with a 4% coupon and a first redemption at EDF's call between 4 July 2024 and 4 October 2024 inclusive. The French market regulator

The results of the tender offer are summarised in the table below:

Targeted hybrid bonds	ISIN	Acceptance Priority Levels	Tendered Amounts	Tendered Amounts (as % of out- standing)	Acceptance Amounts	Pro-Rating Factors	Tender Prices
2020 bonds	FR0011401736	1	€911,800,000	73%	€911,800,000	100.00%	105.255%
2022 bonds	FR0011697010	2	€635,100,000	64%	€338,200,000	59.50%	108.185%
2026 bonds	FR0011401728	3	N/A	N/A	0	N/A	N/A
2025 bonds	FR0011401751	4	N/A	N/A	0	N/A	N/A

The settlement of the tender offer took place on 5 October 2018.

In compliance with IAS 32, this redemption of perpetual subordinated bonds (see note 1.3.20.4) was recorded in equity upon disbursement of the funds, at the amount of €1,329 million net of expenses.

### 3.7 SYNDICATION OF AN INNOVATIVE ESG-INDEXED REVOLVING CREDIT FACILITY

On 14 December 2018 EDF completed the syndication of a €4 billion revolving credit facility (see note 38.2.5), the cost of which is indexed on three of the Group's key performance indicators (KPIs) for environmental, social and governance (ESG) matters: EDF's direct CO<sub>2</sub> emissions, EDF's customers' use of its online consumption monitoring tools (as an indicator of EDF's success in getting French residential customers actively engaged with their consumption), and the electrification of EDF's vehicle fleet.

This ESG-indexed credit facility, which involves a syndicate of more than 20 banks, amends EDF's existing €4 billion revolving credit facility, extending it to a new maturity in 2023. It complements the set of sustainable financing tools that EDF has been developing over the last few years, particularly in the Green Bond market.

issued approval no. 18-466 dated 2 October 2018 for the prospectus concerning these instruments, for which settlement and delivery took place on 4 October 2018.

EDF remains committed to using hybrid bonds as a permanent part of its capital structure, to fund assets under construction.

In compliance with IAS 32, this issuance of perpetual subordinated bonds (see note 1.3.20.4) was recorded in equity upon receipt of the funds, at the amount of €1,243 million net of expenses.

### 3.6 REDEMPTION OF CERTAIN SERIES OF HYBRID BONDS

On 25 September 2018 EDF issued a cash tender offer for redemption of four outstanding series of hybrid bonds.

Following the end of the tender offer period on 3 October 2018, EDF proceeded to the cash redemption of bonds validly tendered from the first two hybrid issues, according to the order of priority, for an amount of €1.25 billion.

The total value of EDF's hybrid bonds remains unchanged as a result of the above hybrid bond issue and redemption transactions.

### 3.8 EDF RENEWABLES

#### 3.8.1 EDF Renewables invests in New Jersey for development of offshore wind power projects

EDF Renewables North America and Shell New Energies US LLC (Shell) announced on 20 December 2018 that they had formed a 50/50 joint venture, Atlantic Shores Offshore Wind, LLC, to co-develop the OCS-0499 lease area within the New Jersey Wind Energy Area (WEA).

The lease area holds the potential to produce approximately 2,500MW of offshore wind energy – enough to cover the annual energy consumption of close to one million homes. This operation requires regulatory approvals, and construction is subject to a positive final investment decision.

The lease area comprises 74,200 hectares and lies about 13 kilometres off the coast of Atlantic City on the US Outer Continental Shelf (OCS). The area offers strong and steady wind resources in relatively shallow water, close to large population centres with high electricity demand.

The maritime lease was purchased as part of this project, for a price of up to €199 million (EDF's share).

### 3.8.2 A new partner for EDF Renewables in twenty-four UK wind farms

On 29 June 2018, EDF Renewables sold a 49% minority stake in twenty-four of its UK wind farms (around 550MW), for the price of £701 million.

The new partnership with Dalmore Capital Limited and Pensions Infrastructure Platform, with investments from large UK local authority pension schemes, will enable EDF Renewables to continue to expand the renewable energy business.

EDF Renewables retained a 51% share in this portfolio of wind farms. It will also continue to run the sites and to provide operations and maintenance and asset management services.

EDF Energy will also continue to purchase all of the electricity and ROCs (Renewables Obligation Certificates) generated by the wind farms, on market-standard terms.

The sale of this investment, which was considered as a transaction between shareholders with no change of control, is recognised in equity and has no impact on the Group's income statement (see the statement of Change in consolidated equity).

### 3.9 CONFIRMATION OF THE EUROPEAN COMMISSION DECISION ON THE TAX TREATMENT OF PROVISIONS ESTABLISHED BETWEEN 1987 AND 1996 FOR RENEWAL OF GENERAL NETWORK FACILITIES

On 16 January 2018, the General Court of the European Union rejected EDF's appeal against the European Commission's decision of 22 July 2015 classifying the tax treatment of provisions established between 1987 and 1996 for renewal of General Network facilities as state aid, and ordering that it be recovered by the French State. Following that decision by the Commission, on 13 October 2015 EDF had repaid €1.383 billion, corresponding to the amount of state aid including interest. Enedis and RTE contributed their respective shares.

In its ruling, the General Court upheld the European Commission's decision of 22 July 2015. In view of the repayment made on 13 October 2015, the execution of this ruling did not entail any additional payment.

On 27 March 2018, EDF submitted an appeal to the Court of Justice of the European Union against the General Court's ruling of 16 January 2018. On 13 December 2018 the Court rejected this appeal, confirming the European Commission's decision. This litigation is now definitively closed.

### 3.10 FLAMANVILLE 3 EPR PROJECT

Major milestones were reached during 2018:

- completion of cold functional testing, consisting of a large number of test operations including the leak performance test on the primary system at a pressure greater than 240 bar – higher than the pressure of this system once in operation;
- successful testing of the reactor containment building in April 2018. This is an in-air test that checks the concrete structure's mechanical behaviour and airtightness by raising pressure inside the building to six times the outside air pressure;
- integration of an instrumentation and control (I&C) configuration involving around 250 modifications, completed in early September 2018, so that hot functional testing can take place in a stable, coherent I&C configuration.

### Equipment manufacturing and quality

At 31 December 2018, almost all the equipment for the nuclear section and the conventional island, had been delivered and assembled on site. The situation as regards the quality of equipment manufactured by Framatome for the primary system is described in the following paragraphs.

#### Vessel

The issue of the higher-than expected carbon content in the vessel head and bottom was examined by the French Nuclear Safety Authority ASN (*Agence de Sécurité Nucléaire*) during the first half of 2017 on the basis of documentation submitted by Framatome under the supervision of EDF. Based on the opinion of a group of ASN-appointed experts, the ASN issued an opinion on 11 October 2017 concluding that the mechanical properties of the vessel head and bottom head were adequate for their uses, including in the event of an accident.

On 9 October 2018, the ASN authorised:

- the commissioning of the vessel bottom, subject to functional checks;
- the commissioning of the vessel head, for a limited operating life until 2024 unless the technical feasibility of checks comparable to the vessel bottom checks can be demonstrated.

EDF is currently working on development of in-service vessel head checks, in order to go back to the ASN later in 2019 for permission to retain the current vessel head if such checks are industrially feasible. If permission is not given, EDF could remain liable for some or all of the costs incurred to manufacture a replacement vessel head. These costs are not included in the target construction cost, since if they arise they would do so after the plant's commissioning. EDF SA has initiated arbitration proceedings against AREVA SA on this matter.

### Break preclusion and quality deviations in the welds of the main secondary system

On 30 November 2017, EDF declared a significant event to the ASN regarding the detection of a quality deviation in the welding of the secondary system that conducts the steam from the steam generators to the turbine of the Flamanville 3 EPR.

This system (main steam lines) was designed and manufactured according to the "break preclusion" concept, with stricter requirements for design, manufacture and in-service monitoring. These stricter requirements, requested by EDF, are backed up by a "high quality" requirement for the building of these systems.

Although these requirements were applied during the design phase, they were not properly incorporated into the welding work. Failure to meet these requirements does not necessarily entail non-compliance with the nuclear pressure equipment regulations.

From 21 March 2018, during an initial comprehensive inspection, EDF detected other quality deviations in welds on the pipes in the main secondary system of the Flamanville 3 EPR. The initial comprehensive inspection is a mandatory by law before commissioning plant, and mainly involves examination of the welds on the primary and secondary systems. It gives rise to an initial benchmark report on the state of plant before it begins operation.

In accordance with industrial procedures, the welds had been checked by the consortium of contractors in charge of manufacturing the system and each one had been declared compliant as the work was done.

On 10 April 2018 (see EDF's press release of the same date), EDF notified the ASN of a significant event relating to the detection of deviations in the performance checks on these welds (part of the main secondary system was already concerned by the insufficient application of the "break preclusion" requirements).

EDF therefore began a further inspection during the second quarter of 2018 of all 150 welds concerned in the main secondary system.

Of these 150 welds:

- 87 welds were compliant with requirements;
- 33 welds had quality deficiencies and had to be repaired. The work on site to repair these welds began in late July 2018;
- EDF also decided to rework a further 20 welds which, although they had no defects, did not meet the break preclusion requirements defined by EDF during the EPR design phase. The files for adjustments to the first welds was sent to the ASN, and on-site welding work began in November 2018;
- for 10 other welds, EDF submitted a proposal to the ASN detailing a specific justification method to confirm the high level of safety at the plant throughout its operating life. After a final analysis this number was reduced to 8. It also became clear from checks that one of these eight welds had a small quality defect. The ASN will closely examine EDF's specific justification method in the next few months.

### Commissioning schedule and construction costs

On 25 July 2018 (see EDF's press release of the same date), the Group presented an update concerning these inspections, and adjusted the Flamanville EPR schedule and target construction costs:

- the target date for loading the nuclear fuel was scheduled for the end of the fourth quarter of 2019, with start-up and hot functional testing planned for late 2018;
- the target construction costs were revised from €10.5 billion to €10.9 billion (in 2015 euros, excluding borrowing costs).

On 21 January 2019 (see EDF's press release of the same date) EDF announced that the schedule for hot functional testing had been revised, and it is now expected to commence during the second half of February 2019.

The schedule and estimated construction costs remain tight. They include a timetable for receiving authorisations from the ASN as explained above, which among other factors is contingent on the ASN completing its examination of the methods proposed by EDF for repairing the welds in the main secondary system, as stated in the Group's press release of 31 January 2019.

On 29 January 2019 the Chairman of the ASN announced that the ASN will issue a statement in May 2019 concerning the validation programme for the welds in the main secondary system, saying "if it turns out that the eight welds in the reactor containment building structure also need reworking then it will not be possible to meet the deadline." A detailed update on progress on the Flamanville EPR, particularly the schedule and construction cost, will be issued after the ASN's statement has been published. EDF is not currently in a position to assess the impact in the event the ASN does not validate the proposed approach.

## 3.11 SIGNIFICANT EVENTS AND TRANSACTIONS OF 2017

### 3.11.1 Capital increase by EDF SA

On 30 March 2017, EDF undertook a cash capital increase with preferential subscription rights for existing shareholders.

The total gross amount of the increase (including the issue premium) was €4,018 million, and 632,741,004 new shares were issued at the unit issue price of €6.35. This total amount comprised:

- a €316 million increase in the share capital;
- a €3,702 million gross increase in the issue premium.

Issue expenses (net of taxes) were charged to the issue premium.

In accordance with its commitment, the French State subscribed for an amount of €3 billion or approximately 75% of the capital increase, and after this operation held 83.10% of the Company's share capital.

### 3.11.2 Acquisition of 75.5% of Framatome

On 22 December 2017 AREVA SA, AREVA NP and EDF completed the sale to EDF of an interest conferring exclusive control over New NP (renamed Framatome since January 2018), a 100% subsidiary of AREVA NP.

EDF's acquisition of 75.5% of Framatome's capital was based on an adjusted valuation of €2.47 billion (for 100% of the capital), with no transfer of financial debt. This price was equivalent to a forecast 2017 EBITDA multiple of 8x<sup>(1)</sup>.

In application of IFRS 3 (revised), the Group finalised recognition of the business combination in its accounts at 31 December 2018 (see note 5.1).

The purchase price at that date is set at €2.6 billion (for 100% of the capital), €132 million more than the initial estimation due to:

- price adjustments based on the final accounts at the completion date of the transaction (31 December 2017);
- estimated earn-out payments, some of them contingent on achievement of performance targets measured after completion of the purchase: the final amount of up to €245 million should be established during 2019;
- estimation of certain guarantees granted to EDF by AREVA NP in the sale agreement of 22 December 2017.

Framatome's provisional opening balance sheet at 31 December 2017 for 100% of the capital is presented in note 3.2.4.1 to the consolidated financial statements at 31 December 2017, and the final opening balance sheet is shown in note 5.1.

On 3 February 2018, Teollisuuden Voima (TVO) filed an appeal before the General Court of the European Union against the European Commission's decision of 29 May 2017 that authorised EDF's purchase of Framatome under antitrust regulations. TVO later withdrew its appeal and the Court announcement of 16 May 2018 removing the case from its register was made public at the end of May.

### 3.11.3 Sale of 49.9% of CTE

On 31 March 2017, EDF finalised the sale to Caisse des Dépôts and CNP Assurances of a 49.9% stake in the electricity transmission entity Coentreprise de transport d'électricité (CTE), which has held 100% of RTE since December 2016.

The sale was based on a valuation of €8.2 billion for 100% of RTE.

It had an impact of €1,462 million in 2017 on other income and expenses (€1,289 million on consolidated net income), and contributed to a decrease of approximately €4 billion in the EDF group's net indebtedness, based on a sale price of €1.3 billion for the portion not allocated to dedicated assets and a net reduction of €2.8 billion in net indebtedness due to loss of control over CTE.

Since this operation, EDF's 50.1% investment in CTE, stated at historic value, has been accounted for under the equity method and is entirely allocated to dedicated assets.

(1) Normalised pro forma EBITDA for the activities acquired, excluding large projects.

## NOTE 4 REGULATORY CHANGES IN FRANCE

### 4.1 FRANCE'S MULTI-YEAR ENERGY PROGRAMME (PPE)

On 25 January 2019, France's Ministry for the Ecological and Inclusive Transition issued the draft PPE, the oversight tool for the energy policy introduced by the French law on the energy transition for green growth adopted in 2015. In principle, the PPE covers two successive five-year periods. The first PPE published in October 2016 departed from this rule by setting out two successive periods of three and five years respectively, 2016-2018 and 2019-2023. The revised PPE, which is not yet finalised, will cover the periods 2019-2023 and 2024-2028. This draft PPE follows the Ministry's press release of 27 November 2018 presenting the government's targets for the multi-year programme and the national low-carbon strategy.

For nuclear electricity generation, the French government has now set the deadline of 2035 for reaching the objective of a 50% nuclear share in the national electricity mix. This objective will consequently be modified in the Energy Code. To achieve it, 14 nuclear reactors would have to be shut down by 2035, including the closure of the two reactors at Fessenheim "by spring 2020, in application of the cap on installed electronuclear power, so that the Flamanville EPR can be put into operation".

The schedule for these shutdowns would be aligned with the timing of the fifth 10-year inspections of the reactors concerned, except for 2 reactors scheduled for closure during the second period of the PPE, in 2027 and 2028, provided the criterion of secure supply is respected. If certain conditions relating to electricity prices and European electricity market trends are fulfilled, two additional reactors could also be shut down in 2025-2026 by a decision to be made in 2023.

The final version of the PPE will name the priority sites for these reactor shutdowns. All of the closures would be associated with State support for the regions concerned, mainly through an ecological transition contract to foster new local development dynamics.

The draft PPE is currently undergoing a consultation process before it can be adopted and translated into laws or regulations in 2019.

If the measures described above are confirmed in the final laws and regulations, the principal consequence of their adoption for the Group's financial statements will be recognition of the change in the expected shutdown date of two nuclear reactors to 2027 and 2028, ahead of their fifth 10-year inspection: this will have an impact on the value of nuclear provisions at the time of the change of estimate, and prospective modification of the depreciation period for the two units concerned. As this situation would bring forward the shutdown of two reactors in the Group's fleet by a few years, the various scenarios examined indicate that the potential effect on nuclear provisions, particularly the decommissioning provision, could be an increase of some tens of millions of euros, via an adjustment to the relevant balance sheet assets.

The French government is to propose the terms of a new system of regulations for existing nuclear plants that will protect consumers against rising market prices after 2025 by allowing them to benefit from the competitive advantage of investments made in the historical nuclear power plant fleet, while giving EDF the financial capacity to ensure economic sustainability of generation facilities and meet the requirements of the PPE in low-price scenarios.

The draft PPE also states that "the Government, together with the industry, will conduct a programme of work by mid-2021 to examine the questions of the cost of new nuclear energy production and its advantages and disadvantages in relation to other low-carbon generation methods, the possible financing models, the project management modalities for new reactor projects and public consultation, and matters relating to the management of waste generated by the potential new nuclear fleet. Based on this information and depending on developments in the energy situation, the Government will make a decision regarding the suitability of launching a renewal programme for nuclear installations".

For fossil-fired electricity generation, under the draft PPE the last coal-fired plants would be closed down by 2022, and no further authorisations would be issued for new electricity plants that use fossil fuels.

If these measures are confirmed in the final laws and regulations, the principal consequence of their adoption for the Group's financial statements will be recognition of the prospective modification of the depreciation period for the coal-fired plants operated by the Group in France, at Le Havre and Cordemais (an increase of some €200 million in the annual depreciation expense over the period 2019-2022). The Group is, however, examining the possibilities of converting these plants to biomass plants. At the end of a meeting held on 24 January 2019, EDF and the Ministry for the Ecological and Inclusive Transition approved a programme of work leading up to a decision on the Ecocombust project.

As announced in EDF's press release of 29 January 2019, between now and autumn 2019, this programme of work should help validate the technical trials, environmental impact studies and economic model for this conversion project. After that period, if the technical, economic and environmental conclusions are satisfactory, once discussions have been held with the Government and local communities, EDF will embark on the industrialisation stage, aiming to start producing the fuel in 2022. The Ecocombust project concerns the production of an innovative, ecological fuel that can be used to run heating or electricity generation facilities that currently run on coal. To ensure secure electricity supplies in the north-west quarter of France, especially Brittany, some or all of the biomass produced could be used to provide 80% of the fuel for current reactors until 2026 if the studies by RTE commissioned by the government confirm the need, to ensure the electricity network in the west of France is secure at the highest peak consumption times.

The draft PPE also sets the objective of a significant step-up in the pace of development of renewable energies.

### 4.2 REGULATED ELECTRICITY SALES TARIFFS IN FRANCE – "BLUE" TARIFFS

#### Council of State decision of 18 May 2018

Legal challenges against the tariff decisions of 2016 and 2017 were brought before France's Council of State by Anode (the national association of retail energy operators) and Engie, on the grounds that the "blue" regulated electricity sales tariffs for residential and non-residential customers were contrary to European Union law.

Ruling on these challenges, by decisions of 18 May and 3 October 2018 the Council of State validated the principle of regulated electricity sales tariffs, notably acknowledging that they serve the public economic interest objective of guaranteeing consumers an electricity price that is more stable than market prices. The Council of State confirmed that this objective cannot be achieved by softer State intervention and that regulation of sales tariffs guarantees electricity firms equal access to consumers and is not discriminatory.

However, the Council of State considered that the tariff regulation is disproportionate in its duration, which is permanent, and its scope of application, which currently covers large business sites with subscribed power levels below 36kVA. These facts were cited as justification for partial cancellation of the tariff decisions of 28 July 2016 and 27 July 2017.

Implementation of these decisions is the responsibility of the lawmaker, which is currently preparing the necessary legislative measures through France's future "Pacte Law" for business growth.

#### Tariff changes

Since 8 December 2015, in accordance with the NOME Law on organisation of the French electricity market (Articles L.337-4 and L.337-13 of the French Energy Code), the French Energy Regulatory Commission (*Commission de régulation de l'énergie* or CRE) has been responsible for sending the Ministers for the Economy and Energy its reasoned proposals for regulated sales tariffs for electricity. If no objections are made within three months, the proposals are deemed to have been approved.

For the tariff changes of 2018, the CRE, in accordance with the NOME Law on organisation of the French electricity market, issued a decision on 11 January 2018 proposing that the Government should raise the "blue" regulated tariffs for residential customers by +0.7% and for non-residential customers by +1.6%. This proposal was confirmed by a tariff decision of 31 January 2018 published in the *Journal officiel* of 1 February 2018, and implemented at that date.

The tariff change of summer 2018 followed the same process. Considering the TURPE adjustment of 1 August 2018 and in application of the French Energy Code, in a decision of 12 July 2018 the CRE proposed a -0.5% reduction in the "blue" regulated tariffs for residential customers and a +1.1% increase in the "blue" tariffs for non-residential customers.

The same CRE decision, citing the Council of State's decision of 18 May 2018, included the phasing out of "blue" tariffs for non-residential customers for all large business sites, suggesting a definition for determining the scope of large businesses based on "decree 2008-1354 of 18 December 2008 on the criteria that will determine the category to which a business belongs for the purposes of economic and statistical analysis".

All items of the CRE's proposal were approved in a tariff decision of 27 July 2018, published in the *Journal officiel* of 31 July 2018 and implemented on 1 August 2018.

In a decision of 7 February 2019 published on 12 February 2019, the CRE proposed an increase of 7.7% (excluding taxes) in the "blue" regulated tariffs for residential customers and non-residential customers. The date of application is as yet unknown. The government has three months to make an objection to this decision.

### 4.3 "TURPE" NETWORK ACCESS TARIFFS

On 17 November 2016, the CRE published its decisions for the TURPE 5 Transmission (high voltage) and TURPE 5 Distribution (medium voltage and low voltage) tariffs for the period 2017-2020. The new TURPE 5 tariff frame took effect on 1 August 2017.

#### TURPE 5 Transmission tariffs

The TURPE 5 Transmission tariff came into force with a 6.76% tariff increase effective from 1 August 2017, to be followed by subsequent rises on 1 August in the years 2018 to 2020, based on average inflation observed over the previous calendar year, adjusted by a correcting factor to balance the income and expenses adjustment account (CRCP)<sup>(1)</sup>. The TURPE 5 Transmission tariff sets the weighted average cost of capital (WACC) at 6.125% for the return on RTE's asset base versus 7.25% for TURPE 4.

On 17 May 2018 the CRE adopted a decision concerning the TURPE 5 tariff for the high voltage network and its revision at 1 August 2018. The tariff scale increased by an average +3% on 1 August 2018, comprising +1% for inflation and +2% to balance the CRCP.

#### TURPE 5 and TURPE 5 bis Distribution tariffs

##### TURPE 5

The TURPE 5 Distribution tariff came into force with a 2.71% tariff increase, which took effect on 1 August 2017, to be followed by subsequent rises on 1 August in the years 2018 to 2020, based on average inflation observed over the previous calendar year, adjusted by a correcting factor to balance the CRCP. The TURPE 5 continues to use the previous method for calculating cost of capital, setting the margin on assets at 2.6% and the return on regulated equity at 4.1%.

##### Action against the TURPE 5 HTA/BT (medium/low voltage) tariffs

- By a decision of 12 January 2017 published in the *Journal officiel* of 17 January 2017; the French Minister for Energy, acting within the two-month response period, requested a new decision from the CRE as in her opinion the decision of 17 November 2016 had not taken national energy policy orientations into consideration. In a new decision of 19 January 2017, the CRE reiterated its initial decision of 17 November 2016. Both decisions were published in the *Journal officiel* of 28 January 2017.

- On 2 February 2017, Enedis filed an application before the Council of State for cancellation of these two CRE decisions.

- On 3 February 2017, EDF, in its capacity as the shareholder of Enedis, also filed an application before the Council of State for cancellation of the same CRE decisions.

- By a decision of 9 March 2018, the Council of State partly cancelled the TURPE 5 decisions since the regulator "did not, in determining the cost of capital invested, apply, in addition to the 'risk premium', the 'risk-free rate' to the assets corresponding to items funded, at the time of renewal of installations, by recovery of the remaining portion of the provisions established during the tariff period covered by the 'TURPE 2' tariffs, and the corresponding portion of the installations handed over by the concessionary authorities to the network operator during the same period".

#### Second TURPE 5 HTA/BT (medium/low voltage) tariffs

On 28 June 2018, the CRE adopted a decision regarding the TURPE 5 HTA-BT (medium voltage – low voltage) tariff and the change from 1 August 2018 to that tariff, known as the "second TURPE 5 HTA-BT". This decision included an adjustment of an average -0.21% to the TURPE 5 from 1 August 2018, following a combination of factors:

- implementation of the Council of State's partial cancellation decision on 9 March 2018, and the concurrent application of a lower corporate income tax rate: these two effects almost totally offset each other over the period 2018-2020 (combined effect of +0.06%);
- the standard inflation-based adjustment at 1 August (+1%) and balancing of the CRCP (-1.27%);
- the -0.21% reduction is modulated according to the tariff structure: on average -1.16% for users of the medium voltage networks (HTA), -0.59% for low voltage networks (BT) above 36kVA, and +0.14% for low voltage networks (BT) below 36kVA.

This decision has no impact on the tariff preparation method, the operating expense trajectory, the principle of regulation for incentive purposes, or the regulations applicable to Linky meters. The change in the corporate income tax rate is equivalent to adjusting the return on regulated equity to 4% and the margin on assets to 2.5% (previously 4.1% and 2.6% respectively).

The decision also reiterates previous CRE decisions about expenses relating to customer management under a single contract (decision of 26 October 2017), via the management component, and collective auto consumption (decision of 7 June 2018), via the energy withdrawal component. It was published in the *Journal officiel* on 29 July 2018.

In particular, to implement the Council of State's decision of 9 March 2018, the CRE added back an annual amount of around €1.6 billion in 2018 (and will add back declining amounts until 2073) to regulated equity. The CRE considers that this will lead to Enedis receiving additional remuneration equivalent to €<sub>2018</sub>750 million expressed in the present value of pre-tax cash flows. This add-back 2018 to regulated equity results in remuneration of some €60 million per year in the first few years, on a basis that will reduce progressively until 2073 at a (nominal pre-tax) rate that may, under the present method, be revised by the CRE at each tariff period.

#### Supplier commissioning

After Law 2017-1839 of 30 December 2017 confirmed the CRE's competence for supplier commissioning, the CRE issued a new decision on 18 January 2018, published in the *Journal officiel* of 25 January 2018. This decision reiterated the principles adopted in its previous decision of 26 October 2017 regarding remuneration payable by distribution network operators to suppliers for their management of customers under a single contract.

The content of these decisions upholds the principle of identical commissions for all suppliers selling single-contract market-price offers. Only regulated electricity tariffs will give rise to slightly lower commissions (€4.50 instead of €6.80 per point of delivery until 1 August 2019), and this difference will be progressively reduced to zero by 1 August 2022.

(1) A mechanism to measure and offset differences between the actual figures and the forecasts on which tariffs are based.



For remuneration of past customer management charges (prior to 1 January 2018), the CRE's decision sets an amount it considers as a cap that can be passed on through the TURPE tariff.

However, Law 2017-1839 of 30 December 2017 introduced a measure intended to rule out the possibility of suppliers receiving remuneration from network managers for past customer management services.

On 23 December 2016, Engie brought an action against Enedis before the Paris Commercial Court claiming such remuneration. These legal proceedings are ongoing.

### Electricity Equalisation Fund

On 22 March 2018, the CRE published its consultation on the levels of contribution due to the Electricity Equalisation Fund for EDF SEI and Électricité de Mayotte for the years 2018 to 2021. The annual average contribution to the Electricity Equalisation Fund for EDF SEI over this period, including the planned smart metering system, is €185 million.

The amended decisions setting the level of contributions to the Electricity Equalisation Fund for the years 2012 to 2015 were cancelled by the Council of State on 9 March 2018. Discussions are in progress concerning the parameters of the coefficients used to calculate the respective contributions or income of Enedis and the various local distribution companies. The authorities have not yet adopted amended decisions for that period, nor for the period 2016 to 2018.

The risk of a change to the contributions payable by Enedis and Électricité de Strasbourg for the period 2012-2018 has been taken into consideration in the financial statements at 31 December 2018, based on ongoing discussions with the authorities, without prejudice to the final level that will be set or the position the companies concerned will present to the authorities.

## 4.4 COMPENSATION FOR PUBLIC ENERGY SERVICE CHARGES (CSPE)

### Legal and regulatory framework

The compensation mechanism for public energy service charges (*compensation des Charges de Service Public de l'Énergie*) results from a reform introduced by France's amended finance law for 2015, published in the *Journal officiel* on 30 December 2015. Under the legislative and regulatory framework, the public energy service charges (electricity and gas) were to be compensated via two State budget items included in France's finance laws from 2016 onwards. The initial finance law for 2019 marks a continuation from 2018, defining the following charges for 2019:

- a special "Energy Transition" budget item of €7.3 billion, principally to compensate for the additional costs associated with all contracts obliging the operators to purchase renewable energies and biogas and the annual contribution to repayment of the accumulated shortfall in compensation due to EDF;
- a "Public Energy Service" item of €3.3 billion in the general budget to cover solidarity charges borne by gas and electricity suppliers, costs associated with purchase obligations excluding renewable energies (essentially cogeneration), and the cost of applying the standard national tariffs to zones that are not connected to France's mainland network. The interest on the accumulated shortfall to be repaid to EDF is also funded through the general budget.

Since 1 January 2018, the "basic necessity" (*Tarif de première nécessité*) rates for electricity and the "special solidarity" rates for gas have been replaced by an energy voucher system. The cost of this system is not borne by EDF, but has been budgeted by the State in the "Public Energy Service" programme. However, EDF will bear solidarity charges in 2019 for the national housing solidarity fund and services for vulnerable customers.

In 2019, this mechanism of compensation for public service charges is funded as follows:

- the costs linked to the energy transition, which correspond to the subsidy mechanisms for renewable energies, and the reimbursement of the past accumulated shortfall in compensation borne by EDF as measured at 31 December 2015, are registered in a special "energy transition" budget item created by the amended finance law for 2015. Law no. 2016-1917 of 29 December 2016 (the finance law for 2017) stipulated that the two sources of additional funding for this special budget item would be a portion of the domestic tax on coal, lignite and coke (TICC), and a portion of the domestic tax on energy products (TICPE). The finance law for 2019 replaces the percentages of the TICC and TICPE by a set amount, to avoid the uncertainties of forecast income from these taxes, and broadens the sources of funding for the "Energy transition" budget item by including the proceeds of auctions of Guarantees of Origin as allowed by Article L. 314-14-1 of the Energy Code;
- other public service charges – excluding costs associated with the subsidy mechanisms for renewable energies (fuel poverty, tariff equalisation in zones that are not connected to France's mainland network, cogeneration, the budget for the energy ombudsman, etc.) are registered directly in the general budget;
- income generated by the domestic tax on the final consumption of electricity, now renamed the Contribution to Public Electricity Service (*Contribution au Service Public de l'Électricité* – CSPE) goes directly into the general budget. The CSPE tax is collected directly from final consumers of electricity in the form of an additional levy on the electricity sale price (and collected from electricity suppliers), or directly from electricity producers that produce electricity for their own uses;

The level of the CSPE tax is the same in 2019 as in 2018 with the full rate set at €22.5/MWh, and eight reduced rates ranging from €12/MWh to €0.5/MWh depending on criteria of electro-intensiveness, business category and the risk of carbon leakage from installations (the risk of industries relocating to countries where greenhouse gas emissions are higher due to their electricity mix).

The costs associated with conclusion and management of purchase obligation contracts will be eligible for compensation in 2019, as they have been since 2017. This concerns an annual amount of around €45 million.

In addition to these measures, the amended French finance law for 2018 applied a downward adjustment to the amounts of compensation paid by the State for public service charges in 2018: these charges had decreased substantially due to a rise in 2018 electricity market prices between the initial forecast of July 2017 and the adjusted forecast of July 2018, and that decrease automatically narrowed the differential between the purchase obligation tariff payable to producers and the market price for electricity. For the same reason, in 2018 the State also lowered 2018 compensation for the difference between 2017 expenses as reforecast in July 2017 and actual 2017 expenses as determined in July 2018.

### Public service charges borne by EDF

The amount of expenses (excluding the annual contribution to repayment and associated interest) to be compensated to EDF for 2018 is €6,554 million.

The amounts received in the year 2018 (excluding the annual contribution to repayment and associated interest) totalled €6,919 million (including €4,610 million for the dedicated "energy transition" budget account and €2,309 million for the general budget).

A repayment schedule for EDF's receivable corresponding to the accumulated shortfall in compensation, which amounted to €5,780 million at 31 December 2015, was set out in the ministerial decision of 13 May 2016, amended on 2 December 2016. Under this schedule the receivable will be fully repaid by 2020. On 22 December 2016 EDF securitised a portion of this receivable (€1.5 billion) through a State-approved "Daily law" assignment. Consequently, since 1 January 2017 EDF has received 73.6% of payments made by the State in reimbursement of the receivable as set out in the repayment schedule. The remainder is paid directly to the assignees.

During 2018, the State paid EDF €1,217 million of the principal amount of the financial receivable, comprising €1,194 million relating to the 2018 repayment schedule and €23 million, paid on 2 January 2018, relating to the 2017 repayment schedule. The €1,194 million received corresponds to the amount due for 2018 under the repayment schedule. At 31 December 2018, EDF's share of the outstanding financial receivable amounted to €2,014 million.

Finally, in accordance with decree 2016-158 of 18 February 2016 concerning compensation for public energy service charges, on 12 July 2018 the CRE published its decision 2018-156 recording the public service charges for 2017 (€6,475 million) and providing a revised forecast of charges for 2018 (€6,940 million) and a forecast of charges for 2019 (€7,206 million).

## 4.5 FRENCH CAPACITY MECHANISM

The French capacity mechanism took effect on 1 January 2017. It was introduced by France's Energy Code to ensure secure national power supplies.

On 8 November 2016, the European Commission authorised France's proposed capacity mechanism subject to the country introducing 7-year certification contracts for new capacities, admitting foreign capacities, and taking measures to prevent any market manipulation.

Several auctions of capacity for 2018 were held on the European Power Exchange EPEX SPOT, in 2017 and 2018. The volumes traded amounted to 10.96GW in November 2017 for the price of €9.31/kW, 10.25GW in December 2017 for the price of €9.38/kW and 1.17GW in April 2018 for the price of €9.38/kW (the market reference price for 2018 was €9.34/kW).

Several auctions of capacity for 2019 were held on the European Power Exchange EPEX SPOT in 2017 and 2018. The volumes traded and the associated prices were as follows:

Auction date	Quantities in GW	Price in €/kW
December 2017	1.22	13.00
March 2018	1.24	18.50
April 2018	2.65	18.24
June 2018	4.99	18.50
September 2018	5.22	18.50
October 2018	5.48	16.77
December 2018	5.91	18.05

Following the auction of 13 December 2018, the last before the year of delivery, the reference price for 2019 is now known: it is €17.37/kW.

An over-the-counter market exists alongside these capacity auctions.

EDF has participated in these auctions since they began. All income from the auctions is recognised in full in sales of goods.

The capacity price is passed on through all EDF's customer contracts, whether the customers are on regulated sales tariff or market-price contracts, and also through other electricity suppliers' contracts.

## 4.6 ENERGY SAVINGS CERTIFICATES

Decree 2017-690 of 2 May 2017 issued by the French Ministry for the Environment, Energy and the Sea, published in the *Journal officiel* on 3 May 2017, set the obligation levels for the fourth period of energy savings obligations running from 1 January 2018 to 31 December 2020. The overall level of obligations for this three-year period was substantially increased by the decree: 1,200TWhc for the "standard" obligations and 400TWhc for the obligations that are intended to benefit households in situations of energy poverty, compared to 700TWhc and 150TWhc respectively for the previous period.

Energy sellers may fulfil their obligation in three ways: by supporting consumers in their energy efficiency operations, funding ministry-approved energy savings certificate schemes, and purchasing certificates from eligible actors. Any surplus "stock" of certificates gained in the previous period also counts towards fulfilment of the obligation. If there is a shortfall at the end of the period, obligated actors must pay the Treasury the fine of €15 per MWhc of shortfall laid down in Article L. 221-4 of the Energy Code, approximately twice the current cost of the standard obligation.

The EDF group achieved a substantially higher number of energy savings certificates in 2018 than in 2017, and will aim to increase it further in order to achieve the objective set by the State. However, given the significant increase in the level of the obligation, combined with the currently shallow market for energy savings certificates and doubts over that market's future liquidity, the Group is exposed to a risk of a shortfall in certificates for the fourth period of the scheme.

## 4.7 ARENH

ARENH applications for 2018 deliveries totalled 96.3TWh: 87.1TWh for supplies to final customers and 9.2TWh to compensate network operators for network losses.

These applications were made at a time when the ARENH price (which includes a capacity guarantee in its €42/MWh) was competitive in comparison to forward baseload prices for 2018 (from early September 2017).

For the ARENH applications of November 2018, total demand from alternative suppliers was above the legal maximum, at 132.98TWh excluding EDF subsidiaries, and EDF will deliver the maximum ARENH volume of 100TWh for supply to competitors' final customers in 2019. Subscriptions to cover network losses amounted to 20.4TWh.

In a decision no. 2018-222 of 25 October 2018, as required by the Energy Code the CRE set out the method for allocating ARENH volumes when applications exceed the legal maximum. This decision stipulated that if the ARENH was oversubscribed in November 2018, curtailment would only apply to new ARENH applications made in that session, and that EDF-controlled subsidiaries' excess applications would be fully curtailed (this does not apply to distributors). Finally, it stated that EDF-controlled subsidiaries could enter into contracts with the parent company replicating the ARENH system and the terms of supply, particularly the curtailment rate for alternative suppliers. This curtailment mechanism, when applied, makes reference to market prices more influential in determining regulated sales tariffs, and all other things being equal, also increases the price of the energy component.

### NOTE 5 CHANGES IN THE SCOPE OF CONSOLIDATION

There was no significant change in the Group's scope of consolidation during 2018, apart from the sale of Dunkerque LNG (see note 3.3), and the operations presented below:

#### 5.1 FRAMATOME – FINAL RECOGNITION OF THE BUSINESS COMBINATION

In application of IFRS 3 (revised), on 31 December 2018 the Group finalised its recognition of the business combination linked to the acquisition of Framatome on 31 December 2017.

As the final amount of certain purchase price adjustments will only be known after 31 December 2018, the Group has estimated the expected value of these items (see note 3.11.2) to finalise recognition of the business combination at 31 December 2018.

Any subsequent adjustments to the estimated fair value of the price will be included in profit and loss.

After fair value measurement of assets and liabilities, Framatome's final opening balance sheet at 31 December 2017, which is very similar to the provisional opening balance sheet shown in note 3.11.2, is as follows:

#### ASSETS

<i>(in millions of euros)</i>	<b>Final opening values</b>
Goodwill	-
Other intangible assets	1,272
Property, plant and equipment	1,096
Investments in associates and joint ventures	92
Financial assets	171
Deferred tax assets	132
Inventories	610
Trade receivables	4,422
Current tax assets	5
Other receivables	604
Cash and cash equivalents	-
<b>TOTAL ASSETS</b>	<b>8,404</b>

#### EQUITY AND LIABILITIES

<i>(in millions of euros)</i>	<b>Final opening values</b>
Capital	707
Consolidated reserves	147
<b>Equity – Group share</b>	<b>854</b>
Non-controlling interests	4
<b>Total equity</b>	<b>858</b>
Provisions	987
Financial liabilities	10
Deferred tax liabilities	172
Trade payables	455
Current tax liabilities	1
Other liabilities	5,921
<b>TOTAL EQUITY AND LIABILITIES</b>	<b>8,404</b>

This balance sheet for the Framatome subgroup is presented before elimination of positions with Group entities, which mainly concern trade receivables and other liabilities.

At 31 December 2018, the final purchase price was adjusted for the expected earn-out payment and purchase price adjustments.

The final goodwill recorded on the operation on 31 December 2018, under the partial goodwill method and based on a 75.5% ownership percentage, is determined as follows:

*(in millions of euros)*

Purchase price for the investment	1,960
<b>Consideration transferred at 31 December 2018 (A)</b>	<b>1,960</b>
Fair value of the Framatome assets acquired	645
<b>Fair value of assets acquired and liabilities assumed (B)</b>	<b>645</b>
<b>FINAL GOODWILL (A)-(B)</b>	<b>1,315</b>

## 5.2 ACQUISITION OF A 450MW OFFSHORE WIND PROJECT IN SCOTLAND

The EDF group, via EDF Renewables in the United Kingdom, a joint subsidiary of EDF Energy and EDF Renewables, has bought the "Neart na Gaoithe <sup>(1)</sup>" wind farm project from global wind and solar developer Mainstream Renewable Power, following a competitive bidding process.

This wind farm will generate up to 450 megawatts (MW) of renewable energy, enough to meet the annual electricity requirements of more than 375,000 homes <sup>(2)</sup>.

Neart na Gaoithe is a fully consented offshore wind project located in the Firth of Forth off the east coast of Scotland. It covers 105km<sup>2</sup>, and has a 15-year Contract for Difference at €140/MWh (resulting from indexation of the tariff of £114.39/MWh set in 2012), and grid connection agreements in place. It also benefits from one of the best wind regimes in Europe. The commissioning of the wind farm is planned for 2023.

The total investment required to deliver the project is around £1.8 billion. The project will be open to other investors in due course.

## 5.3 ACQUISITION BY EDISON OF EDISON ENERGIE (FORMERLY GAS NATURAL VENDITA ITALIA)

Following approval from the European Union, Edison finalised its acquisition of Edison Energie (formerly Gas Natural Vendita Italia (GNVI)) on 22 February 2018 and strengthened its position in the domestic market, increasing its customer base by 50% and expanding its presence throughout Italy. Edison Energie's portfolio is located primarily in Southern Italy and the majority consists of gas customers. With this transaction, Edison has strengthened its position as a key national energy operator in the retail sector. The price paid to acquire the company was €193 million (see note 44.1.2.2 to the consolidated financial statements at 31 December 2017), and the goodwill recognised on this acquisition amounts to €80 million.

Completion of the acquisition of Edison Energie paves the way for transfer to Edison of a contract for gas supplies from the Shah Deniz II field in Azerbaijan.

6.

<sup>(1)</sup> Neart na Gaoithe is Gaelic for "Strength of the Wind".

<sup>(2)</sup> Based on the average domestic electricity consumption per home of 3,889kWh per the Energy Consumption in the UK report (published in July 2017) and the average load factor for Renewable-UK offshore wind farms estimated at 37.2%.

### NOTE 6 SEGMENT REPORTING

#### 6.1 REPORTING BY OPERATING SEGMENT

Segment reporting presentation complies with IFRS 8, "Operating segments".

Segment reporting is presented before inter-segment eliminations. Inter-segment transactions take place at market prices.

In accordance with IFRS 8, the breakdown used by the EDF group corresponds to the operating segments as regularly reviewed by the Management Committee (the Group's chief operating decision-maker).

In 2018, the Group modified its segment reporting and now presents EDF Renewables and Dalkia separately (they were previously included in the "Other activities" segment).

The Group uses the following segments:

- **"France – Generation and Supply"**: EDF's energy production and sales activities, commodity trading, and other activities;

- **"France – Regulated activities"**: distribution, transmission, EDF's island activities and the activities of Electricité de Strasbourg;
- **"Framatome"**: the entities of the Framatome subgroup;
- **"United Kingdom"**: the entities of the EDF Energy subgroup;
- **"Italy"**: Edison entities and TdE SpA;
- **"Other international"**: EDF International and the other gas and electricity entities located in continental Europe, the US, Latin America and Asia;
- **"EDF Renewables"**: the entities of the EDF Renewables (formerly EDF Énergies Nouvelles) subgroup;
- **"Dalkia"**: the entities of the Dalkia subgroup;
- **"Other activities"**: comprising in particular EDF Trading and EDF Investissements Groupe.

No segments have been merged.

#### 6.1.1 At 31 December 2018

(in millions of euros)	France – Generation and Supply	France – Regulated activities	Frama- tome	United Kingdom	Italy	Other international	EDF Renewables <sup>(1)</sup>	Dalkia	Other activities	Inter- segment eliminations	Total
<b>Income statements:</b>											
External sales	24,937	16,007	1,904	8,965	8,477	2,227	1,089	3,633	1,737	-	68,976
Inter-segment sales	1,159	41	1,409	5	30	184	416	556	864	(4,664)	-
<b>TOTAL SALES</b>	<b>26,096</b>	<b>16,048</b>	<b>3,313</b>	<b>8,970</b>	<b>8,507</b>	<b>2,411</b>	<b>1,505</b>	<b>4,189</b>	<b>2,601</b>	<b>(4,664)</b>	<b>68,976</b>
<b>OPERATING PROFIT BEFORE DEPRECIATION AND AMORTISATION</b>											
	<b>6,327</b>	<b>4,916</b>	<b>465</b>	<b>783</b>	<b>791</b>	<b>240</b>	<b>856</b>	<b>292</b>	<b>858</b>	<b>(263)</b>	<b>15,265</b>
<b>OPERATING PROFIT</b>	<b>2,963</b>	<b>1,914</b>	<b>240</b>	<b>(397)</b>	<b>(127)</b>	<b>(10)</b>	<b>316</b>	<b>72</b>	<b>574</b>	<b>(263)</b>	<b>5,282</b>
<b>Balance sheet:</b>											
Goodwill	53	223	1,317	7,578	108	20	206	548	142	-	10,195
Intangible assets and property, plant and equipment	53,219	60,802	2,392	15,467	6,197	2,119	8,856	2,283	689	-	152,024
Investments in associates and joint ventures <sup>(2)</sup>	2,394	-	87	79	73	4,053	1,307	29	265	-	8,287
Other segment assets <sup>(3)</sup>	19,313	3,583	1,965	4,604	2,541	647	824	1,909	3,893	-	39,279
Assets classified as held for sale	-	-	-	-	-	-	-	-	-	-	-
Other non-allocated assets	-	-	-	-	-	-	-	-	-	-	73,384
<b>TOTAL ASSETS</b>	<b>74,979</b>	<b>64,608</b>	<b>5,761</b>	<b>27,728</b>	<b>8,919</b>	<b>6,839</b>	<b>11,193</b>	<b>4,769</b>	<b>4,989</b>	<b>-</b>	<b>283,169</b>
<b>Other information:</b>											
Net depreciation and amortisation	(3,307)	(2,942)	(211)	(982)	(574)	(249)	(437)	(205)	(99)	-	(9,006)
Impairment	(2)	-	(12)	(163)	(314)	-	(103)	-	(4)	-	(598)
Equity (non-controlling interests)	109	42	194	5,425	336	401	848	304	518	-	8,177
Investments in intangible assets and property, plant and equipment	5,526	4,334	261	2,983	447	216	1,919	388	112	-	16,186

(1) Formerly EDF Énergies Nouvelles.

(2) At 31 December 2018, investments in associates and joint ventures include 50.1% of the interests in CTE (the joint venture holding RTE's shares) which is part of the France – Generation and Supply segment.

(3) Other segment assets include inventories, trade receivables and other receivables. By convention, the CSPE receivable is totally allocated to the France – Regulated Activities segment, in the amount of €799 million.



### 6.1.2 At 31 December 2017

The segment reporting at 31 December 2017 has been restated in accordance with the changes in operating segments introduced for the consolidated financial statements at 31 December 2018 and the provisions of IFRS 15 (see note 2.1.4).

(in millions of euros)	France – Generation and Supply	France – Regulated activities	Frama- tome <sup>(1)</sup>	United Kingdom	Italy	Other international	EDF Renewables	Dalkia	Other activities	Inter- segment eliminations	Total
<b>Income statements:</b>											
External sales	24,011	15,773	-	8,681	7,700	2,993	971	3,271	1,492	-	64,892
Inter-segment sales	1,073	63	-	7	22	173	309	480	983	(3,110)	-
<b>TOTAL SALES</b>	<b>25,084</b>	<b>15,836</b>	<b>-</b>	<b>8,688</b>	<b>7,722</b>	<b>3,166</b>	<b>1,280</b>	<b>3,751</b>	<b>2,475</b>	<b>(3,110)</b>	<b>64,892</b>
<b>OPERATING PROFIT BEFORE DEPRECIATION AND AMORTISATION</b>											
	<b>4,896</b>	<b>4,898</b>	<b>-</b>	<b>1,035</b>	<b>910</b>	<b>457</b>	<b>751</b>	<b>259</b>	<b>536</b>	<b>-</b>	<b>13,742</b>
<b>OPERATING PROFIT</b>	<b>3,048</b>	<b>2,035</b>	<b>-</b>	<b>(296)</b>	<b>(96)</b>	<b>314</b>	<b>361</b>	<b>13</b>	<b>258</b>	<b>-</b>	<b>5,637</b>
<b>Balance sheet:</b>											
Goodwill	53	223	1,257	7,586	18	15	206	537	141	-	10,036
Intangible assets and property, plant and equipment	50,433	59,008	2,336	14,074	6,396	2,155	8,230	2,128	2,103	-	146,863
Investments in associates and joint ventures <sup>(2)</sup>	2,040	-	92	114	67	3,812	903	34	187	-	7,249
Other segment assets <sup>(3)</sup>	20,165	3,784	1,694	4,306	2,405	628	578	1,737	5,072	-	40,369
Assets classified as held for sale	-	-	-	-	-	-	-	-	-	-	-
Other non-allocated assets	-	-	-	-	-	-	-	-	-	-	67,325
<b>TOTAL ASSETS</b>	<b>72,691</b>	<b>63,015</b>	<b>5,379</b>	<b>26,080</b>	<b>8,886</b>	<b>6,610</b>	<b>9,917</b>	<b>4,436</b>	<b>7,503</b>	<b>-</b>	<b>271,842</b>
<b>Other information:</b>											
Net depreciation and amortisation	(3,138)	(2,797)	-	(1,097)	(603)	(246)	(361)	(187)	(108)	-	(8,537)
Impairment	(73)	-	-	(246)	(150)	(19)	(29)	(1)	-	-	(518)
Equity (non-controlling interests)	-	39	209	5,109	370	407	113	155	940	-	7,342
Investments in intangible assets and property, plant and equipment	5,839	4,003	-	2,408	457	325	1,190	392	133	-	14,747

(1) The Framatome group was acquired on 31 December 2017.

(2) At 31 December 2017, investments in associates and joint ventures included RTE in the France – Generation and Supply segment.

(3) Other segment assets include inventories, trade receivables and other receivables. By convention, the CSPE receivable is totally allocated to the France-Regulated Activities segment, in the amount of €1,147 million.

### 6.2 SALES TO EXTERNAL CUSTOMERS, BY PRODUCT AND SERVICE GROUP

The Group's sales are broken down by product and service group as follows:

- **"Generation/Supply"**: energy generation and energy sales to industry, local authorities, small businesses and residential consumers. This segment also includes commodity trading activities;
- **"Distribution"**: management of the low and medium-voltage public electricity distribution networks;

- **"Other"**: services and production of equipment and fuel for reactors, energy services (district heating, thermal energy services, etc.) for industry and local authorities, and new businesses mainly aimed at boosting electricity generation through cogeneration and renewable energy sources (e.g. wind turbines, photovoltaic panels, etc.).

(in millions of euros)	Generation – Supply	Distribution	Other <sup>(1)</sup>	Total
<b>2018:</b>				
External sales:				
■ France <sup>(2)</sup>	25,217	15,555	172	40,944
■ International and Other activities	21,392	-	6,640	28,032
<b>SALES</b>	<b>46,609</b>	<b>15,555</b>	<b>6,812</b>	<b>68,976</b>

(1) "Other" groups of services include Framatome, which was acquired on 31 December 2017 (see note 3.11.2).

(2) "France" comprises the two operating segments "France – Generation and Supply" and "France – Regulated activities" (see note 6.1).

(in millions of euros)	Generation – Supply	Distribution	Other	Total
<b>2017:</b>				
External sales:				
■ France <sup>(1)</sup>	24,327	15,292	165	39,784
■ International and Other activities	20,326	-	4,782	25,108
<b>SALES</b>	<b>44,653</b>	<b>15,292</b>	<b>4,947</b>	<b>64,892</b>

(1) "France" comprises the two operating segments "France – Generation and Supply" and "France – Regulated activities" (see note 6.1).

## INCOME STATEMENT

### NOTE 7 SALES

Sales are comprised of:

<i>(in millions of euros)</i>	2018	2017 restated <sup>(1)</sup>
Sales of energy and energy-related services	63,713	62,102
Other sales of goods and services	4,387	2,186
Trading	876	604
<b>SALES</b>	<b>68,976</b>	<b>64,892</b>

(1) The comparative figures at 31 December 2017 have been restated according to IFRS 15 (see note 2.1).

After elimination of changes in foreign exchange rates and the scope of consolidation, sales in 2018 increase by 4% or €2.6 billion, principally in the France – Generation and Supply segment (+3.9% or +€0.9 billion), and Italy (+6.1% or +€0.5 billion), and in general across all segments (adjusted contribution figures).

The rise in sales in the France – Generation and Supply segment in 2018 mainly reflects (i) higher net resales on the purchase obligation markets (neutral effect on the operating profit before depreciation and amortisation with the CSPE), largely due to a substantial volume effect, (ii) favourable price effects on market-price offers, (iii) and the higher energy savings certificate component of offers, in relation with the increase in the obligation cost. The marked increase in nuclear generation in 2018 (+14.1TWh) compared to 2017, which was adversely affected by several reactor outages, and the increase in hydropower generation (+9.2TWh net),

essentially reduced the Group's net buyer position (in euros) on the markets compared to 2017. These factors are favourable for the operating profit before depreciation and amortisation but are not reflected in the change in sales between 2017 and 2018, as the Group was in a net buyer position (in euros) in both years.

In Italy, sales increased due to a favourable volume movement on the business customer segment, and higher hydropower production following better hydrological conditions and very positive price effects on gas and exploration-production activities, driven by favourable changes in Brent and gas prices.

The effect on other sales of goods and services of the first consolidation of Framatome, which was acquired at 31 December 2017, amounted to €1,904 million.

6.

### NOTE 8 FUEL AND ENERGY PURCHASES

Fuel and energy purchases comprise:

<i>(in millions of euros)</i>	2018	2017 restated <sup>(1)</sup>
Fuel purchases used – power generation	(12,337)	(12,167)
Energy purchases	(13,351)	(13,816)
Transmission and delivery expenses	(7,724)	(7,441)
Gain/loss on hedge accounting	(18)	80
(Increase)/decrease in provisions related to nuclear fuels and energy purchases	418	443
<b>FUEL AND ENERGY PURCHASES</b>	<b>(33,012)</b>	<b>(32,901)</b>

(1) The comparative figures at 31 December 2017 have been restated according to IFRS 15 (see note 2.1).

Fuel purchases used include costs relating to raw materials for energy generation (coal, biomass, oil, propane, fissile materials, nuclear fuels and gas), purchases of services related to the nuclear fuel cycle, and costs associated with environmental schemes (mainly greenhouse gas emission rights and renewable energy certificates).

Energy purchases include energy generated by third parties, incorporating energy derived from cogeneration intended for resale.

### NOTE 9 OTHER EXTERNAL EXPENSES

Other external expenses comprise:

<i>(in millions of euros)</i>	2018	2017
External services	(13,189)	(11,678)
Other purchases (excluding external services, fuel and energy)	(3,504)	(2,706)
Change in inventories and capitalised production	7,139	5,485
(Increase)/decrease in provisions on other external expenses	190	160
<b>OTHER EXTERNAL EXPENSES</b>	<b>(9,364)</b>	<b>(8,739)</b>

After elimination of changes in foreign exchange rates and the scope of consolidation (mainly concerning Framatome in 2018), other external expenses are stable compared to 2017.

## NOTE 10 PERSONNEL EXPENSES

### 10.1 PERSONNEL EXPENSES

Personnel expenses comprise:

<i>(in millions of euros)</i>	2018	2017
Wages and salaries	(8,776)	(7,790)
Social contributions	(1,963)	(1,844)
Employee profit sharing	(278)	(223)
Other contributions related to personnel	(388)	(383)
Other expenses linked to short-term benefits	(233)	(212)
<b>Short-term benefits</b>	<b>(11,638)</b>	<b>(10,452)</b>
Expenses under defined-contribution plans	(1,033)	(938)
Expenses under defined-benefit plans	(1,017)	(994)
<b>Post-employment benefits</b>	<b>(2,050)</b>	<b>(1,932)</b>
Other long-term expenses	-	(83)
Termination payments	(2)	11
<b>Other personnel expenses</b>	<b>(2)</b>	<b>(72)</b>
<b>PERSONNEL EXPENSES</b>	<b>(13,690)</b>	<b>(12,456)</b>

Excluding foreign exchange effects and changes in the scope of consolidation (principally concerning Framatome in 2018), personnel expenses decreased by 0.6% from 2017, chiefly in the France – Generation and supply segment.

### 10.2 AVERAGE WORKFORCE

	2018	2017
IEG status	98,358	100,185
Other	63,850	50,888
<b>AVERAGE WORKFORCE</b>	<b>162,208</b>	<b>151,073</b>

The Group's average workforce for 2017 presented in the above table does not include the effect of acquisition of Framatome, due to the date of the acquisition (31 December 2017).

Average workforce numbers for the controlled entities and joint operations are reported on a full-time equivalent basis.

A more detailed presentation of workforce categories can be found in the "Environmental and Societal Information – Human Resources" section of the Reference Document in section 3.9.3.2.3, "Social indicators".

## NOTE 11 TAXES OTHER THAN INCOME TAXES

Taxes other than income taxes break down as follows:

<i>(in millions of euros)</i>	2018	2017
Payroll taxes	(297)	(267)
Energy taxes	(1,561)	(1,518)
Other non-income taxes	(1,839)	(1,756)
<b>TAXES OTHER THAN INCOME TAXES</b>	<b>(3,697)</b>	<b>(3,541)</b>

Taxes other than income taxes mainly concern France and essentially comprise land tax and the French business taxes on land and value added.

## NOTE 12 OTHER OPERATING INCOME AND EXPENSES

Other operating income and expenses comprise:

<i>(in millions of euros)</i>	Notes	2018	2017
Operating subsidies	12.1	6,846	6,823
Net income on deconsolidation	12.2	194	214
Gains on disposal of fixed assets	12.2	54	57
Net increase in provisions on current assets		73	42
Net increase in provisions for operating contingencies and losses		(132)	137
Other items	12.3	(983)	(786)
<b>OTHER OPERATING INCOME AND EXPENSES</b>		<b>6,052</b>	<b>6,487</b>

### 12.1 OPERATING SUBSIDIES

This item mainly comprises the subsidy received or receivable by EDF in respect of the CSPE, reflected in the financial statements through recognition of income of €6,554 million for 2018 (€6,547 million for 2017).

### 12.2 NET INCOME ON DECONSOLIDATION AND GAINS ON DISPOSAL OF FIXED ASSETS

In 2018, net income on deconsolidation and gains on disposal of property, plant and equipment mainly includes:

- gains on sales of EDF Renewables' generation assets as part of the Development and Sale of Structured Assets (DSSA) activities, amounting to €192 million (€180 million for 2017);
- gains on sales of real estate assets in France, amounting to €262 million (€307 million in France and Italy for 2017).

### 12.3 OTHER ITEMS

Other items principally comprise losses on non-recoverable operating receivables and costs associated with the energy savings certificates used or consumed over the year. The unfavourable development in other items in 2018 is mainly explained by a rise in costs related to energy savings certificates.



## NOTE 13 IMPAIRMENT/REVERSALS

### 13.1 IMPAIRMENT BY CATEGORY OF ASSET

Details of impairment recognised and reversed are as follows:

<i>(in millions of euros)</i>	Notes	2018	2017
Impairment of goodwill	18	-	-
Impairment of other intangible assets	19	(52)	(16)
Impairment of tangible assets and discontinued operations	21-22-43	(546)	(502)
<b>IMPAIRMENT NET OF REVERSALS</b>		<b>(598)</b>	<b>(518)</b>

In 2017, the €(518) million of impairment recorded concerned:

- thermal assets: €(188) million in the United Kingdom;
- some of Edison's exploration and production fields: €(150) million;
- other impairment on specific assets: €(131) million (notably concerning real estate assets in the United Kingdom and France, and hydropower projects in France);
- various CGUs of EDF Renewables (particularly a specialist battery company in the United States): €(29) million.

Impairment of €(618) million was also booked at 31 December 2017 in respect of associates (see note 23).

In 2018, impairment amounts to €(598) million. Details are given below.

### 13.2 IMPAIRMENT TESTS ON GOODWILL, INTANGIBLE ASSETS AND PROPERTY, PLANT AND EQUIPMENT

The following tables present the results of impairment tests carried out on the main goodwill, intangible assets with indefinite useful lives and other Group assets in 2018, and some of the key assumptions used.

As reported in note 3.11.2, the Group finalised allocation of the purchase price paid for 75.5% of the capital of Framatome on 31 December 2018. The assets acquired, mainly goodwill, intangible assets and property, plant and equipment, were recorded at fair value at the acquisition date of 31 December 2017.

The work done for the impairment tests applied at 31 December 2018 did not indicate that these amounts required adjustment.

#### IMPAIRMENT OF GOODWILL AND INTANGIBLE ASSETS WITH INDEFINITE USEFUL LIVES

Operating segment	Cash-Generating Unit or asset	Net book value <i>(in millions of euros)</i>	WACC after tax	Growth rate to infinity	Impairment 2018 <i>(in millions of euros)</i>
United Kingdom	EDF Energy goodwill	7,604			
	British Energy brand	34	6.3%	-	(34)
6.5%(distribution) – 8.9%(exploration-production)					
Italy	Edison brand	945		2.0%	-
Dalkia	Dalkia goodwill	550	4.4%	1.7%	-
	Dalkia brand	130	4.9%	1.7%	-
<b>IMPAIRMENT OF GOODWILL AND INTANGIBLE ASSETS WITH INDEFINITE USEFUL LIVES</b>					<b>(34)</b>

#### IMPAIRMENT OF OTHER INTANGIBLE ASSETS AND PROPERTY, PLANT AND EQUIPMENT

Operating segment	Cash-Generating Unit or asset	Impairment indicators	WACC after tax	Impairment 2018 <i>(in millions of euros)</i>
United Kingdom	Coal-fired plants	CCGT Fall in clean spark spread and temporary suspension of the capacity market mechanism		(106)
		Fall in clean dark spread and temporary suspension of the capacity market mechanism	6.3%	(16)
Italy	E&P Edison assets	Decline in the long-term outlook for Brent oil prices, and production profiles for each field	6.9% – 10.4% depending on the country	(308)
EDF Renewables	EDF Renewables CGU		4.2% – 6.4%	(103)
Other impairment				(31)
<b>IMPAIRMENT OF OTHER INTANGIBLE ASSETS AND PROPERTY, PLANT AND EQUIPMENT</b>				<b>(564)</b>

## General assumptions

Note 1.3.15 explains the methodology used by the Group for impairment testing.

The WACC in the benchmark countries was stable overall compared to 31 December 2017. In core Euro zone countries (especially France and Belgium), the effect of lower tax rates was offset by the slight downturn in risk-free rates and the country risk. In the United Kingdom and Italy, the WACC remained stable despite the impacts of tax reforms, and country risk premiums remain at the same level as 2017. Test results are subjected to analyses of sensitivity to the discount rate.

The market environment in 2018 was significantly better than in 2017, with a substantial rise in electricity market prices. Commodity prices rose in 2018, although at a slower pace in the second half of the year. CO<sub>2</sub> prices also registered a sharp rise, particularly under the influence of the Market Stability Reserve.

On the market horizon, forward prices were also markedly higher than the price levels used in the previous medium-term plan.

Over the long-term horizon, however, visibility of fundamentals was lower year-on-year, as the benchmark scenario incorporated more pronounced environmental objectives, notably European targets, which reduced demand for fossil fuels. The fuel and electricity price trajectories used in impairment testing are thus lower than last year in the core countries despite the impacts of the ETS (EU Emissions Trading System), with a larger downward adjustment in the United Kingdom due to a more cautious approach to the continued existence of the Carbon Price Support mechanism. As these assumptions are crucial in determining recoverable value, sensitivity analyses are applied to long-term price curves when impairment tests are undertaken.

In addition, the capacity mechanisms introduced under different approaches in different countries are still an uncertain channel for restoring sufficient income levels on certain generation assets. No capacity mechanism has yet been adopted in Italy, for example. In the United Kingdom, the Capacity Market was suspended on 18 November 2018 by a decision of the European Court of Justice ruling that it was incompatible with European rules on State aid. The impairment test applied assumes that a new system will be set up from the second half-year of 2019, in line with the British government's objective of holding further auctions in summer 2019 for deliveries in 2019/2020.

At 31 December 2018, the macro-economic context presented above does not introduce any major risk for the Group in addition to the risks already noted in previous years' financial statements; the impairment booked reflects risks specific to certain CGUs or specific assets.

## United Kingdom – EDF Energy

### British Energy brand

The British Energy brand is fully depreciated at 31 December 2018, as the prospects for its use are currently very limited.

### Thermal assets

Significant amounts of impairment have been booked in recent years in respect of the Group's thermal assets in England, notably reducing the net book value of coal-fired plants and gas storage facilities practically to zero. Investments made in the Cottam and West Burton A coal-fired plants have been totally depreciated for an amount of €(16) million, consistent with the decisions of 2017 to close these plants early. On 7 February 2019 EDF Energy announced that it had decided to close the Cottam coal-fired plant.

At 31 December 2018, the temporary suspension of the British Capacity Market, and in the longer term, prospects of lower capacity prices and clean spark spreads than forecast at the end of 2017 led to the recognition of additional impairment on the West Burton B CCGT plant (€(106) million). The value of this asset is sensitive to price variations; a 5% variation in clean spark spreads would have an impact of approximately 5% on the recoverable value of the West Burton B CCGT plant.

## Nuclear assets (plants in operation and the Hinkley Point C project) and goodwill

The recoverable value of existing nuclear assets (7 power plants) is estimated by discounting future cash flows over the assets' useful life, assuming a 20-year extension for the Sizewell B PWR plant (other, Advanced Gas-cooled Reactor (AGR) plants have already had their useful life extended by the British Nuclear Authority, the most recent decisions dating from February 2016). The level of production assumed for the test is coherent with the high nuclear plant availability of the past few years, although the level in 2018 was lower due to certain specific events. The recoverable value of EDF Energy's nuclear fleet has declined compared to 2017, mostly in line with long-term downward price trajectories, but is still higher than the assets' net book values. A 5% variation in electricity prices compared to the trajectory assumed for the test would have a 14% impact on the assets' recoverable value, without affecting the margin resulting from the test.

EDF Energy's goodwill amounted to €7.6 billion (or €6.7 billion) at 31 December 2018 and mainly resulted from the takeover of British Energy in 2009.

The recoverable value of EDF Energy is estimated by discounting future cash flows over the assets' expected useful life, taking into consideration the plan to construct two EPRs with a 60-year useful life at the Hinkley Point site, a project for which the final contracts were signed on 29 September 2016. Future cash flows relating to these plants are determined by reference to the Contract for Difference (CfD) between the Group and the UK government. The CfD sets stable, predictable prices for EDF Energy for a period of 35 years from the date the two EPRs are first commissioned: if market prices fall below the CfD exercise price, EDF Energy will receive an additional payment.

The 2018 impairment test, like the 2017 test, incorporates the latest estimates of revised project costs (see the press release of 3 July 2017) i.e. total project completion costs (excluding borrowing costs and exchange rate effects compared to the project's benchmark rate of £1=€1.23) of £19.6 billion (in 2015 sterling), £1.5 billion more than previous estimates, still assuming delivery of Unit 1 by the end of 2025. This estimate also assumes successful completion of operational action plans in partnership with suppliers. EDF's projected rate of return (IRR) is estimated at 8.5% (compared to about 9% initially).

Apart from the above information on medium and long-term price prospects, in 2018 the recoverable value of EDF Energy also reflects lower assumptions regarding downstream margins, in line with the introduction of the cap on the Standard Variable Tariff, and in the longer term, margin rates considered relatively small on the British market. On these bases, the difference between the recoverable value and the book value of EDF Energy remains significant at 31 December 2018.

For HPC, the project review also identified a risk of deferral of the Commercial Operation Date (COD), estimated at 15 months for Unit 1 and 9 months for Unit 2, entailing an additional potential cost of around £0.7 billion (in 2015 sterling) which would lead to an IRR for EDF of around 8.2%. This risk of deferral and the associated additional cost would reduce the margin resulting from the EDF Energy impairment test by approximately 20%.

Further sensitivity analyses were also conducted for information purposes, for example based on a 4-year deferral of commissioning and an associated additional cost of £4 billion over the new benchmark business plan. The results do not call into question the book value of EDF Energy.

Although the Brexit decision has no immediate impact on EDF Energy's impairment tests since most cash flows (receipts, costs, investments) and assets are stated in pounds sterling, it is still difficult at this stage to anticipate the long-term consequences, given the uncertainties over the timing and terms of the UK's departure from the European Union. The Group will monitor movements in the rates of return demanded by investors and changes in fuel prices, CO<sub>2</sub> prices and macro-economic data such as GDP growth, which could affect price curves.

### Italy – Edison

As an intangible asset with an indefinite useful life, the Edison brand, first recognised at the value of €945 million when Edison was taken over in 2012, was subjected to an impairment test that did not identify any risk of impairment. This test used the royalty relief method. An external study of the brand value was also conducted and concluded that the brand's value in use is higher than its net book value.

At 31 December 2018, the recoverable value of certain "electricity" assets was improving due to a favourable short-term market environment (hydropower assets), and investments in high-return projects (wind power assets). The recoverable value of thermal assets, in contrast, declined due to slightly lower long-term forecasts concerning capacity prices and auxiliary services, but this did not affect the margin resulting from the test.

However, additional risks amounting to €(308) million were identified in 2018 concerning certain exploration-production fields, principally affected by a deterioration in long-term prospects for Brent oil prices, and in some cases by revision of production profiles.

Sensitivity analyses conducted as part of the impairment tests produced the following information:

- for "merchant" electricity generation assets, a 10% decrease in electricity prices or a 50 base point increase in the WACC would cause a maximum risk of around €(30) million, or less than 2% of the book value of these assets;
- for exploration and production assets, a 5% decrease in commodity prices would generate an additional risk of some €(60) million.

### EDF Renewables

In 2018, impairment of €(103) million was recorded in respect of the various CGUs of EDF Renewables. It mainly concerns a wind farm and a biomass technology firm in the United States.

### Dalkia

Dalkia's goodwill amounted to €550 million at 31 December 2018, and mainly resulted from acquisition of the Dalkia group in France under the agreement of 25 March 2014 with Veolia Environnement.

The recoverable value of the Dalkia group is based on future cash flows projected over a medium-term horizon, and a terminal value that represents cash flow projections to infinity. According to revised assumptions for 2018, the recoverable value remains higher than the book value. The key parameters of the test are the calculation method for the terminal value, and the discount rate: both were subjected to sensitivity analyses and the results did not affect the positive difference between the recoverable value and the book value.

The Dalkia brand, recognised as an asset when the Group took control of Dalkia in 2014 at the value of €130 million, is estimated by the royalties relief method. An updated test at 31 December 2018 showed that this book value is justified.

### France – Generation and supply

The integrated management and interdependence of the different generation facilities that make up the French fleet (nuclear, thermal and hydropower plants), independently of their maximum technical capacities, have led the Group to consider the entire fleet as a single CGU. This CGU does not include any goodwill.

Even when there is no indication of any loss of value, an impairment test is performed due to the highly significant value of this CGU in the Group's financial statements and its substantial exposure to market prices since discontinuation of the "yellow" and "green" regulated tariffs on 1 January 2016.

The recoverable value of the generation fleet is estimated by discounting future cash flows under the Group's usual methodology, described in note 1.3.15, over the assets' useful life, using an after-tax WACC of 5.2% at 31 December 2018. For nuclear assets currently in operation (except for Fessenheim), the Group's basic valuation assumes that the useful life is extended to 50 years, in line with its industrial strategy. The nuclear capacity remains subject to a ceiling of 63.2GW in the test, consistent with France's Energy Transition Law.

The assumption of stable returns on capacity of €10/KW is adopted over a long-term horizon, in line with the analysis of system fundamentals used in the benchmark scenario. The average auction price achieved in 2018 was €18/KW.

The impairment test indicated a significant positive difference between the recoverable value and the book value of the generation fleet in France, supported by the rise in electricity prices on the market horizon and implementation of savings plans. The margin resulting from the test is down slightly from 31 December 2017, principally due to lower long-term price scenarios, and because in the short term the ARENH system cannot capture all the value associated with higher forward prices.

The key assumptions used in the test include the useful life of nuclear assets, the long-term price scenario, the discount rate, developments in costs and investments, and the assumed capacity premium. Each of these assumptions has been subjected to a sensitivity analysis, which does not call into question the existence of a positive difference between the recoverable value and book value. The test conducted at 31 December 2018 also took into consideration the sensitivity associated with the proposals for early closures of certain nuclear plants, as set out in the proposed multi-year energy programme. This did not affect the conclusions of the test.

### Other International – Belgium

The impairment test applied to EDF Luminus did not indicate any risk of impairment. However, the margin resulting from the test is adversely affected by the Tihange 2 and 3 and Doel 3 and 4 nuclear assets, in which EDF Luminus owns a 10.2% share.

Finally, impairment of €(39) million was booked in respect of associates at 31 December 2018. Details are given in note 23.

## NOTE 14 OTHER INCOME AND EXPENSES

Other income and expenses amount to €(105) million for 2018, mainly including a gain of €755 million on the sale of Dunkerque LNG and an allocation of €(737) million to provisions for onerous contract associated with the long-term contract with Dunkerque LNG, giving a net impact of €18 million (see note 3.3). Other income and expenses also include €(36) million of exceptional solidarity

bonuses in France, and €(15) million resulting from the adjustment of EDF Energy's guaranteed minimum pension scheme (see note 31.3.1).

Other income and expenses amounted to €1,363 million for 2017, mainly including a gain of €1,462 million on the sale of 49.9% of the Group's investment in CTE.

## NOTE 15 FINANCIAL RESULT

### 15.1 COST OF GROSS FINANCIAL INDEBTEDNESS

Details of the components of the cost of gross financial indebtedness are as follows:

<i>(in millions of euros)</i>	2018	2017
Interest expenses on financing operations	(1,769)	(1,869)
Change in the fair value of derivatives and hedges of liabilities	(93)	37
Transfer to income of changes in the fair value of cash flow hedges	102	31
Net foreign exchange gain on indebtedness	44	23
<b>COST OF GROSS FINANCIAL INDEBTEDNESS</b>	<b>(1,716)</b>	<b>(1,778)</b>

### 15.2 DISCOUNT EFFECT

The effect of unwinding the discount primarily concerns provisions for the back-end of the nuclear cycle, decommissioning and last cores, and long-term and post-employment employee benefits.

The increase in the discount effect at 31 December 2018 reflects a decrease in the real discount rate used for nuclear provisions in France that was more pronounced in 2018 than 2017 (see note 29.1)

Details of the final discount effect are as follows:

<i>(in millions of euros)</i>	2018	2017
Provisions for long-term and post-employment employee benefits	(875)	(884)
Provisions for the back-end of the nuclear cycle, decommissioning and last cores <sup>(1)</sup>	(2,480)	(1,968)
Other provisions and advances	(131)	(107)
<b>DISCOUNT EFFECT</b>	<b>(3,486)</b>	<b>(2,959)</b>

(1) Including the effect of discounting the receivable corresponding to amounts reimbursable by the NLF – see note 36.3.

### 15.3 OTHER FINANCIAL INCOME AND EXPENSES

Other financial income and expenses comprise:

<i>(in millions of euros)</i>	2018	2017
Financial income on cash and cash equivalents	13	21
Gains/(losses) on other financial assets (including loans and financial receivables)	254	295
Gains/(losses) on debt and equity securities	496	-
Changes in financial instruments carried at fair value through profit and loss	(995)	(102)
Gains/(losses) on available-for-sale financial assets	-	1,395
Other financial expenses	(261)	(52)
Foreign exchange gain/loss on financial items other than debts	(91)	(41)
Return on fund assets	475	470
Capitalised borrowing costs	502	515
<b>OTHER FINANCIAL INCOME AND EXPENSES</b>	<b>393</b>	<b>2,501</b>

In application of the simplified approach allowed by IFRS 9, the comparative figures for the first year of application have not been restated. Consequently, in 2018, "gains/(losses) on debt and equity securities" include dividends and interest income

of €494 million on debt securities, and net gains of €2 million on sales (including €(12) million on dedicated assets).

In 2017, dividends and interest income on debt securities, and net gains (losses) on sales, were presented under "Gains/(losses) on available-for-sale financial assets" and amounted to €410 million.

Other financial income and expenses in 2018 include €(995) million of changes in fair value on financial instruments. In a context of market decline, particularly at the end of 2018, this unfavourable difference is explained by a €(1,026) million change in the fair value of debt and equity securities (of which €(989) million concern

dedicated assets) and a €31 million change in the fair value of derivatives. In 2017, other changes in the fair value of financial instruments amounted to €(102) million including €(42) million relating to dedicated assets, and principally concerned derivatives held for trading.

Conversely, "Gains/(losses) on available-for-sale financial assets" in 2017 included net gains of €985 million on disposals (entirely attributable to dedicated assets).

## NOTE 16 INCOME TAXES

### 16.1 BREAKDOWN OF TAX EXPENSE

Details are as follows:

<i>(in millions of euros)</i>	2018	2017
Current tax expense	(358)	42
Deferred taxes	507	(189)
<b>TOTAL</b>	<b>149</b>	<b>(147)</b>

In 2018, €(168) million of the current tax expense relates to French companies, and €(190) million relates to other subsidiaries (€314 million and €(272) million respectively in 2017).

### 16.2 RECONCILIATION OF THE THEORETICAL AND EFFECTIVE TAX EXPENSE (TAX PROOF)

<i>(in millions of euros)</i>	2018	2017
<b>Income of consolidated companies before tax</b>	<b>473</b>	<b>3,401</b>
Income tax rate applicable to the parent company	34.43%	34.43%
<b>Theoretical tax expense</b>	<b>(163)</b>	<b>(1,171)</b>
Differences in tax rate <sup>(1)</sup>	(90)	51
Permanent differences <sup>(2)</sup>	30	476
Taxes without basis <sup>(3)</sup>	239	478
Unrecognised deferred tax assets	132	20
Other	1	(1)
<b>ACTUAL TAX EXPENSE</b>	<b>149</b>	<b>(147)</b>
<b>EFFECTIVE TAX RATE</b>	<b>-31.54%</b>	<b>4.32%</b>

The income tax receivable of +€149 million in 2018, corresponding to an effective tax rate of -31.54% (compared to a charge of €(147) million in 2017, corresponding to an effective tax rate of 4.32%) essentially results from non-recurring items (disposals or impairment). After elimination of these non-recurring items, the effective current tax rate for 2018 is 25.70%, compared to 18% in 2017.

The main factors explaining the difference between the theoretical tax rate and this effective rate are:

#### ■ 2018:

- <sup>(2)</sup> the favourable impact of sales of investments and assets subject to a reduced tax rate, amounting to €199 million (principally Dunkerque LNG - see note 3.3),
- <sup>(3)</sup> the impact of deduction of payments made to bearers of perpetual subordinated bonds, amounting to €203 million;

#### ■ 2017:

- <sup>(1)</sup> the positive impacts of income tax cuts in Belgium (from 33.99% to 25% in 2020) and the United States (from 40% to 27%), amounting to €38 million and €46 million respectively,
- <sup>(2)</sup> the favourable impact of sales of investments (principally the CTE/RTE operation) and assets subject to a reduced tax rate, amounting to €389 million,
- <sup>(3)</sup> the favourable impact of the appeal concerning the 3% contribution on dividend distributions, amounting to €255 million (and non-taxable) and the impact of deduction of payments made to bearers of perpetual subordinated loans, amounting to €195 million.



### 16.3 CHANGE IN DEFERRED TAX ASSETS AND LIABILITIES

<i>(in millions of euros)</i>	2018	2017
Deferred tax assets	1,220	1,641
Deferred tax liabilities	(2,362)	(2,272)
<b>Net deferred taxes at 1 January</b>	<b>(1,142)</b>	<b>(631)</b>
Change in net income	508	(189)
Change in equity	(354)	(437)
Translation adjustments	23	61
Changes in scope of consolidation	(28)	22
Other movements	(16)	32
<b>NET DEFERRED TAXES AT 31 DECEMBER</b>	<b>(1,009)</b>	<b>(1,142)</b>
Deferred tax assets	978	1,220
Deferred tax liabilities	(1,987)	(2,362)

€(309) million of the change in 2018 in deferred tax assets included in equity results from actuarial gains and losses on post-employment benefits (€(349) million in 2017).

### 16.4 BREAKDOWN OF DEFERRED TAX ASSETS AND LIABILITIES BY NATURE

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
<b>Deferred taxes:</b>		
Fixed assets	(5,627)	(5,419)
Provisions for employee benefits	4,493	5,203
Other provisions and impairment	557	378
Financial instruments	172	163
Tax loss carryforwards and unused tax credits	1,448	1,289
Other	187	132
<b>Total deferred tax assets and liabilities</b>	<b>1,230</b>	<b>1,746</b>
Unrecognised deferred tax assets	(2,239)	(2,888)
<b>NET DEFERRED TAXES</b>	<b>(1,009)</b>	<b>(1,142)</b>

At 31 December 2018, unrecognised deferred tax assets represent a potential tax saving of €2,239 million (€2,888 million at 31 December 2017), mainly relating to France and the United States.

In France, this potential tax saving, which amounts to €1,449 million at 31 December 2018 (€2,043 million at 31 December 2017), essentially concerns deferred tax assets on employee benefits. These deferred tax assets have no expiry date.

In the United States, this potential tax saving amounts to €485 million (€499 million in 2017) and relates to negative taxable earnings generating losses which can be carried forward until dates between 2029 and 2039.

Recognised deferred tax assets on tax loss carryforwards amount to €662 million (€497 million in 2017) and principally concern the United States (€230 million in 2018, €199 million in 2017), France (€214 million in 2018, €51 million in 2017), Canada and Belgium. They have been recognised due to the existence of deferred tax liabilities on the same tax entities that will reverse over the same time horizon, or because there are prospects of taxable profits.

## NOTE 17 BASIC EARNINGS PER SHARE AND DILUTED EARNINGS PER SHARE

The diluted earnings per share is calculated by dividing the Group's share of net income, corrected for dilutive instruments and the payments made during the year to bearers of perpetual subordinated bonds, by the weighted average number of potential shares outstanding over the period after elimination of treasury shares.

The following table shows the reconciliation of the basic and diluted earnings used to calculate earnings per share (basic and diluted), and the variation in the weighted average number of shares used in calculating basic and diluted earnings per share:

<i>(in millions of euros)</i>	2018	2017
Net income attributable to ordinary shares	1,177	3,173
Payments on perpetual subordinated bonds	(584)	(565)
Effect of dilutive instruments	-	-
<b>Net income used to calculated earnings per share</b>	<b>593</b>	<b>2,608</b>
<b>Average weighted number of ordinary shares outstanding during the year</b>	<b>2,968,327,473</b>	<b>2,660,243,412</b>
<b>Average weighted number of diluted shares outstanding during the year</b>	<b>2,968,327,473</b>	<b>2,660,243,412</b>
<b>Earnings per share (in euros):</b>		
<b>EARNINGS PER SHARE</b>	<b>0.20</b>	<b>0.98</b>
<b>DILUTED EARNINGS PER SHARE</b>	<b>0.20</b>	<b>0.98</b>

In 2018, the payment of the outstanding scrip dividend for 2017 led to an increase in the share capital and an issue premium totalling €847 million, corresponding to the issuance of 82,828,872 shares.

## OPERATING ASSETS AND LIABILITIES, EQUITY

### NOTE 18 GOODWILL

#### 18.1 CHANGES IN GOODWILL

Goodwill on consolidated entities comprises the following:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
<b>Net book value at opening date</b>	<b>10,036</b>	<b>8,923</b>
Acquisitions	116	1,396
Disposals	-	-
Impairment (note 13)	-	-
Translation adjustments	(61)	(282)
Other changes	104	(1)
<b>NET BOOK VALUE AT CLOSING DATE</b>	<b>10,195</b>	<b>10,036</b>
Gross value at closing date	10,960	10,802
Accumulated impairment at closing date	(765)	(766)

The changes in goodwill in 2018 primarily related to:

- the change in goodwill following finalisation of the business combination accounts for the acquisition of Framatome at 31 December 2017 (€58 million) (see notes 5.1 and 3.11.2);
- Edison's acquisition of Edison Energie (formerly GNVI) in Italy (€80 million) (see note 5.3) and Attiva (€13 million);

- translation adjustments of €(61) million, largely reflecting the pound sterling's decline against the Euro.

The changes in goodwill in 2017 primarily related to the acquisition of Framatome for €1,257 million, (see note 3.11.2) and the translation adjustments of €(282) million, largely reflecting the pound sterling's decline against the Euro.

#### 18.2 GOODWILL BY OPERATING SEGMENT

The breakdown of goodwill between the new segments as presented in note 6.1 is as follows:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
<b>France – Generation and supply</b>	<b>53</b>	<b>53</b>
<b>France – Regulated activities</b>	<b>223</b>	<b>223</b>
<b>Framatome<sup>(1)</sup></b>	<b>1,317</b>	<b>1,257</b>
<b>United Kingdom (EDF Energy)</b>	<b>7,578</b>	<b>7,586</b>
<b>Italy</b>	<b>108</b>	<b>18</b>
<b>Other international</b>	<b>20</b>	<b>15</b>
<b>Dalkia</b>	<b>548</b>	<b>536</b>
<b>EDF Renewables</b>	<b>206</b>	<b>206</b>
<b>Other activities</b>	<b>142</b>	<b>142</b>
<b>GROUP TOTAL</b>	<b>10,195</b>	<b>10,036</b>

(1) At 31 December 2018, €1,315 million results from the acquisition of Framatome (see note 5.1).

## NOTE 19 OTHER INTANGIBLE ASSETS

The net value of other intangible assets breaks down as follows:

### At 31 December 2018

<i>(in millions of euros)</i>	31/12/2017	Acquisitions	Disposals	Translation adjustments	Changes in scope	Other movements	31/12/2018
Software	4,034	774	(165)	(10)	24	7	4,664
Positive fair value of commodity contracts acquired in a business combination	810	-	-	-	-	(229)	581
Greenhouse gas emission rights – green certificates	440	1,144	(1,082)	(2)	-	1	501
Other intangible assets	7,501	1,023	(40)	(11)	214	33	8,720
Intangible assets in development <sup>(1)</sup>	1,211	32	(6)	1	-	(5)	1,233
<b>Gross value</b>	<b>13,996</b>	<b>2,973</b>	<b>(1,293)</b>	<b>(22)</b>	<b>238</b>	<b>(193)</b>	<b>15,699</b>
Accumulated amortisation and impairment	(5,100)	(1,109)	170	15	2	241	(5,781)
<b>NET VALUE</b>	<b>8,896</b>	<b>1,864</b>	<b>(1,123)</b>	<b>(7)</b>	<b>240</b>	<b>48</b>	<b>9,918</b>

(1) Increases in intangible assets in development are presented net of the effect of commissioning new assets.

The gross value of other intangible assets at 31 December 2018 includes:

- the Edison brand and intangible assets related to Edison's hydropower concessions, amounting to €945 million and €729 million respectively;
- the Dalkia brand and intangible assets related to Dalkia's concession agreements in France, amounting to €130 million and €1,145 million respectively;
- the Framatome brand, Framatome's nuclear technology-related intangible assets and Framatome's customer contracts, amounting to €151 million, €777 million and €344 million respectively.

Intangible assets in development include studies currently in process for the EPR2 project, amounting to €296 million.

Impairment of €(52) million was recorded in respect of other intangible assets in 2018.

EDF's research and development expenses recorded in the income statement total €510 million for 2018.

### At 31 December 2017

<i>(in millions of euros)</i>	31/12/2016	Acquisitions	Disposals	Translation adjustments	Changes in scope	Other movements	31/12/2017
Software	3,624	638	(224)	(37)	23	10	4,034
Positive fair value of commodity contracts acquired in a business combination	810	-	-	-	-	-	810
Greenhouse gas emission rights – green certificates	428	1,123	(1,107)	(7)	1	2	440
Other intangible assets	5,975	410	(113)	(46)	1,322	(47)	7,501
Intangible assets in development <sup>(1)</sup>	995	128	(2)	(6)	96	-	1,211
<b>Gross value</b>	<b>11,832</b>	<b>2,299</b>	<b>(1,446)</b>	<b>(96)</b>	<b>1,442</b>	<b>(35)</b>	<b>13,996</b>
Accumulated amortisation and impairment	(4,382)	(976)	272	58	(71)	(1)	(5,100)
<b>NET VALUE</b>	<b>7,450</b>	<b>1,323</b>	<b>(1,174)</b>	<b>(38)</b>	<b>1,371</b>	<b>(36)</b>	<b>8,896</b>

(1) Increases in intangible assets in development are presented net of the effect of commissioning new assets.

The gross value of other intangible assets at 31 December 2017 included:

- the Edison brand and intangible assets related to Edison's hydropower concessions, amounting to €945 million and €729 million respectively;
- the Dalkia brand and intangible assets related to Dalkia's concession agreements in France, amounting to €130 million and €962 million respectively;

- the Framatome brand, Framatome's nuclear technology-related intangible assets and Framatome's customer contracts, amounting to €132 million, €702 million and €402 million respectively.

Impairment of €(16) million was recorded in respect of other intangible assets in 2017.

EDF's research and development expenses recorded in the income statement totalled €546 million for 2017.

## NOTE 20 PROPERTY, PLANT AND EQUIPMENT OPERATED UNDER FRENCH PUBLIC ELECTRICITY DISTRIBUTION CONCESSIONS

### 20.1 NET VALUE OF PROPERTY, PLANT AND EQUIPMENT OPERATED UNDER FRENCH PUBLIC ELECTRICITY DISTRIBUTION CONCESSIONS

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Property, plant and equipment	54,677	53,034
Property, plant and equipment in progress	1,838	1,705
<b>PROPERTY, PLANT AND EQUIPMENT OPERATED UNDER FRENCH PUBLIC ELECTRICITY DISTRIBUTION CONCESSIONS</b>	<b>56,515</b>	<b>54,739</b>

### 20.2 MOVEMENTS IN PROPERTY, PLANT AND EQUIPMENT OPERATED UNDER FRENCH PUBLIC ELECTRICITY DISTRIBUTION CONCESSIONS (EXCLUDING ASSETS IN PROGRESS)

<i>(in millions of euros)</i>	Land and buildings	Networks	Other installations, plant, machinery, equipment & other	Total
<b>Gross value at 31/12/2017</b>	<b>2,746</b>	<b>89,955</b>	<b>4,131</b>	<b>96,832</b>
Increases <sup>(1)</sup>	168	3,919	419	4,506
Decreases	(19)	(595)	(172)	(786)
<b>GROSS VALUE AT 31/12/2018</b>	<b>2,895</b>	<b>93,279</b>	<b>4,378</b>	<b>100,552</b>
<b>Depreciation and impairment at 31/12/2017</b>	<b>(1,397)</b>	<b>(39,778)</b>	<b>(2,623)</b>	<b>(43,798)</b>
Net depreciation	(64)	(237)	(193)	(494)
Disposals	15	469	205	689
Other movements <sup>(2)</sup>	(12)	(2,148)	(112)	(2,272)
<b>DEPRECIATION AND IMPAIRMENT AT 31/12/2018</b>	<b>(1,458)</b>	<b>(41,694)</b>	<b>(2,723)</b>	<b>(45,875)</b>
<b>Net value at 31/12/2017</b>	<b>1,349</b>	<b>50,177</b>	<b>1,508</b>	<b>53,034</b>
<b>NET VALUE AT 31/12/2018</b>	<b>1,437</b>	<b>51,585</b>	<b>1,655</b>	<b>54,677</b>

(1) Increases also include facilities provided by the concession grantors.

(2) Other movements mainly concern depreciation of assets operated under concessions, booked against amortization recorded in the special concession liability accounts.



## **NOTE 21 PROPERTY, PLANT AND EQUIPMENT OPERATED UNDER CONCESSIONS FOR OTHER ACTIVITIES**

### **21.1 NET VALUE OF PROPERTY, PLANT AND EQUIPMENT OPERATED UNDER CONCESSIONS FOR OTHER ACTIVITIES**

The net value of property, plant and equipment operated under concessions for other activities breaks down as follows:

<i>(in millions of euros)</i>	<b>31/12/2018</b>	<b>31/12/2017</b>
Property, plant and equipment	6,026	6,369
Property, plant and equipment in progress	1,313	1,238
<b>PROPERTY, PLANT AND EQUIPMENT OPERATED UNDER CONCESSIONS FOR OTHER ACTIVITIES</b>	<b>7,339</b>	<b>7,607</b>

### **21.2 MOVEMENTS IN PROPERTY, PLANT AND EQUIPMENT OPERATED UNDER CONCESSIONS FOR OTHER ACTIVITIES (EXCLUDING ASSETS IN PROGRESS)**

<i>(in millions of euros)</i>	<b>Land and buildings</b>	<b>Fossil-fired &amp; hydropower plants</b>	<b>Networks</b>	<b>Other installations, plant, machinery, equipment &amp; other</b>	<b>Total</b>
<b>Gross value at 31/12/2017</b>	<b>1,489</b>	<b>12,566</b>	<b>39</b>	<b>582</b>	<b>14,676</b>
Increases	25	376	20	29	450
Decreases	(1)	(83)	(35)	(3)	(122)
Translation adjustments	-	17	-	-	17
Changes in the scope of consolidation	-	13	-	-	13
Other movements	(3)	13	-	1	11
<b>GROSS VALUE AT 31/12/2018</b>	<b>1,510</b>	<b>12,902</b>	<b>24</b>	<b>609</b>	<b>15,045</b>
<b>Depreciation and impairment at 31/12/2017</b>	<b>(895)</b>	<b>(6,999)</b>	<b>(22)</b>	<b>(391)</b>	<b>(8,307)</b>
Net depreciation	(33)	(383)	(4)	(33)	(453)
Impairment net of reversals	-	(306)	-	-	(306)
Disposals	1	46	11	3	61
Translation adjustments	-	(11)	-	-	(11)
Changes in the scope of consolidation	-	-	-	-	-
Other movements	(2)	-	-	(1)	(3)
<b>DEPRECIATION AND IMPAIRMENT AT 31/12/2018</b>	<b>(929)</b>	<b>(7,653)</b>	<b>(15)</b>	<b>(422)</b>	<b>(9,019)</b>
<b>Net value at 31/12/2017</b>	<b>594</b>	<b>5,567</b>	<b>17</b>	<b>191</b>	<b>6,369</b>
<b>NET VALUE AT 31/12/2018</b>	<b>581</b>	<b>5,249</b>	<b>9</b>	<b>187</b>	<b>6,026</b>

Property, plant and equipment operated under concessions for other activities comprise concession facilities mainly located in France (hydropower, excluding public electricity distribution) and Italy.

In 2018, impairment of property, plant and equipment in progress and other assets used in concessions for other activities amount to €(2) million and €(306) million respectively.

## NOTE 22 PROPERTY, PLANT AND EQUIPMENT USED IN GENERATION AND OTHER TANGIBLE ASSETS OWNED BY THE GROUP

### 22.1 NET VALUE OF PROPERTY, PLANT AND EQUIPMENT USED IN GENERATION AND OTHER TANGIBLE ASSETS OWNED BY THE GROUP

The net value of property, plant and equipment used in generation and other tangible assets owned by the Group breaks down as follows:

(in millions of euros)	31/12/2018	31/12/2017
Property, plant and equipment	47,779	48,972
Property, plant and equipment in progress	30,377	26,515
Finance-leased property, plant and equipment	96	135
<b>PROPERTY, PLANT AND EQUIPMENT USED IN GENERATION AND OTHER TANGIBLE ASSETS OWNED BY THE GROUP</b>	<b>78,252</b>	<b>75,622</b>

At 31 December 2018, property, plant and equipment in progress owned by the Group mainly concerns the EPR reactors at Flamanville 3 (€12,479 million including capitalised borrowing costs of €2,622 million), Hinkley Point C (€7,502 million including capitalised borrowing costs of €108 million) and Sizewell (€133 million including capitalised borrowing costs of €1 million).

The capitalised value of the Flamanville 3 EPR project in the financial statements at 31 December 2018 is €10,065 million excluding borrowing costs (€9,874 million in property, plant and equipment in progress and €191 million<sup>(1)</sup> in property, plant and equipment in operation). This includes the following, in addition to the construction cost:

- an inventory of spare parts and capitalised amounts totalling €328 million for related projects (notably the initial comprehensive inspection and North Area development);
- €520 million of pre-operating expenses and other property, plant and equipment related to the Flamanville project;

(1) €241 million gross, less €50 million of depreciation.

- and also, since 1 January 2018, the elimination of internal balances on balance sheet items and margins between Framatome and EDF SA in connection with the Flamanville 3 EPR project (€437 million, essentially consisting of advances and progress payments),

giving a construction cost at historical value of €9,217 million in the financial statements at 31 December 2018, for target construction costs (excluding borrowing costs) announced on 25 July 2018 as €10.9 billion expressed in 2015 euros.

The changes observed in property, plant and equipment (including assets in progress) also include a foreign exchange effect of €(129) million, mainly caused by the decline of the pound sterling against the Euro.

In 2018, impairment recognised in respect of property, plant and equipment in progress and finance-leased, and other property, plant and equipment owned by the Group, amounts to €(19) million and €(219) million respectively.

### 22.2 MOVEMENTS IN PROPERTY, PLANT AND EQUIPMENT USED IN GENERATION AND OTHER TANGIBLE ASSETS OWNED BY THE GROUP (EXCLUDING ASSETS IN PROGRESS AND FINANCE-LEASED ASSETS)

(in millions of euros)	Land and buildings	Nuclear power plants	Fossil-fired & hydropower plants	Networks	Other installations, plant, machinery, equipment & other	Total
<b>Gross value at 31/12/2017</b>	<b>13,019</b>	<b>68,890</b>	<b>20,837</b>	<b>17</b>	<b>18,765</b>	<b>121,528</b>
Increases	610	3,336	187	-	1,857	5,990
Decreases	(403)	(1,074)	(225)	-	(543)	(2,245)
Translation adjustments	(8)	(89)	(9)	-	(23)	(129)
Changes in the scope of consolidation <sup>(1)</sup>	(233)	-	(1,367)	-	(755)	(2,355)
Other movements <sup>(2)</sup>	(17)	327	22	-	36	368
<b>GROSS VALUE AT 31/12/2018</b>	<b>12,968</b>	<b>71,390</b>	<b>19,445</b>	<b>17</b>	<b>19,337</b>	<b>123,157</b>
<b>Depreciation and impairment at 31/12/2017</b>	<b>(7,074)</b>	<b>(45,679)</b>	<b>(12,230)</b>	<b>(12)</b>	<b>(7,561)</b>	<b>(72,556)</b>
Net depreciation	(331)	(2,804)	(581)	-	(1,246)	(4,962)
Impairment net of reversals	-	-	(154)	-	(65)	(219)
Disposals	208	984	220	-	501	1,913
Translation adjustments	1	45	12	-	3	61
Changes in the scope of consolidation <sup>(1)</sup>	12	-	71	1	57	141
Other movements	(7)	230	63	-	(42)	244
<b>DEPRECIATION AND IMPAIRMENT AT 31/12/2018</b>	<b>(7,191)</b>	<b>(47,224)</b>	<b>(12,599)</b>	<b>(11)</b>	<b>(8,353)</b>	<b>(75,378)</b>
<b>Net value at 31/12/2017</b>	<b>5,945</b>	<b>23,211</b>	<b>8,607</b>	<b>5</b>	<b>11,204</b>	<b>48,972</b>
<b>NET VALUE AT 31/12/2018</b>	<b>5,777</b>	<b>24,166</b>	<b>6,846</b>	<b>6</b>	<b>10,984</b>	<b>47,779</b>

(1) Changes in the scope of consolidation mainly concern assets related to the sale of the Dunkerque methane terminal (see note 3.3).

(2) Other movements include the effect on assets associated with provisions and underlying assets of the €289 million change in the real discount rate used to calculate provisions related to EDF's nuclear generation (see note 29.1).

## 22.3 FINANCE LEASE CONTRACTS

	31/12/2018				31/12/2017
	Maturity				
<i>(in millions of euros)</i>	Total	< 1 year	1–5 years	> 5 years	Total
Future minimum lease payments receivable as lessor	24	8	14	2	33
Future minimum lease payments payable as lessee	405	53	164	188	367

The Group is the lessor in agreements classified as finance leases under IFRIC 4 and IAS 17.

The Group is bound as lessee by irrevocable finance lease contracts for premises, equipment and vehicles used in the course of its business. The corresponding payments are subject to renegotiation at intervals defined in the contracts.

## NOTE 23 INVESTMENTS IN ASSOCIATES AND JOINT VENTURES

Investments in associates and joint ventures are as follows:

		31/12/2018			31/12/2017	
(in millions of euros)	Principal activity <sup>(1)</sup>	Ownership %	Share of net equity	Share of net income	Share of net equity	Share of net income
Principal investments in associates						
CTE <sup>(2)</sup>	O	50.10	1,406	283	1,241	249
CENG	G	49.99	1,667	102	1,494	(316)
Taishan (TNPJVC) <sup>(3)</sup>	G	30.00	n.c	n.c.	1,122	(17)
Alpiq <sup>(4)</sup>	G, D, O, T	25.04	622	(41)	602	25
Other investments in associates and joint ventures			n.c.	n.c.	2,790	94
TOTAL			8,287	569	7,249	35

n.c. = not communicated

(1) G= generation, D= distribution, T = transmission, O = other.

(2) At 31 December 2018, this corresponds to a 50.1% interest in CTE (the joint venture holding RTE's shares – see note 3.11.3).

In 2017, by convention, the share of net income presented comprises 100% of RTE's net income for the first quarter of 2017 and 50.1% of the CTE subgroup's net income for the rest of the year 2017.

(3) The financial data for Taishan at 31 December 2018 are not reported in this table as CGN (Taishan's parent company) publishes its consolidated financial statements later than the Group.

(4) As Alpiq publishes its consolidated financial statements after the Group, the figures above include an estimate for net income at 31 December 2018 (including the final results published by Alpiq in August 2018).

Other investments in associates and joint ventures principally concern Nam Theun Power Company (NTPC), Compagnie Énergétique de Sinop (CES), Jiangxi Datang International Fuzhou Power Generation Company Ltd and certain companies owned by EDF Renewables and EDF SA.

In 2018, €(39) million of impairment was booked in respect of investments in associates and joint ventures and a number of specific assets. This impairment is not detailed below due to its low materiality for the Group's financial statements.

In 2017, €(618) million of impairment of investments in associates and joint ventures was booked, mainly concerning the assets of CENG (see note 23.2.2).

### 23.1 COENTREPRISE DE TRANSPORT D'ÉLECTRICITÉ (CTE)

#### 23.1.1 CTE – financial indicators

The key financial indicators for the CTE subgroup (on a 100% basis) are as follows:

(in millions of euros)	31/12/2018	31/12/2017 <sup>(1)</sup>
Non-current assets	17,740	17,163
Current assets	2,854	2,793
<b>TOTAL ASSETS</b>	<b>20,593</b>	<b>19,956</b>
Equity	2,807	2,476
Non-current liabilities	13,225	12,870
Current liabilities	4,561	4,610
<b>TOTAL EQUITY AND LIABILITIES</b>	<b>20,593</b>	<b>19,956</b>
Sales	4,817	3,143
Operating profit before depreciation and amortisation	2,058	1,285
Net income	566	337
Net indebtedness	11,799	11,633
Gains and losses recorded directly in equity	78	-
Dividends paid	313	159

(1) The figures at 30 June 2017 are the figures for the CTE subgroup (CTE is the joint venture that holds the shares in RTE), comprising 100% of RTE's net income for the first quarter of 2017 and 50.1% of the CTE subgroup's net income for the second quarter of 2017, due to the sale of CTE (see note 3.11.3).

CTE's affiliate, RTE (Réseau de Transport d'Électricité), is responsible for managing the high voltage and very high voltage public electricity transmission network. Enedis uses RTE's network to convey energy to the distribution network.

### 23.2 CENG

#### 23.2.1 CENG – financial indicators

The key financial indicators for CENG (on a 100% basis) are as follows:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Non-current assets	7,689	7,370
Current assets	1,142	965
<b>TOTAL ASSETS</b>	<b>8,831</b>	<b>8,335</b>
Equity	3,334	2,989
Non-current liabilities	4,912	5,030
Current liabilities	585	316
<b>TOTAL EQUITY AND LIABILITIES</b>	<b>8,831</b>	<b>8,335</b>
Sales	1,335	1,156
Operating profit before depreciation and amortisation	579	396
Net income <sup>(1)</sup>	205	(633)
Gains and losses recorded directly in equity	(123)	107
Dividends paid	-	-

(1) Including 100% of impairment at 31 December 2017, amounting to €(982) million.

#### 23.2.2 Impairment

In 2017, impairment of €(491) million was recorded on the Group's investment in CENG as a result of lower forward prices and long-term electricity prices.

At 31 December 2018, the update of the impairment test for CENG assets indicated that the recoverable value of the investment was higher than the book value, mainly due to the new long-term price curves published by external organisations over the second half-year, and the effects of the tax reform. However, given the specific context of the asset explained below, there was no partial recovery of the impairment booked previously.

Calculation of the value in use is sensitive to several assumptions, particularly concerning the long-term existence of New York State's Zero Emission Credit (ZEC)

programme of subsidies for nuclear power plants, which provides additional income for the Ginna and Nine Mile Point plants. This programme is currently the subject of legal proceedings and its continuation could be called into question.

In addition, there are uncertainties relating to several key assumptions for the valuation of the investment in CENG (e.g. the market environment, legal framework, changes in energy policies, and the Group's lack of control over strategy-setting). The calculation of recoverable value for the CENG asset thus includes a specific risk premium.

Under the terms of the agreement with Exelon, EDF has an option to sell its share in CENG to Exelon at fair value, exercisable between January 2016 and June 2022.



## 23.3 TAISHAN

### 23.3.1 Taishan – financial indicators

The key financial indicators published for Taishan (on a 100% basis) are as follows:

<i>(in millions of euros)</i>	31/12/2017	31/12/2016
Non-current assets	11,030	10,936
Current assets	350	66
<b>TOTAL ASSETS</b>	<b>11,380</b>	<b>11,002</b>
Equity	3,316	3,594
Non-current liabilities	6,864	6,563
Current liabilities	1,200	845
<b>TOTAL EQUITY AND LIABILITIES</b>	<b>11,380</b>	<b>11,002</b>
Sales	-	-
Net income	(56)	(39)
Dividends paid	-	-

### 23.3.2 Transactions between the EDF group and Taishan

EDF owns 30% of Taishan Nuclear Power Joint Venture Company Limited (TNPJVC), which was set up to build and operate two EPR nuclear reactors in Taishan, in the province of Guangdong in China. CGN holds a 51% stake and Yudean a 19% stake.

Framatome has two contracts with TNPJVC:

- supply of two EPR nuclear islands in a consortium with CNPDC and CNPEC;
- delivery of fuels (initial core and first refuelling for each unit).

The first reactor began commercial operation on 13 December 2018 (see note 3.1), and the second reactor is due to start commercial operation in 2019.

As the tariff preparation is currently in process, an impairment test will be applied once the tariff and the indexing system are known.

## 23.4 ALPIQ

As Alpiq publishes its consolidated financial statements after the Group, the figures presented here include an estimate for net income at 31 December 2018 (see note 4 to the table in note 23).

### 23.4.1 Published financial indicators

The main published indicators by the Alpiq group were as follows:

<i>(in millions of euros)</i>	31/12/2017	31/12/2016 restated <sup>(2)</sup>
Non-current assets	4,833	5,394
Current assets	2,858	3,921
Assets classified as held for sale	1,022	5
<b>TOTAL ASSETS</b>	<b>8,713</b>	<b>9,320</b>
Equity <sup>(1)</sup>	3,388	3,619
Non-current liabilities	2,554	3,235
Current liabilities	2,154	2,465
Liabilities related to assets classified as held for sale	617	1
<b>TOTAL EQUITY AND LIABILITIES</b>	<b>8,713</b>	<b>9,320</b>
Sales	6,444	5,576
Operating profit before depreciation and amortisation	250	714
Net income	(80)	270
Gains and losses recorded directly in equity	176	(24)
Dividends paid to the Group	-	-

(1) Including €869 million of hybrid bonds.

(2) The Alpiq group's balance sheet at 31 December 2016 has been restated to reflect presentation impacts and impacts of the change in classification of certain companies that were previously classified as assets held for sale and are now presented in the balance sheet.

On 25 April 2013, the main Swiss shareholders of Alpiq subscribed a hybrid loan of CHF 366.5 million. Following this first step, on 2 May 2013 Alpiq placed a public

hybrid bond amounting to CHF 650 million, with 5% coupon and a redemption option after five and a half years at the earliest.

## 6. FINANCIAL STATEMENTS

### Operating assets and liabilities, equity

Due to their characteristics, in compliance with IAS 32, these hybrid loan and bond were recorded in equity in Alpiq's consolidated financial statements. Since the EDF group did not subscribe to the operation, there was no impact on the value of the investment in Alpiq reported in "Investments in associates and joint ventures".

The difference between the shares of equity as published by Alpiq and as reported in the Group's consolidated financial statements largely results from this hybrid loan.

The value of the EDF group's investment in Alpiq, valued on the basis of the stock market price at 31 December 2018, is €475 million.

#### 23.4.2 Impairment

The Alpiq group is operating in a difficult market environment with notably low wholesale prices. Also, Alpiq has no access to final customers on the non-liberalised Swiss market. This unfavourable context has affected the profitability of its generation capacities in Switzerland and furthermore, due to price coverage strategies, Alpiq cannot take advantage in the short term of market price rises.

In March 2016 Alpiq announced that it was introducing structural measures in traditional energy generation, to reduce its exposure to wholesale prices with a view to selling some of its generation fleet. These measures did not produce the expected results and the Group subsequently refocused on disposal of its energy service assets.

When it published its half-year 2018 financial statements on 24 August 2018, Alpiq once again mentioned the difficulties caused by Switzerland's asymmetrical electricity market regulations. As these risks had already been taken into consideration, no additional impairment was booked by Alpiq in those half-year financial statements.

On the strategic level, Alpiq successfully concluded the sale of its energy service activities to the French company Bouygues Construction in late July 2018. This operation enables Alpiq to refocus on its core businesses and improve its liquidities.

At the end of August 2018 EDF gave notice to terminate the consortium agreement that has existed between the entity's founding shareholders since 2005. The agreement will expire in September 2020.

The Group is not currently aware of any factor that has arisen since publication of Alpiq's half-year results to indicate a risk of further impairment on its investment at 31 December 2018. The Group will continue to closely monitor the effective implementation of Alpiq's action plans and changes in the market context and regulatory environment in Switzerland. Should the Alpiq group recognise impairment in its annual 2018 consolidated financial statements, due to be published on 4 March 2019, the EDF group would reflect that in its half-year 2019 financial statements.

## NOTE 24 INVENTORIES

The carrying value of inventories, broken down by nature, is as follows:

	31/12/2018			31/12/2017		
	Gross value	Provision	Net value	Gross value	Provision	Net value
<i>(in millions of euros)</i>						
Nuclear fuel	10,671	(6)	10,665	10,831	(15)	10,816
Other fuel	957	(14)	943	906	(7)	899
Other raw materials	1,613	(302)	1,311	1,526	(283)	1,243
Work-in-progress for production of goods and services	538	(30)	508	494	(48)	446
Other inventories	840	(40)	800	768	(34)	734
<b>TOTAL INVENTORIES</b>	<b>14,619</b>	<b>(392)</b>	<b>14,227</b>	<b>14,525</b>	<b>(387)</b>	<b>14,138</b>

The more-than-one-year portion mainly concerns nuclear fuel inventories amounting to €7,810 million at 31 December 2018 (€7,932 million at 31 December 2017).

The value of EDF Trading's inventories stated at market value is €142 million at 31 December 2018 (€179 million at 31 December 2017).

## NOTE 25 TRADE RECEIVABLES

Details of net trade receivables are as follows:

<i>(in millions of euros)</i>	<b>31/12/2018</b>	<b>31/12/2017 restated</b>
Trade receivables, gross value – excluding EDF Trading	14,468	14,359
Trade receivables, gross value – EDF Trading	2,446	3,530
Impairment	(1,004)	(1,046)
<b>TRADE RECEIVABLES, NET VALUE</b>	<b>15,910</b>	<b>16,843</b>

Most trade receivables mature within one year.

Advances received from customers in France who pay in regular monthly instalments, amounting to €6,827 million at 31 December 2018 (€6,568 million at 31 December 2017), are deducted from trade receivables (see note 2.1.3.2).

### 25.1 TRADE RECEIVABLES DUE AND NOT YET DUE

<i>(in millions of euros)</i>	<b>31/12/2018</b>			<b>31/12/2017</b>		
	<b>Gross value</b>	<b>Provision</b>	<b>Net value</b>	<b>Gross value</b>	<b>Provision</b>	<b>Net value</b>
<b>TRADE RECEIVABLES</b>	<b>16,914</b>	<b>(1,004)</b>	<b>15,910</b>	<b>17,889</b>	<b>(1,046)</b>	<b>16,843</b>
overdue by up to 6 months	1,318	(214)	1,104	1,172	(260)	912
overdue by 6-12 months	393	(152)	241	435	(137)	298
overdue by more than 12 months	877	(511)	366	890	(532)	358
<b>Trade receivables due</b>	<b>2,588</b>	<b>(877)</b>	<b>1,711</b>	<b>2,497</b>	<b>(929)</b>	<b>1,568</b>
<b>Trade receivables not yet due</b>	<b>14,326</b>	<b>(127)</b>	<b>14,199</b>	<b>15,392</b>	<b>(117)</b>	<b>15,275</b>

### 25.2 ASSIGNMENT OF RECEIVABLES

<i>(in millions of euros)</i>	<b>31/12/2018</b>	<b>31/12/2017</b>
Trade receivables assigned and wholly retained in the balance sheet	-	-
Trade receivables assigned and partly retained in the balance sheet	38	41
Trade receivables assigned and wholly derecognised	1,095	903

The Group assigned trade receivables for a total of €1,095 million at 31 December 2018, mainly concerning EDF SA, Edison and Dalkia (€903 million in December 2017).

As most assignment operations are carried out on a recurrent, without-recourse basis, the corresponding receivables are no longer carried in the Group's consolidated balance sheet.

### 25.3 CONTRACT ASSETS

Contract assets are rights held by an entity to receive a consideration in return for goods or services supplied to customers, when such rights are conditional on something other than the passage of time.

The contract assets included in receivables represent an amount of €225 million at 31 December 2017 and €439 million at 31 December 2018 and mainly concern the Framatome, Dalkia and EDF Renewables operating segments.

## NOTE 26 OTHER RECEIVABLES

Details of other receivables are as follows:

<i>(in millions of euros)</i>	<b>31/12/2018</b>	<b>31/12/2017 restated <sup>(1)</sup></b>
Prepaid expenses	1,719	1,592
Compensation for Public Energy Service charges (CSPE)	799	1,147
VAT receivables	2,133	2,043
Other tax receivables	342	368
Other operating receivables	4,149	4,237
<b>OTHER RECEIVABLES</b>	<b>9,142</b>	<b>9,387</b>
Non-current portion	1,796	2,168
Current portion	7,346	7,219
Gross value	9,197	9,462
Impairment	(55)	(75)

(1) The published figures at 31 December 2017 have been restated according to IFRS 15 (note 2.1.3.2).

At 31 December 2018, other receivables include an amount of €799 million corresponding to the CSPE receivable (€1,147 million at 31 December 2017). The rest of the CSPE receivable is included in "Loans and financial receivables" (see note 36.3).

## NOTE 27 EQUITY

### 27.1 SHARE CAPITAL

At 31 December 2018, EDF's share capital amounts to €1,505,133,838 comprising 3,010,267,676 fully subscribed and paid-up shares with nominal value of €0.50, owned 83.67% by the French State, 15.06% by the public (institutional and private investors) and 1.15% by current and retired Group employees, with 0.12% held by EDF as treasury shares.

In June 2018, payment of part of the balance of dividends for 2017 in the form of a scrip dividend led to a €41 million increase in the share capital and an issue premium of €806 million following issuance of 82,828,872 new shares. The legal formalities for this operation were finalised in June 2018.

Under Article L. 111-67 of the French Energy Code, the French State must hold more than 70% of the capital of EDF at all times.

### 27.2 TREASURY SHARES

A share repurchase programme authorised by the General Shareholders' Meeting of 9 June 2006 was implemented by the Board of Directors, within the limit of 10% of the total number of shares making up the Company's capital. The initial duration of the programme was 18 months, renewed for 12 months then by tacit agreement every year.

A liquidity contract exists for this programme, as required by the French market regulator AMF (*Autorité des marchés financiers*).

At 31 December 2018, treasury shares deducted from consolidated equity represent 3,728,019 shares with total value of €56 million.

### 27.3 DIVIDENDS

The General Shareholders' Meeting of 15 May 2018 decided to distribute an ordinary dividend of €0.46 per share in respect of 2017, offering shareholders the choice of payment in cash or shares (scrip option).

In application of Article 24 of the Company's articles of association, shareholders who had held their shares continuously for at least 2 years at the year-end and still

held them at the dividend distribution date benefit from a 10% bonus on their dividends. The number of shares carrying an entitlement to the bonus dividend cannot exceed 0.5% of the Company's capital per shareholder. The bonus dividend amounts to €0.506 per share.

As interim dividends of €0.15 per share had been paid in the form of new shares or cash on 11 December 2017, the balance payable for 2017 amounted to €0.31 per share benefiting from the ordinary dividend and €0.356 per share benefiting from the bonus dividend. The balance of the dividend was paid out on 19 June 2018.

The French government opted for the scrip dividend for the balance of 2017 dividends payable.

The amount of the cash dividend paid to shareholders who did not opt for the scrip dividend for 2017 amounts to €60 million.

On 6 November 2018, EDF's Board of Directors decided to distribute an interim dividend of €0.15 per share in respect of 2018. This interim dividend, amounting to a total of €451 million, was paid out entirely in cash on 10 December 2018.

### 27.4 EQUITY INSTRUMENTS

At 31 December 2018, perpetual subordinated bonds carried in equity amount to €10,101 million (less net-of-tax transaction costs).

On 25 September 2018 EDF issued new perpetual subordinated bonds amounting to a total €1.25 billion, with a 4% coupon. They may be redeemed at the initiative of EDF from 4 July 2024.

Also, on 3 October 2018, EDF proceeded to cash redemption of part of two outstanding series of hybrid bonds, for an amount of €1.25 billion.

Interest paid by EDF to the bearers of perpetual subordinated bonds issued in January 2013 and January 2014 totalled €584 million in 2018 and €565 million in 2017. The resulting cash payout is reflected in a corresponding reduction in Group equity.

In January 2019, EDF paid interest of around €334 million to the bearers of perpetual subordinated bonds.

### Perpetual subordinated bonds in the accounts of EDF

(in millions of currencies)

Entity	Issue	Nominal amount	Currency	Redemption option	Coupon
EDF	01/2013	338	EUR	7 years	4.25%
EDF	01/2013	1,250	EUR	12 years	5.38%
EDF	01/2013	1,250	GBP	13 years	6.00%
EDF	01/2013	3,000	USD	10 years	5.25%
EDF	01/2014	1,500	USD	10 years	5.63%
EDF	01/2014	662	EUR	8 years	4.13%
EDF	01/2014	1,000	EUR	12 years	5.00%
EDF	01/2014	750	GBP	15 years	5.88%
EDF	10/2018	1,250	EUR	6 years	4.00%



## 27.5 NON-CONTROLLING INTERESTS (MINORITY INTERESTS)

### 27.5.1 Details of non-controlling interests

(in millions of euros)	31/12/2018			31/12/2017	
	Ownership %	Equity (non-controlling interests)	Net income attributable to non-controlling interests	Equity (non-controlling interests)	Net income attributable to non-controlling interests
<b>Principal non-controlling interests:</b>					
EDF Energy Nuclear Generation Ltd.	20.0%	2,612	(21)	2,687	23
NNB Holding Ltd.	33.5%	2,849	(3)	2,138	-
EDF Investissements Groupe SA	6.1%	516	11	516	11
EDF Luminus SA	31.4%	380	(21)	388	2
Framatome	24.5%	258	40	209	-
<b>Other non-controlling interests</b>	-	<b>1,562</b>	<b>8</b>	<b>1,403</b>	<b>80</b>
<b>TOTAL</b>	-	<b>8,177</b>	<b>14</b>	<b>7,341</b>	<b>116</b>

Non-controlling interests in EDF Energy Nuclear Generation Ltd. (formerly British Energy), which is owned 80% by the Group via EDF Energy, correspond to Centrica's share.

Non-controlling interests in NNB Holding Limited, the holding company for the Hinkley Point C project, which is owned 66.5% by the Group via EDF Energy, correspond to CGN's share.

Non-controlling interests in Framatome, the Group which was acquired on 31 December 2017 (see note 3.11.2) and is owned 75.5% by the Group via EDF SA, correspond to the 19.5% share held by Mitsubishi Heavy Industries and the 5% share held by Assystem.

Non-controlling interests in EDF Luminus correspond to the investments held by Belgian local authorities.

Non-controlling interests in EDF Investissements Groupe correspond to the investment held by Natixis Belgique Investissements.

Other non-controlling interests in 2017 principally comprised the investments held by Total and Fluxys in Dunkerque LNG, and minority interests in Sizewell C Holding Co and subsidiaries of the Edison and EDF Renewables subgroups. In 2018 they mainly comprise minority interests in Sizewell C Holding Co and subsidiaries of the Edison and EDF Renewables subgroups.

Other non-controlling interests also include instruments in the form of bonds convertible into shares, issued by the Dalkia group and subscribed by minority interests, amounting to a total €260 million at 31 December 2018 (€124 million in 2017). The changes over the year are mainly explained by convertible bond issues totalling €157 million. These bonds qualify as equity instruments under IAS 32, and analysis of voting rights and corporate governance confirms the continuation of exclusive control by Dalkia. In the statement of cash flows, this operation is presented in cash flows from financing activities.

### 27.5.2 Non-controlling interests in EDF Energy

The key financial indicators (100% basis) for EDF Energy Nuclear Generation Ltd. are as follows:

(in millions of euros)	31/12/2018	31/12/2017
Non-current assets	21,304	21,149
Current assets	3,289	3,228
<b>TOTAL ASSETS</b>	<b>24,593</b>	<b>24,377</b>
Equity	13,061	13,433
Non-current liabilities	10,805	10,252
Current liabilities	727	692
<b>TOTAL EQUITY AND LIABILITIES</b>	<b>24,593</b>	<b>24,377</b>
Sales	2,765	3,070
Net income	(106)	135
Gains and losses recorded directly in equity	(100)	(220)
Net cash flow from operating activities	649	867
Net cash flow from investing activities	(555)	(514)
Net cash flow from financing activities	(113)	(328)
<b>CASH AND CASH EQUIVALENTS – OPENING BALANCE</b>	<b>483</b>	<b>468</b>
Net increase/(decrease) in cash and cash equivalents	(19)	25
Effect of currency fluctuations	1	(10)
Other	7	-
<b>CASH AND CASH EQUIVALENTS – CLOSING BALANCE</b>	<b>472</b>	<b>483</b>
Dividends paid to shares of non-controlling interests	23	70

## NOTE 28 PROVISIONS

The breakdown between current and non-current provisions is as follows:

<i>(in millions of euros)</i>	Notes	31/12/2018			31/12/2017		
		Current	Non-current	Total	Current	Non-current	Total
Provisions for the back-end of the nuclear cycle		1,515	22,362	23,877	1,479	21,378	22,857
Provisions for decommissioning and last cores		302	26,842	27,144	290	25,032	25,322
<b>Provisions related to nuclear generation</b>	<b>29</b>	<b>1,817</b>	<b>49,204</b>	<b>51,021</b>	<b>1,769</b>	<b>46,410</b>	<b>48,179</b>
<b>Other provisions for decommissioning</b>	<b>30</b>	<b>91</b>	<b>2,033</b>	<b>2,124</b>	<b>80</b>	<b>1,977</b>	<b>2,057</b>
<b>Provisions for employee benefits</b>	<b>31</b>	<b>998</b>	<b>17,627</b>	<b>18,625</b>	<b>1,106</b>	<b>20,630</b>	<b>21,736</b>
<b>Other provisions</b>	<b>32</b>	<b>3,104</b>	<b>2,908</b>	<b>6,012</b>	<b>2,529</b>	<b>2,356</b>	<b>4,885</b>
<b>TOTAL PROVISIONS</b>		<b>6,010</b>	<b>71,772</b>	<b>77,782</b>	<b>5,484</b>	<b>71,373</b>	<b>76,857</b>

## NOTE 29 PROVISIONS RELATED TO NUCLEAR GENERATION – BACK-END OF THE NUCLEAR CYCLE, PLANT DECOMMISSIONING AND LAST CORES

Provisions related to nuclear generation comprise provisions for back-end nuclear cycle expenses (management of spent fuel and radioactive waste), provisions for plant decommissioning and provisions for last cores.

Provisions are estimated under the principles presented in note 1.3.2.2.

Obligations can vary noticeably depending on each country's legislation and regulations, and the technologies and industrial practices used in each company.

The movement in provisions for the back-end of the nuclear cycle, provisions for decommissioning and provisions for last cores breaks down as follows:

(in millions of euros)	31/12/2017	Increases	Decreases	Discount effect	Translation adjustments	Other movements	31/12/2018
Provisions for spent fuel management	12,353	500	(1,204)	748	(12)	(223)	12,162
Provisions for waste removal and conditioning	1,041	12	(29)	59	(3)	40	1,120
Provisions for long-term radioactive waste management	9,463	42	(231)	859	(6)	468	10,595
<b>Provisions for the back-end of the nuclear cycle</b>	<b>22,857</b>	<b>554</b>	<b>(1,464)</b>	<b>1,666</b>	<b>(21)</b>	<b>285</b>	<b>23,877</b>
Provisions for nuclear plant decommissioning	21,431	52	(162)	1,083	(57)	693	23,040
Provisions for last cores	3,891	-	-	166	(13)	60	4,104
<b>Provisions for decommissioning and last cores</b>	<b>25,322</b>	<b>52</b>	<b>(162)</b>	<b>1,249</b>	<b>(70)</b>	<b>753</b>	<b>27,144</b>
<b>PROVISIONS RELATED TO NUCLEAR GENERATION</b>	<b>48,179</b>	<b>606</b>	<b>(1,626)</b>	<b>2,915</b>	<b>(91)</b>	<b>1,038</b>	<b>51,021</b>

The change in provisions related to nuclear generation in 2018 is mainly due to a lower discount rate in France and the United Kingdom. The corresponding effects are included in the "Discount effect" (€835 million) for provisions with corresponding entries in the income statement, and in "Other movements"

(€1,169 million) for changes in provisions with related assets (assets associated with provisions and underlying assets in France; the NLF receivable in the United Kingdom).

The breakdown of provisions by company is shown below:

	EDF Note 29.1	EDF Energy Note 29.2	Belgium	Total
(in millions of euros)				
Provisions for spent fuel management	10,698	1,464	-	12,162
Provisions for waste removal and conditioning	751	369	-	1,120
Provisions for long-term radioactive waste management	9,846	743	6	10,595
<b>PROVISIONS FOR THE BACK-END OF THE NUCLEAR CYCLE AT 31/12/2018</b>	<b>21,295</b>	<b>2,576</b>	<b>6</b>	<b>23,877</b>
<b>Provisions for the back-end of the nuclear cycle at 31/12/2017</b>	<b>20,326</b>	<b>2,527</b>	<b>4</b>	<b>22,857</b>
Provisions for nuclear plant decommissioning	15,985	6,754	301	23,040
Provisions for last cores	2,526	1,578	-	4,104
<b>PROVISIONS FOR DECOMMISSIONING AND LAST CORES AT 31/12/2018</b>	<b>18,511</b>	<b>8,332</b>	<b>301</b>	<b>27,144</b>
<b>Provisions for decommissioning and last cores at 31/12/2017</b>	<b>17,307</b>	<b>7,737</b>	<b>278</b>	<b>25,322</b>

### 29.1 NUCLEAR PROVISIONS IN FRANCE

In France, the provisions established by EDF SA for the nuclear generation fleet result from the Law of 28 June 2006 on long-term management of radioactive materials and waste, and the associated implementing provisions concerning secure financing of nuclear expenses.

In compliance with the accounting principles described in note 1.3.2.2.

- EDF books provisions to cover all obligations related to the nuclear facilities it operates;
- EDF holds dedicated assets for secure financing of long-term obligations (see note 45).

The calculation of provisions incorporates a level of risks and unknowns as appropriate to the operations concerned. The valuation of costs carries uncertainty factors such as:

- changes in legislation, particularly regarding safety, security and environmental protection, and financing of nuclear expenses;
- changes in the regulatory decommissioning process and the time necessary for issuance of administrative authorisation;
- future methods for storing long-lived radioactive waste and provision of storage facilities by the French agency for radioactive waste management ANDRA (*Agence nationale pour la gestion des déchets radioactifs*);
- changes in certain financial parameters such as discount rates, notably in view of the regulatory limits, inflation rates, or changes in the contractual terms of spent fuel management.

Details of changes in provisions for the back-end of the nuclear cycle, decommissioning and last cores are as follows:

<i>(in millions of euros)</i>	<b>Notes</b>	<b>31/12/2017</b>	<b>Increases</b>	<b>Decreases</b>	<b>Discount effect <sup>(1)</sup></b>	<b>Other movements <sup>(2)</sup></b>	<b>31/12/2018</b>
Provisions for spent fuel management	29.1.1	10,786	488	(986)	651	(241)	10,698
Provisions for waste removal and conditioning	29.1.2	726	10	(29)	43	1	751
Provisions for long-term radioactive waste management	29.1.2	8,814	38	(231)	826	399	9,846
<b>Provisions for the back-end of the nuclear cycle</b>		<b>20,326</b>	<b>536</b>	<b>(1,246)</b>	<b>1,520</b>	<b>159</b>	<b>21,295</b>
Provisions for nuclear plant decommissioning	29.1.3	14,920	52	(138)	752	399	15,985
Provisions for last cores	29.1.4	2,387	-	-	97	42	2,526
<b>Provisions for decommissioning and last cores</b>		<b>17,307</b>	<b>52</b>	<b>(138)</b>	<b>849</b>	<b>441</b>	<b>18,511</b>
<b>PROVISIONS RELATED TO NUCLEAR GENERATION</b>		<b>37,633</b>	<b>588</b>	<b>(1,384)</b>	<b>2,369</b>	<b>600</b>	<b>39,806</b>

(1) The discount effect comprises the €1,534 million cost of unwinding the discount, and the €835 million effect of the change in the real discount rate in 2018, which were recorded in the income statement for provisions with no related assets (cost of unwinding the discount).

(2) Other movements mainly include:

- reclassification of the provision for long-term radioactive waste management previously included in the provision for spent fuel management (€(298) million);
- the €718 million effect of the change in the real discount rate at 31 December 2018 for provisions with related assets.

Concerning non-EDF installations:

- EDF, COGEMA (now Orano Cycle) and the French Atomic Energy Commission (*Commissariat à l'Energie Atomique* or CEA) signed an agreement in December 2004 which transferred the management and financing of final shutdown, decommissioning and waste recovery and reconditioning for the UP1 reprocessing facility at Marcoule to the CEA. In return, EDF paid the CEA a one-time financial contribution covering its full share of the cost of outstanding operations, while remaining the owner of its final waste and bearing only the transport and storage costs;
- EDF, AREVA and AREVA NC (now Orano Cycle) signed two agreements in December 2008 and July 2010 defining the legal and financial terms for the transfer to AREVA NC of EDF's contractual obligations regarding its financial contribution to the dismantling of La Hague installations and the recovery and conditioning of waste. In application of those agreements, EDF paid AREVA NC a one-time financial contribution covering its full share of the cost of outstanding operations, while remaining the owner of its final waste and bearing only the transport and storage costs.

### 29.1.1 Provisions for spent fuel management

EDF's currently adopted strategy with regards to the fuel cycle, in agreement with the French State, is to process spent fuel and to recycle the separated plutonium in the form of MOX fuel (Mixed OXide of plutonium and uranium).

The quantities processed by Orano at the request of EDF, totalling approximately 1,100 tonnes per year, are determined based on the quantity of recyclable plutonium in the reactors that are authorised to load MOX fuel.

Consequently, provisions for spent fuel cover services associated with the following:

- removal of spent fuel from EDF's generation centres, as well as reception and interim storage;
- processing, including conditioning and storage of recyclable matter.

The processing expenses included in these provisions exclusively concern spent fuel that can be recycled in existing facilities, including the portion in reactors but not yet irradiated.

Expenses are measured based on forecast physical flows at the year-end, with reference to the contracts with Orano which define the terms for implementation of the framework agreement for the period 2008-2040. The most recent of these agreements, signed on 5 February 2016, covers the period 2016-2023.

In 2018 the Board of Directors approved resumption of recycling of uranium from reprocessing (which was suspended in 2013 pending availability of a new industrial

schema), with loading of the first fuel assemblies scheduled for 2023, subject to technical adaptations and the necessary authorisations from the Nuclear Safety Authority. The corresponding contracts were signed with the respective suppliers in the second quarter of 2018.

The portion of the provision for spent fuel management relating to uranium from reprocessing will be recovered once all the industrial, regulatory and economic conditions for resumption of uranium recycling have been fulfilled, but EDF has no control over fulfilment of some of these conditions (currently, no advance timetable has been set).

These provisions also cover long-term storage of spent fuel that cannot currently be recycled in existing installations: plutonium fuel (MOX) or uranium fuel derived from enriched processing, and fuel from Creys-Malville and Brennilis until fourth-generation reactors become available.

Following publication of the ministerial order of 28 December 2018 amending the order of 21 March 2007 on secure financing of nuclear expenses, in 2018 the provision covering interim storage of waste from spent fuel processing has been reclassified as part of the provision for long-term radioactive waste management (this concerns an amount of €298 million).

### 29.1.2 Provisions for waste removal and conditioning – Provisions for long-term radioactive waste management

#### 29.1.2.1 Provisions for waste removal and conditioning

The provisions for waste removal and conditioning are reported separately from 1 January 2017.

They cover the following future expenses for radioactive waste resulting from operations or decommissioning (apart from spent fuel):

- characterisation and conditioning of waste;
- interim storage of waste.

Equipment assembly for the conditioning and intermediate storage facility for radioactive waste (*Installation de conditionnement et d'entreposage des déchets activés* – ICEDA) was completed in December 2018 and pre-service testing is currently in process. Information on the identification of EIP equipment (equipment that is important for protection of interests) has been added to the commissioning permit application (DAMS) which has now been sent to the ASN. The objective is to open the storage facility in September 2019.

### 29.1.2.2 Provisions for long-term radioactive waste management

These provisions concern future expenses for:

- removal and storage of radioactive waste resulting from decommissioning of nuclear installations operated by EDF;
- interim storage (reclassification in 2018 of €298 million from the provision for spent fuel management (see note 29.1.1), removal and storage of radioactive waste packages resulting from spent fuel processing;

- direct storage, where relevant, of spent fuel that cannot be recycled in existing installations: specifically plutonium fuel (MOX) or uranium fuel derived from enriched processing, and fuel from Creys-Malville and Brennilis;
- EDF's share of the costs of studies, construction, operation and maintenance, shutdown and surveillance of existing and future storage centres.

The volumes of waste concerned by provisions include existing packages of waste and all waste to be conditioned, resulting from plant decommissioning or spent fuel processing at La Hague (comprising all fuel in reactors at 31 December, irradiated or otherwise). These volumes are regularly reviewed, in keeping with the data declared for the purposes of the national waste inventory undertaken by ANDRA.

The provisions for long-term radioactive waste management break down as follows:

(in millions of euros)	31/12/2018	31/12/2017
Very low-level and low and medium-level waste	1,278	1,161
Long-lived low-level waste	292	265
Long-lived medium and high-level waste	8,276	7,388
<b>PROVISIONS FOR LONG-TERM RADIOACTIVE WASTE MANAGEMENT</b>	<b>9,846</b>	<b>8,814</b>

#### Very low level and low and medium level waste

Very low-level waste mainly comes from nuclear plant decommissioning, and generally takes the form of rubble (concrete, scrap metal, insulating materials and piping). This type of waste is stored at surface level at the Morvilliers storage centre managed by ANDRA.

Low and medium-level waste comes from nuclear facilities (gloves, filters, resins). This type of waste is stored at surface level at the Soulaïnes storage centre managed by ANDRA.

The cost of removing and storing short-lived waste (very low-level and low and medium-level) is assessed on the basis of current contracts with transporters and contracts with ANDRA for operation of the existing storage centres.

#### Long lived low level waste

Long-lived low-level waste belonging to EDF essentially consists of graphite waste from the ongoing decommissioning of the former UNGG (natural uranium graphite gas-cooled) reactors.

As this waste has a long lifetime, but is lower-level than long-lived medium and high-level waste, specific subsurface storage requirements apply under the French Law of 28 June 2006.

Following the initial geological investigations, in July 2015 ANDRA remitted a report on the proposed storage centre for long-lived low-level waste on a site located in the Soulaïnes region (Aube) in France. This report was submitted to the ASN for its opinion. Uncertainties remain about the site's capacity to accommodate all of the waste included in the baseline inventory of the long-lived low-level waste storage facility. Further studies are planned under the 2016-2018 National Plan for the Management of Radioactive Materials and Waste, concerning both the feasibility of this storage centre and the search for additional waste management solutions. A general industrial plan for management of all long-lived low-level radioactive waste is also to be remitted by the end of 2019.

#### Long lived medium and high level waste

Long-lived medium and high-level waste essentially comes from processing of spent fuel, and to a lesser extent waste resulting from nuclear plant decommissioning (metallic components that have been inside the reactor).

The French Law of 28 June 2006 requires reversible storage in deep geological layers for this type of waste.

The provision established for long-lived medium and high-level waste is the largest component of provisions for long-term radioactive waste management.

Until June 2015 the gross value and disbursement schedules for forecast expenses were based on a scenario of industrial geological waste storage, following conclusions presented in the first half of 2005 by a working group formed under supervision of the State involving representatives of the administrations concerned, ANDRA and the producers of waste (EDF, Orano, CEA). EDF applied a reasonable approach to information supplied by this working group, leading to a benchmark

cost, for storage of waste from all producers, of €14.1 billion under the economic conditions of 2003 (€20.8 billion under 2011 economic conditions).

In 2012 ANDRA carried out preliminary conceptional studies for the Cigéo geological storage project, after discussing the technical optimisations proposed by the producers of waste.

On this basis, ANDRA drew up figures which, in compliance with the Law of 28 June 2006, were subjected to a consultation process with waste producers started in late 2014 by the French Department for Energy and Climate (*Direction Générale de l'Énergie et du Climat* or DGEC). In April 2015 EDF and the other producers sent the DGEC their comments on ANDRA's report and a joint estimation of the target Cigéo storage cost due to divergent approaches. All this information was included, together with the ASN's opinion, in a report submitted to the Minister for Ecology, Sustainable Development and Energy.

On 15 January 2016 the Ministry of Ecology, Sustainable Development and Energy issued a Ministerial Order setting the target cost for the Cigéo storage project at €25 billion under 2011 year-end economic conditions. The cost as defined constitutes an objective to be met by ANDRA, in compliance with safety standards set by the ASN, working in close liaison with the operators of nuclear installations.

Publication of this Order entailed an €820 million adjustment to the provision shown in the Group's financial statements at 31 December 2015. The cost of the Cigéo project defined in the Order has replaced the estimated benchmark cost of €20.8 billion previously used by EDF for its consolidated financial statements.

In application of this Ministerial Order, the cost of the Cigéo project will be regularly updated, at least at each key milestone in the course of the project's development (authorisation to create the facility, commissioning, end of the "pilot industrial phase", safety reviews) in accordance with the opinion of the ASN.

Design studies for future facilities are currently in process with ANDRA and stakeholders. They include technical and economic optimisation and the responses to the safety option report sent by ANDRA to the ASN in April 2016. The law of 11 July 2016 also clarified the concept of reversibility. In 2017 ANDRA opted for a new configuration to provide the basis for the preliminary project.

Under the schedule prepared by ANDRA, the application to build Cigéo (classified as a basic nuclear facility) should be made in 2019 and permission is expected to be granted in 2022. After an industrial pilot phase starting in 2026, the first waste packages should be received in 2031.

On 11 January 2018, the ASN issued its opinion on the Cigéo safety option file (DOS Cigéo). It considered that the project had reached satisfactory overall technological maturity at that stage and required examination of alternatives to the proposals for storage of bituminous waste at Cigéo. In September 2018, prior to filing an application for authorisation to create Cigéo in 2019, a group of experts was appointed by the DGEC to draw up a report on current bituminous waste management practices, focusing on three themes: knowledge of bituminous waste and its behaviour, neutralisation processes, and storage arrangements.



### 29.1.3 Decommissioning provisions for nuclear power plants

EDF bears full technical and financial responsibility for decommissioning of the nuclear plants it operates. The decommissioning process is governed by French Law of 13 June 2006, Decree 2007-1557 of 2 November 2007, and the French Environment Code (Articles L. 593-25 and following). It involves the following operations for each site:

- a shutdown declaration, to be made at least two years prior to the planned shutdown date:
  - since the Energy Transition Law of 17 August 2015, the final shutdown, which takes place during the operating phase of the basic nuclear facility, is considered separately from dismantling, as a notable change of lesser importance (simply requiring a declaration by the operator to the Minister and the ASN);
- an application for decommissioning, which after examination by the authorities and a public inquiry, leads to a single decree authorising the decommissioning;
- key progress reviews with the ASN, included in a formal safety procedure specific to dismantling operations;
- an internal authorisation procedure for the operator, independent of operational personnel and audited by the ASN, allowing some specific work to be started ahead of the authorised safety procedure;
- finally, once these operations are complete, declassification of the facility to remove it from the legal regime governing basic nuclear facilities.

The decommissioning scenario adopted by EDF complies with France's environmental Code, which requires as short a period as possible to elapse between final shutdown and dismantling in economically acceptable conditions and in compliance with the principles laid down in Article L. 1333-1 of the public health code (radioprotection) and section II of Article L. 110-1 of the environmental code (protection of the environment). The intended end-state is industrial use: the sites

will be restored to their original condition and will be reusable for industrial facilities.

The ongoing operations concern plants that were constructed and operated before the current nuclear fleet ("first-generation" plants), and the Superphenix plant and Irradiated Materials Workshop at Chinon. These operations cover four different technologies: a heavy water reactor (Brennilis), a sodium-cooled fast-neutron reactor (the Superphenix at Creys-Malville), natural uranium graphite gas-cooled (UNGG) reactors (at Chinon, Saint Laurent and Bugey) and a pressurised water reactor (PWR at Chooz). Each of them is a first for EDF, and apart from the PWR, they concern reactor technologies for which there is little or no international experience. They therefore require development of new methods and technologies that are riskier than technologies for which feedback already exists. Decommissioning of the Chooz PWR is benefiting from past experience (essentially in the US and limited), but the reactor has the specificity of being located in a cave, making this a unique operation, generating experience that is not immediately transposable and involves specific risks.

The experience gained from dismantling the Chooz PWR will make the studies and estimates of future decommissioning of the nuclear fleet currently in operation ("second-generation" plants) as robust as possible. But so far, neither EDF nor any other operator has begun a decommissioning programme on a scale comparable to the current PWR fleet, and as a result the estimates include both opportunities and risks, especially the risks associated with the scale effect.

The decommissioning provisions cover future decommissioning expenses as described above (excluding the cost of removing and storing waste, which is covered by the provisions for long-term waste management).

The preliminary dismantling plan and the priority areas for the fourth periodic review of Fessenheim (RP4) were sent to the ASN in July 2018, with the objective of filing the dismantling and RP4 documents in mid-2020.

The Consolidated Preliminary Plan (*Avant-Projet Consolidé* or APC) is currently being finalised, with studies expanding on the Summary Preliminary Plan (*Avant-Projet Sommaire* or APS), derisking, etc.

Details of changes in decommissioning provisions for nuclear power plants are as follows:

(in millions of euros)	31/12/2017	Increases	Decreases	Discount effect	Other movements	31/12/2018
Provisions for decommissioning nuclear plants in operation	11,616	-	(17)	482	399	12,480
Provisions for decommissioning permanently shut-down nuclear plants	3,304	52	(121)	270	-	3,505
<b>DECOMMISSIONING PROVISIONS FOR NUCLEAR POWER PLANTS</b>	<b>14,920</b>	<b>52</b>	<b>(138)</b>	<b>752</b>	<b>399</b>	<b>15,985</b>

#### For nuclear power plants currently in operation (PWR pressurized water reactor plants with 900MW, 1,300MW and N4 reactors)

Until 2013, provisions were estimated based on a 1991 study by the French Ministry of Trade and Industry, which set an estimated benchmark cost for decommissioning expressed in €/MW, confirming the assumptions defined in 1979 by the PEON commission. These estimates had been confirmed from 2009 by a detailed study of decommissioning costs conducted by EDF at the representative site of Dampierre (four 900MW units), and its results were corroborated by an intercomparison with the study carried out by consultants LaGuardia, based mainly on the Maine Yankee reactor in the US.

In 2014 the Dampierre study was reviewed by EDF to make sure that the previous calculations were still valid in view of recent developments and experience, both internationally and internally. For this revision, the decommissioning provisions for

plants in operation were based on costs resulting from the Dampierre study, in order to incorporate best estimates and feedback from inside and outside France. This change of estimate had no significant impact on the level of provisions at 31 December 2014.

Between June 2014 and July 2015, an audit of dismantling costs for EDF's nuclear fleet currently in operation was conducted by specialised consulting firms, at the request of the French Department for Energy and Climate (*Direction Générale de l'Énergie et du Climat* or DGEC). On 15 January 2016 the DGEC published a summary of the audit report. It stated that although estimating the cost of decommissioning nuclear reactors is a demanding exercise due to relatively limited past experience, the prospects of changes in techniques, and the distant timing of the expenditure, overall, the audit confirmed EDF's estimate of decommissioning costs for its nuclear fleet currently in operation. The DGEC also made a number of recommendations to EDF following this audit.

In 2016, EDF revised the decommissioning estimate, in order to incorporate the audit recommendations and past experience gained from dismantling operations for first-generation reactors (particularly Chooz A).

A detailed analytical approach was used to revise this estimate, identifying all costs for the engineering, construction work, operation and waste processing involved in future decommissioning of reactors currently in operation. This led to figures based on detailed timetables for plant decommissioning. The approach adopted made it possible to explore more thoroughly the assessment of costs specific to the initial units of each series, estimated for each series based on transposition coefficients applied to the baseline costs for the initial 900MW unit, and the series and mutualisation effects, as these costs and effects are inherent to the fleet's size and configuration.

The natures of the principal mutualisation and series effects used to arrive at the estimate are explained below.

There are several types of mutualisation effects:

- some of them relate to the fact that several reactors may share common buildings and facilities on the same site, and these buildings and facilities will not have to be decommissioned twice. Structurally, decommissioning a pair of reactors on the same site costs less than decommissioning two standalone reactors on two different sites. In France, unlike other countries, there are no single reactors but sites with two or four, and in one case six reactors;
- certain costs are no higher when 2 or 4 reactors are decommissioned on the same site. This is usually the case for surveillance costs and cost of maintaining safe operating conditions on the site;
- waste processing in centralised facilities (for example for dismantling major components) costs less than having several waste processing facilities at the decommissioning location.

Series effects are mainly of two types:

- first, in a fleet using the same technology, many of the studies do not need to be repeated each time;
- second, in a fleet using the same technology, robots and tooling can be largely reused from one site to another.

Such series effects are comparable in nature to the effects observed during construction of the fleet, in terms of studies or component manufacturing plants.

For example, for the 900MW fleet, a series effect of approximately 20% is expected between the first-of-a-kind reactor with 2 units and an average 2-units reactor.

Series and mutualisation effects in particular explain why it is not appropriate simply to compare the average decommissioning cost per reactor between the French fleet and other countries' nuclear fleets.

The figures only marginally reflect changes in productivity and the learning effect. The external audit of the decommissioning cost for the fleet currently in operation, ordered by the DGEC, considered that the learning effect incorporated into the estimate was conservative.

For reasons of prudence, the estimate also includes an assessment of risks, contingencies and uncertainties.

The Group considers that the work done to revise the estimate answers the recommendations issued after the audit. The approach adopted and its results have been presented to the administrative authority and gave rise to further questions and discussions.

EDF is also continuing to support its analyses through an international comparison, making it sure it takes into consideration a number of factors that could distort direct comparisons, for example differences in the scope concerned by costs estimate, or national and regulatory contexts.

The results of this detailed approach led to limited changes overall in the cost estimate and the associated provisions at 31 December 2016, apart from the consequences of the change in the depreciation period for 900MW series plants (excluding Fessenheim) at 1 January 2016, and the effect of changes in discount rates at 31 December 2016, i.e.:

- an increase of €321 million in the estimated decommissioning costs and an increase of €334 million in the estimated cost of long-term management of long-lived medium-level waste;
- a decrease of €(451) million in the provision for plant decommissioning, and an increase of €162 million in the provision for long-term management of long-lived medium-level waste, with corresponding changes in the underlying assets.

After its revision in 2016, it was decided that the estimate would be reviewed annually. The 2017 and 2018 reviews led to non-significant adjustments.

### For permanently shut down nuclear power plants

Unlike the PWR fleet currently in operation, the first-generation reactors now shut down used a range of different technologies: a PWR reactor at Chooz A, UNGG (natural uranium graphite gas-cooled) reactors at Bugey, St-Laurent and Chinon, a heavy water reactor at Brennilis, and a sodium-cooled fast neutron reactor at Creys-Malville.

The decommissioning costs are based on contractor quotes, which take account of accumulated industrial experience, unforeseen and regulatory developments, and the latest available figures.

In 2015 the industrial decommissioning strategy for UNGG plants was totally revised. The previously selected strategy was based on a scenario involving "underwater" dismantling of caissons (UNGg reactor buildings) for four of the reactors, with direct graphite storage in a centre currently under examination by ANDRA (see Long-lived low-level waste, note 29.1.2). Several new technical developments showed that the alternative "in-air" dismantling solution for the caissons would improve industrial control of operations and was apparently more favourable in terms of safety, radioprotection and environmental impact. The company therefore selected a new "in-air" dismantling scenario as the benchmark strategy for all six caissons. This scenario includes a consolidation phase, building on experience acquired from dismantling the first caisson before beginning work on the other five. The decommissioning phase will ultimately be longer than previously planned, leading to higher contractor quotes due to the induced operating costs.

Updating the industrial decommissioning scenario for first-generation power plants, particularly UNGGs plants, led to a €590 million increase in the provision at 31 December 2015.

The amended industrial scenario was presented to the ASN's commissioners on 29 March 2016.

At the request of the ASN, an independent expert review was ordered in the first quarter of 2017 to analyse EDF's chosen solutions for decommissioning of its 6 UNGG reactors. The conclusions supported the main options chosen. A meeting took place with the ASN commissioners in June 2017 based on these conclusions and a justification file remitted by EDF the previous March.

The strategy file, the safety option report concerning establishment of a secure configuration, and the detailed timetable for operations over the period 2017-2032 were sent to the ASN in late December 2017. In 2018 the ASN issued its main questions and conclusions about the UNGG strategy file. "In-air" dismantling for all reactors, the usefulness of an industrial demonstrator, and the timetable for dismantling the first-of-a-kind reactor (Chinon A2) appear to be settled, but discussions are continuing regarding the dismantling timetable for the other 5 reactors. EDF's proposed schedule allows for significant experience-based adjustments (after dismantling the first reactor) before beginning the larger-scale phases. While acknowledging the need to incorporate experience from the first-of-a-kind reactor, the ASN has so far not expressed an opinion on the timetable as a whole. At a meeting on 12 February 2019 EDF presented all the information justifying its proposed timetable to the ASN's panel of commissioners. The ASN is expected to issue draft decisions in 2019 that will be submitted for public consultation.

Due to uncertainties over the complex operations to be undertaken (particularly development of new methods and technologies), the provisions are very sensitive to the sequencing of operations, and the overall timetable for dismantling all six reactors. If EDF were ultimately to amend the timetable of decommissioning operations (shortening the sequence), that would entail an increase in provisions.

After the revision of the estimated cost in 2015, the decision was made that it should be reviewed annually. The 2016 review led to non-significant adjustments, apart from one increase of €125 million for a specific installation (the Irradiated Materials Workshop at Chinon). The 2018 review, like the 2017 review, led to non-significant adjustments.

#### 29.1.4 Provisions for last cores

These provisions cover the future expenses resulting from scrapping fuel that will only be partially irradiated when the reactor is shut down. It is measured based on:

- the cost of the loss on fuel in the reactor that is not totally spent at the time of final reactor shutdown and cannot be reused due to technical and regulatory constraints;
- the cost of fuel processing, and waste removal and storage operations. These costs are valued in a similar way to provisions for spent fuel management and long-term radioactive waste management.

These unavoidable costs are components of the cost of nuclear reactor shutdown and decommissioning. As such, they are fully covered by provision from the commissioning date and an asset associated with the provision is recognised.

#### 29.1.5 Discounting of provisions related to nuclear generation and sensitivity analyses

##### 29.1.5.1 Discount rate

###### Calculation of the discount rate

The discount rate is determined based on long-series data for a sample of bonds with maturities as close as possible to that of the liability. However, some expenses covered by these provisions will be disbursed over periods significantly longer than the duration of instruments generally traded on the financial markets.

The benchmark used to determine the discount rate is the sliding 10-year average of the return on French OAT 2055 treasury bonds which have a similar duration to the obligations, plus the spread of corporate bonds rated A to AA, which include EDF.

The methodology used to determine the discount rate, particularly the reference to sliding 10-year averages, is able to prioritise long-term trends in rates, in keeping with the long-term horizon for disbursements. The discount rate is therefore revised in response to structural developments in the economy leading to medium and long-term changes.

The assumed inflation rate is determined in line with the forecasts provided by consensus and expected inflation based on the returns on inflation-linked bonds.

The discount rate determined in this way is 3.9% at 31 December 2018, assuming inflation of 1.5% (4.1% and 1.5% respectively at 31 December 2017), giving a real discount rate of 2.4% at 31 December 2018 (2.6% at 31 December 2017).

##### Regulatory discount rate limit

The discount rate applied must also comply with two regulatory limits. Under the amended decree of 23 February 2007 and the ministerial order of 21 March 2007, itself modified by the order of 29 December 2017, the discount rate must be lower than:

- a regulatory maximum, set until 31 December 2026 as the weighted average of two terms, the first set at 4.3%, and the second corresponding to the arithmetic average over the 48 most recent months of the TEC 30-year rate plus 100 points. The weighting given to the first constant term of 4.3% reduces on a straight-line basis from 100% at 31 December 2016 to 0% at 31 December 2026;
- and the expected rate of return on assets covering the liability (dedicated assets).

The ceiling rate based on the TEC 30-year rate is 4.0% (3.97%, rounded up to 4.0%) at 31 December 2018 (4.1% at 31 December 2017).

The discount rate used at 31 December 2018 is 3.9%.

##### 29.1.5.2 Analyses of sensitivity to macro-economic assumptions

Sensitivity to assumptions concerning costs, inflation rate, long-term discount rate, and disbursement schedules can be estimated through comparison of the gross amount estimated under year-end economic conditions with the present value of the amount.

	31/12/2018		31/12/2017	
	Costs based on year-end economic conditions	Amounts in provisions at present value	Costs based on year-end economic conditions	Amounts in provisions at present value
<i>(in millions of euros)</i>				
Spent fuel management	18,737	10,698	19,058	10,786
Waste removal and conditioning	1,194	751	1,203	726
Long-term radioactive waste management	30,970	9,846	29,396	8,814
<b>BACK-END NUCLEAR CYCLE EXPENSES</b>	<b>50,901</b>	<b>21,295</b>	<b>49,657</b>	<b>20,326</b>
Decommissioning provisions for nuclear plants in operation	20,755	12,480	20,563	11,616
Decommissioning provisions for shut-down nuclear plants	6,576	3,505	6,472	3,304
Provisions for last cores	4,346	2,526	4,332	2,387
<b>DECOMMISSIONING AND LAST CORE EXPENSES</b>	<b>31,677</b>	<b>18,511</b>	<b>31,367</b>	<b>17,307</b>

This approach can be complemented by estimating the impact of a change in the discount rate on the present value.

## 6. FINANCIAL STATEMENTS

### Operating assets and liabilities, equity

In application of Article 11 of the Decree of 23 February 2007, the following table reports these details for the main components of provisions for the back-end of the nuclear cycle, decommissioning of nuclear plants and last cores:

#### AT 31 DECEMBER 2018:

AT 31 DECEMBER 2018.

(in millions of euros)	Amounts in provisions at present value	Sensitivity to discount rate			
		Balance sheet provisions		Pre-tax net income	
		+ 0.20%	- 0.20%	+ 0.20%	- 0.20%
<b>Back-end nuclear cycle expenses:</b>					
■ spent fuel management	10,698	(218)	237	185	(202)
■ waste removal and conditioning	751	(23)	25	14	(15)
■ long-term radioactive waste management	9,846	(597)	780	498	(673)
<b>Decommissioning and last core expenses:</b>					
■ decommissioning of nuclear plants in operation	12,480	(496)	520	7	(7)
■ decommissioning provisions for shut-down nuclear plants	3,505	(138)	149	138	(149)
■ last cores	2,526	(88)	94	-	-
<b>TOTAL</b>	<b>39.806</b>	<b>(1.560)</b>	<b>1.805</b>	<b>842</b>	<b>(1.046)</b>

#### AT 31 DECEMBER 2017:

AT 31 DECEMBER 2017.

(in millions of euros)	Amounts in provisions at present value	Sensitivity to discount rate			
		Balance sheet provisions		Pre-tax net income	
		+0.20%	-0.20%	+0.20%	-0.20%
Back-end nuclear cycle expenses:					
■ spent fuel management	10,786	(221)	238	190	(206)
■ waste removal and conditioning	726	(22)	24	13	(14)
■ long-term radioactive waste management	8,814	(497)	562	407	(464)
Decommissioning and last core expenses:					
■ decommissioning of nuclear plants in operation	11,616	(477)	501	7	(7)
■ decommissioning provisions for shut-down nuclear plants	3,304	(125)	135	125	(135)
■ last cores	2,387	(85)	90	-	-
TOTAL	37,633	(1,427)	1,550	742	(826)

## 29.2 EDF ENERGY'S NUCLEAR PROVISIONS

The specific financing terms for long-term nuclear obligations related to EDF Energy are reflected as follows in the EDF group's financial statements:

- the obligations are reported in liabilities in the form of provisions amounting to €10,908 million at 31 December 2018;

- in the assets, EDF Energy reports receivables corresponding to the amounts payable under the restructuring agreements by the NLF, for non-contracted obligations or decommissioning obligations, and by the British Government for contracted obligations (or historical liabilities).

These receivables are discounted at the same real rate as the obligations they are intended to finance. They are included in "Financial assets" in the consolidated balance sheet (see note 36.3) at the amount of €9,220 million at 31 December 2018 (€8,650 million at 31 December 2017).

Details of changes in provisions for the back-end of the nuclear cycle and provisions for decommissioning and last cores are as follows:

<i>(in millions of euros)</i>	<b>31/12/2017</b>	<b>Increases</b>	<b>Decreases</b>	<b>Discount effect</b>	<b>Translation adjustments</b>	<b>Other movements <sup>(1)</sup></b>	<b>31/12/2018</b>
Provisions for spent fuel management	1,567	12	(218)	97	(12)	18	1,464
Provisions for waste removal and conditioning	315	2	-	16	(3)	39	369
Provisions for long-term radioactive waste management	645	2	-	33	(6)	69	743
<b>Provisions for the back-end of the nuclear cycle</b>	<b>2,527</b>	<b>16</b>	<b>(218)</b>	<b>146</b>	<b>(21)</b>	<b>126</b>	<b>2,576</b>
Provisions for nuclear plant decommissioning	6,233	-	(24)	322	(57)	280	6,754
Provisions for last cores	1,504	-	-	69	(13)	18	1,578
<b>Provisions for decommissioning and last cores</b>	<b>7,737</b>	<b>-</b>	<b>(24)</b>	<b>391</b>	<b>(70)</b>	<b>298</b>	<b>8,332</b>
<b>PROVISIONS RELATED TO NUCLEAR GENERATION</b>	<b>10,264</b>	<b>16</b>	<b>(242)</b>	<b>537</b>	<b>(91)</b>	<b>424</b>	<b>10,908</b>

(1) Other movements include €404 million for the change in nuclear liabilities, reflecting the lower discount rate, with an equivalent change in the receivable corresponding to amounts reimbursable by the NLF (Nuclear Liabilities Fund) and the British government.

### 29.2.1 Regulatory and contractual framework

Amendments signed with the Nuclear Liabilities Fund (NLF – an independent trust set up by the UK Government as part of the restructuring of British Energy) following the EDF group's acquisition of British Energy had a limited impact on the contractual financing commitments made to British Energy by the UK Secretary of State and the NLF under the "Restructuring Agreements". These agreements were entered into by British Energy on 14 January 2005 as part of the restructuring led by the UK Government from 2005 in order to stabilise British Energy's financial position. British Energy Generation Limited changed its name to EDF Energy Nuclear Generation Limited on 1 July 2011 and replaced British Energy in these agreements and amendments.

Under the terms of the Restructuring Agreements:

- the NLF agreed to fund, to the extent of its assets: (i) qualifying contingent and/or latent nuclear liabilities (including liabilities for management of spent fuel from the Sizewell B power station); and (ii) qualifying decommissioning costs for EDF Energy's existing nuclear power stations;
- the Secretary of State agreed to fund: (i) qualifying contingent and/or latent nuclear liabilities (including liabilities for the management of spent fuel from the Sizewell B power station) and qualifying decommissioning costs related to EDF Energy's existing nuclear power stations, to the extent that they exceed the assets of the NLF; and (ii) subject to a cap of £2,185 million (in December 2002 monetary values, adjusted accordingly), qualifying known existing liabilities for EDF Energy's spent fuel (including liabilities for management of spent fuel from plants other than Sizewell B loaded in reactors prior to 15 January 2005);
- EDF Energy is responsible for funding certain excluded or disqualified liabilities (e.g. those defined as EDF Energy liabilities), and additional liabilities which could be created as a result of failure by EDF Energy to meet minimum performance standards under applicable law. The obligations of EDF Energy to the NLF and the Secretary of State are guaranteed by the assets of the principal members of EDF Energy.

EDF Energy also made commitments to pay:

- annual decommissioning contributions for a period limited to the useful life of the plants as at the date of the "restructuring agreements"; the corresponding provision amounts to €117 million at 31 December 2018;
- £150,000 (indexed to inflation) per tonne of uranium loaded in the Sizewell B reactor after the date of the "restructuring agreements".

Furthermore, EDF Energy entered into a separate contract with the Nuclear Decommissioning Authority (NDA) for management of AGR spent fuel and associated radioactive waste resulting from operation of power plants other than Sizewell B after 15 January 2005, and bears no responsibility for this fuel and waste once it is transferred to the processing site at Sellafield. The corresponding costs of £150,000 (indexed to inflation) per tonne of loaded uranium – plus a rebate or surcharge dependent on market electricity price and electricity generated in the year – are included in inventories (see note 1.3.17.1).

### 29.2.2 Provisions for the back-end of the nuclear cycle

Spent fuel from the Sizewell B PWR (pressurised water reactor) plant is stored on site. Spent fuel from other plants is transferred to Sellafield for storage and reprocessing.

EDF Energy's provisions for the back-end of the nuclear cycle concern obligations for reprocessing and storage of spent fuel and long-term storage of radioactive waste, required by the existing regulations in the UK approved by the Nuclear Decommissioning Authority (NDA). Their amount is based on contractual agreements or if this is not possible, on the most recent technical estimates.

## 6. FINANCIAL STATEMENTS

### Operating assets and liabilities, equity

	31/12/2018		31/12/2017	
	Costs based on year-end economic conditions	Amounts in provisions at present value	Costs based on year-end economic conditions	Amounts in provisions at present value
<i>(in millions of euros)</i>				
Spent fuel management	2,665	1,464	2,829	1,567
Waste removal and conditioning	1,856	369	1,827	315
Long-term radioactive waste management	3,645	743	3,589	645
<b>BACK-END NUCLEAR CYCLE EXPENSES</b>	<b>8,166</b>	<b>2,576</b>	<b>8,245</b>	<b>2,527</b>

### 29.2.3 Provisions for nuclear plant decommissioning

Provisions for decommissioning of nuclear plants result from management's best estimates. They cover the full cost of decommissioning and are measured on the

basis of existing techniques and methods that are most likely to be used for application of current regulations. The current costs are based on Baseline Decommissioning Plans produced in 2016 (3-year revision) and approved in 2013 and assume that plants will be decommissioned and the land will ultimately be reused.

	31/12/2018		31/12/2017	
	Costs based on year-end economic conditions	Amounts in provisions at present value	Costs based on year-end economic conditions	Amounts in provisions at present value
<i>(in millions of euros)</i>				
<b>PLANT DECOMMISSIONING EXPENSES</b>	<b>15,741</b>	<b>6,637</b>	<b>15,520</b>	<b>6,111</b>

The table above concerns decommissioning obligations excluding the present value of decommissioning contributions payable to the NLF, which is €117 million at 31 December 2018 (see note 29.2.1).

Corporate bonds rated A to AA, again over the longest-term duration. The implicit inflation rate used in determining a discount rate is based on a long-term forecast of adjusted retail prices (the UK's CPIH index).

### 29.2.4 Discounting of provisions related to nuclear generation

The discount rate has been calculated using an average series of data for a sample of UK Government gilts over the longest available durations plus the spread of UK

At 31 December 2018, EDF Energy applied a real discount rate of 2.5% to nuclear liabilities in the United Kingdom (2.7% at 31 December 2017).

## NOTE 30 OTHER PROVISIONS FOR DECOMMISSIONING

The breakdown by company is as follows:

<i>(in millions of euros)</i>	EDF	EDF Energy	Edison	Framatome <sup>(1)</sup>	Other entities <sup>(2)</sup>	Total
<b>OTHER PROVISIONS FOR DECOMMISSIONING AT 31/12/2018 <sup>(2)</sup></b>	<b>658</b>	<b>132</b>	<b>716</b>	<b>350</b>	<b>268</b>	<b>2,124</b>
<b>Other provisions for decommissioning at 31/12/2017</b>	<b>626</b>	<b>130</b>	<b>692</b>	<b>347</b>	<b>262</b>	<b>2,057</b>

<sup>(1)</sup> Including €78 million of provisions concerning basic nuclear facilities in France.

<sup>(2)</sup> Including €46 million of provisions concerning SOCODEI's basic nuclear facilities in France.

Other provisions for decommissioning principally concern fossil-fired power plants, hydrocarbon production assets and installations for the production of nuclear fuel assemblies.

The costs of decommissioning fossil-fired power plants are calculated using regularly updated studies based on estimated future costs, measured by reference to the

charges recorded on past operations and the most recent estimates for plants still in operation.

The provision recorded at 31 December 2018 reflects the most recent known contractor quotes and commissioning of new generation assets.



## NOTE 31 PROVISIONS FOR EMPLOYEE BENEFITS

### 31.1 EDF GROUP

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Provisions for employee benefits – current portion	998	1,106
Provisions for employee benefits – non-current portion	17,627	20,630
<b>PROVISIONS FOR EMPLOYEE BENEFITS</b>	<b>18,625</b>	<b>21,736</b>

#### 31.1.1 Breakdown of the change in the net liability

<i>(in millions of euros)</i>	Obligations	Fund assets	Net Liability
<b>Balance at 31/12/2017 <sup>(1)</sup></b>	<b>42,721</b>	<b>(21,895)</b>	<b>20,826</b>
Net expense for 2018	1,892	(475)	1,417
Actuarial gains and losses	(3,898)	746	(3,152)
Employer's contributions to funds	-	(331)	(331)
Employees' contributions to funds	15	(15)	-
Benefits paid	(2,194)	1,131	(1,063)
Translation adjustment	(53)	61	8
Changes in scope of consolidation	-	-	-
Other movements	(4)	(13)	(17)
<b>BALANCE AT 31/12/2018</b>	<b>38,479</b>	<b>(20,791)</b>	<b>17,688</b>
<b>Including:</b>			
Provisions for employee benefits			18,625
Non-current financial assets			(937)

(1) The net liability at 31 December 2017 comprised €21,736 million for the provisions for employee benefits and €(910) million of non-current financial assets, giving a net liability amount of €20,826 million.

Actuarial gains and losses on obligations amount to €(3,898) million for 2018, including €(3,323) million in France as a result of the €(2,174) million change in the discount rate, €(462) million for updating the mortality table, and €(491) million for updating the wage law; and €(518) million in the United Kingdom, essentially associated with changes in the discount and inflation rates (see note 31.3.6).

Actuarial gains and losses on fund assets amount to €746 million for 2018. They mainly result from a €463 million change in the United Kingdom and a €259 million change in France due to the poor performance on the equity markets.

Actuarial gains and losses on obligations amount to €(400) million for 2017, essentially comprising €194 million in the United Kingdom associated with changes in the discount and inflation rates and €(598) million in France, mainly attributable to experience adjustments.

#### 31.1.2 Post-employment and other long-term employee benefit expenses

<i>(in millions of euros)</i>	2018	2017
Current service cost	(1,018)	(1,010)
Past service cost	(19)	-
Actuarial gains and losses – long-term benefits	20	(67)
<b>Net expenses recorded as operating expenses</b>	<b>(1,017)</b>	<b>(1,077)</b>
Interest expense (discount effect)	(875)	(884)
Return on fund assets	475	470
<b>Net interest expense included in financial result</b>	<b>(400)</b>	<b>(414)</b>
<b>EMPLOYEE BENEFIT EXPENSES RECORDED IN THE INCOME STATEMENT</b>	<b>(1,417)</b>	<b>(1,491)</b>
Actuarial gains and losses – post-employment benefits	3,898	400
Actuarial gains and losses on fund assets	(746)	721
<b>Actuarial gains and losses</b>	<b>3,152</b>	<b>1,121</b>
<b>Translation adjustments</b>	<b>(8)</b>	<b>(17)</b>
<b>GAINS AND LOSSES ON EMPLOYEE BENEFITS RECORDED DIRECTLY IN EQUITY</b>	<b>3,144</b>	<b>1,104</b>

## 31.1.3 Net employee benefit liability by geographical area

<i>(in millions of euros)</i>	France <sup>(1)</sup>	United Kingdom	Other	Total
<b>Obligations at 31/12/2017</b>	<b>32,701</b>	<b>8,956</b>	<b>1,064</b>	<b>42,721</b>
Net expense for 2018	1,342	505	45	1,892
Actuarial gains and losses	(3,323)	(518)	(57)	(3,898)
Employees' contributions to funds	-	15	-	15
Benefits paid	(1,519)	(644)	(31)	(2,194)
Translation adjustment	-	(66)	13	(53)
Changes in scope of consolidation	-	-	-	-
Other movements	-	-	(4)	(4)
<b>OBLIGATIONS AT 31/12/2018</b>	<b>29,201</b>	<b>8,248</b>	<b>1,030</b>	<b>38,479</b>
Fair value of fund assets	(11,165)	(9,039)	(587)	(20,791)
<b>NET EMPLOYEE BENEFIT LIABILITY AT 31/12/2018</b>	<b>18,036</b>	<b>(791)</b>	<b>443</b>	<b>17,688</b>
<b>Including:</b>				
Provisions for employee benefits	18,036	146	443	18,625
Non-current financial assets <sup>(2)</sup>	-	(937)	-	(937)

(1) France comprises the two operating segments "France – Generation and Supply" and "France – Regulated activities" (see note 31.2).

(2) At 31 December 2018, EDF Energy recognised surplus funding on its EEGSG and BEGG pension schemes (see note 31.3.1).

<i>(in millions of euros)</i>	France <sup>(1)</sup>	United Kingdom	Other	Total
<b>Obligations at 31/12/2017</b>	<b>32,701</b>	<b>8,956</b>	<b>1,064</b>	<b>42,721</b>
Fair value of fund assets	(11,621)	(9,684)	(588)	(21,895)
<b>Provisions for employee benefits at 31/12/2017</b>	<b>21,080</b>	<b>(728)</b>	<b>474</b>	<b>20,826</b>
<b>Including:</b>				
Provisions for employee benefits	21,080	182	474	21,736
Non-current financial assets	-	(910)	-	(910)

(1) France comprises the two operating segments "France – Generation and Supply" and "France – Regulated activities" (see note 31.2).

## 31.2 FRANCE (REGULATED ACTIVITIES, AND GENERATION AND SUPPLY)

Given the strong similarities between their pension schemes, the two operating segments "France – Generation and Supply" and "France – Regulated activities" (see note 6.1) are combined here into a single subtotal, "France", which primarily

includes EDF and Enedis. Almost all of these companies' employees have IEG status, including the special IEG pension and other IEG benefits.

These benefits are described in note 1.3.22.

### 31.2.1 Details of changes in the provisions

<i>(in millions of euros)</i>	Obligations	Fund assets	Provisions in the balance sheet
<b>Balances at 31/12/2017</b>	<b>32,701</b>	<b>(11,621)</b>	<b>21,080</b>
Net expense for 2018	1,342	(221)	1,121
Actuarial gains and losses	(3,323)	259	(3,064)
Contributions to funds	-	(44)	(44)
Benefits paid	(1,519)	462	(1,057)
<b>BALANCES AT 31/12/2018</b>	<b>29,201</b>	<b>(11,165)</b>	<b>18,036</b>

### 31.2.2 Post-employment and other long-term employee benefit expenses

<i>(in millions of euros)</i>	2018	2017
Current service cost	(732)	(725)
Past service cost	-	-
Actuarial gains and losses – other long-term benefits	17	(68)
<b>Net expenses recorded as operating expenses</b>	<b>(715)</b>	<b>(793)</b>
Interest expense (discount effect)	(627)	(634)
Return on fund assets	221	220
<b>Net interest expense included in financial result</b>	<b>(406)</b>	<b>(414)</b>
<b>EMPLOYEE BENEFIT EXPENSES RECORDED IN THE INCOME STATEMENT</b>	<b>(1,121)</b>	<b>(1,207)</b>
Actuarial gains and losses – post-employment benefits	3,323	598
Actuarial gains and losses on fund assets	(259)	161
<b>Actuarial gains and losses</b>	<b>3,064</b>	<b>759</b>
<b>GAINS AND LOSSES ON EMPLOYEE BENEFITS RECORDED DIRECTLY IN EQUITY</b>	<b>3,064</b>	<b>759</b>

Actuarial gains and losses on post-employment benefits break down as follows:

<i>(in millions of euros)</i>	2018	2017
Experience adjustments	(90)	462
Changes in demographic assumptions	462	-
Changes in financial assumptions <sup>(1)</sup>	2,968	68
<b>ACTUARIAL GAINS AND LOSSES ON OBLIGATIONS</b>	<b>3,340</b>	<b>530</b>
<b>Including:</b>		
Actuarial gains and losses on post-employment benefits	3,323	598
Actuarial gains and losses on other long-term benefits	17	(68)

<sup>(1)</sup> Financial assumptions mainly concern the discount rate, inflation rate and wage increase rate.

The actuarial gains and losses on obligations generated over 2018 amount to €3,340 million, and are mainly associated with changes in the discount rate, the wage increase rate and the updating of the mortality table (see note 31.2.7).

The actuarial gains and losses on obligations generated over 2017 amount to €530 million, and are mainly attributable to experience adjustments.

### 31.2.3 Provisions for employee benefits by nature

**AT 31 DECEMBER 2018:**

<i>(in millions of euros)</i>	Obligations	Fund assets	Provisions in the balance sheet
<b>Provisions for post-employment benefits at 31/12/2018</b>	<b>27,798</b>	<b>(11,165)</b>	<b>16,633</b>
<b>Comprising:</b>			
Pensions	21,514	(10,416)	11,098
Benefits in kind (electricity/gas)	4,233	-	4,233
Retirement gratuities	822	(734)	88
Other	1,229	(15)	1,214
<b>Provisions for other long-term employee benefits at 31/12/2018</b>	<b>1,403</b>	<b>-</b>	<b>1,403</b>
<b>Comprising:</b>			
Annuities following work-related accident and illness, and invalidity	1,177	-	1,177
Long service awards	197	-	197
Other	29	-	29
<b>PROVISIONS FOR EMPLOYEE BENEFITS AT 31/12/2018</b>	<b>29,201</b>	<b>(11,165)</b>	<b>18,036</b>

6.

## AT 31 DECEMBER 2017:

<i>(in millions of euros)</i>	<b>Obligations</b>	<b>Fund assets</b>	<b>Provisions in the balance sheet</b>
<b>Provisions for post-employment benefits at 31/12/2017</b>	<b>31,214</b>	<b>(11,621)</b>	<b>19,593</b>
<b>Comprising:</b>			
Pensions	24,266	(10,859)	13,407
Benefits in kind (electricity/gas)	4,758	-	4,758
Retirement gratuities	873	(747)	126
Other	1,317	(15)	1,302
<b>Provisions for other long-term employee benefits at 31/12/2017</b>	<b>1,487</b>	<b>-</b>	<b>1,487</b>
<b>Comprising:</b>			
Annuities following work-related accident and illness, and invalidity	1,250	-	1,250
Long service awards	208	-	208
Other	29	-	29
<b>PROVISIONS FOR EMPLOYEE BENEFITS AT 31/12/2017</b>	<b>32,701</b>	<b>(11,621)</b>	<b>21,080</b>

### 31.2.4 Breakdown of obligations by type of beneficiary

<i>(in millions of euros)</i>	<b>31/12/2018</b>	<b>31/12/2017</b>
Current employees	16,009	18,577
Retirees	13,192	14,124
<b>OBLIGATIONS</b>	<b>29,201</b>	<b>32,701</b>

### 31.2.5 Fund assets

For France, fund assets, managed under an asset/liability model, amount to €11,165 million at 31 December 2018 (€11,621 million at 31 December 2017) and concern the coverage of retirement gratuities and the specific benefits of the special pension system.

They consist of insurance contracts with the following risk profile:

- 73% in a hedging pocket consisting of bonds, designed to replicate variations in the obligation caused by changes in interest rates;
- 27% in a growth asset pocket consisting of international equities.

Fund assets break down as follows:

<i>(in millions of euros)</i>	<b>31/12/2018</b>	<b>31/12/2017</b>
<b>FUND ASSETS</b>	<b>11,165</b>	<b>11,621</b>
<b>Assets funding special pension benefits</b>	<b>10,416</b>	<b>10,859</b>
<b>Comprising (%)</b>		
Listed equity instruments (shares)	27%	31%
Listed debt instruments (bonds)	73%	69%
<b>Assets funding retirement gratuities</b>	<b>734</b>	<b>747</b>
<b>Comprising (%)</b>		
Listed equity instruments (shares)	27%	32%
Listed debt instruments (bonds)	73%	68%
<b>Other fund assets</b>	<b>15</b>	<b>15</b>

At 31 December 2018, the equities held as part of fund assets are distributed as follows:

- approximately 58% of the total are shares in North American companies;
- approximately 18% of the total are shares in European companies;
- approximately 24% of the total are shares in companies in the Asia-Pacific zone and emerging countries.

This distribution is relatively stable compared to the distribution at 31 December 2017.

At 31 December 2018, the bonds held as part of fund assets are distributed as follows:

- approximately 93% of the total are AAA and AA-rated bonds;
- approximately 7% of the total are bonds with A, BBB and other ratings.

Around 89% of bonds are sovereign bonds issued by Euro zone countries, and the balance mainly consists of bonds issued by financial and non-financial firms.

This distribution is relatively stable compared to the distribution at 31 December 2017.

The performance of pension fund assets in France is -0.4% in 2018.

### 31.2.6 Future Cash Flows

Cash flows related to future employee benefits are as follows:

<i>(in millions of euros)</i>	<b>Cash flow under year-end economic conditions</b>	<b>Amount covered by provisions (present value)</b>
Less than one year	1,446	1,430
One to five years	5,202	4,850
Five to ten years	5,175	4,316
More than ten years	39,379	18,605
<b>CASH FLOWS RELATED TO EMPLOYEE BENEFITS</b>	<b>51,202</b>	<b>29,201</b>

At 31 December 2018, the average duration of employee benefit commitments in France is 17.8 years.

### 31.2.7 Actuarial assumptions

<i>(in %)</i>	<b>31/12/2018</b>	<b>31/12/2017</b>
Discount rate/rate of return on assets <sup>(1)</sup>	2.30%	1.90%
Inflation rate	1.50%	1.50%
Wage increase rate <sup>(2)</sup>	2.60%	2.70%

(1) The interest income generated by assets is calculated using the discount rate. The difference between this interest income and the return on assets is recorded in equity.

(2) Average wage increase rate, including inflation and projected over a full career.

In France, the discount rate used for employee benefit obligations is determined by applying the yield rate on high-quality corporate bonds based on their duration to maturities corresponding to the future disbursements resulting from these obligations. For longer durations, the calculation also takes into consideration data from a wider selection of corporate bonds adjusted for comparability with the high-quality bonds, given the smaller panel of bonds with these durations since 2017.

Changes at 31 December 2018 in the economic and market parameters used have led the Group to set the discount rate at 2.30% at 31 December 2018 (1.90% at 31 December 2017).

The inflation rate used to calculate provisions for employee benefits is derived from an internally-determined inflation curve by maturity which is used in the Group as a benchmark for Euro zone countries. The inflation rate determined in this way at 31 December 2018 is an average 1.50% (identical to the rate applied at 31 December 2017).

The mortality table used to calculate obligations is adjusted for specificities of the IEG (gas and electricity sector) system; in 2018 it was updated by using the INSEE 2013-2070 generation table (produced by the French statistics office), instead of the INSEE 2007-2060 generation table.

### 31.2.8 Sensitivity analysis

Sensitivity analyses on the amount of the obligation are as follows:

<i>(in %)</i>	<b>31/12/2018</b>
Impact of a 25bp increase or decrease in the discount rate	-4.3% / +4.7%
Impact of a 25bp increase or decrease in the inflation rate	+4.4% / -4.1%
Impact of a 25bp increase or decrease in the wage increase rate	+3.8% / -3.5%

## 31.3 UNITED KINGDOM

The United Kingdom segment chiefly comprises EDF Energy, whose principal employee benefits are described in note 1.3.22.

### 31.3.1 Details of the change in the net liability

<i>(in millions of euros)</i>	<b>Obligations</b>	<b>Fund assets</b>	<b>Net liability</b>
<b>Balances at 31/12/2017</b>	<b>8,956</b>	<b>(9,684)</b>	<b>(728)</b>
Net expense for 2018	505	(248)	257
Actuarial gains and losses	(518)	463	(55)
Employer's contributions to funds	-	(271)	(271)
Employees' contributions to funds	15	(15)	-
Benefits paid	(644)	644	-
Translation adjustment	(66)	72	6
<b>BALANCES AT 31/12/2018</b>	<b>8,248</b>	<b>(9,039)</b>	<b>(791)</b>
<b>Including:</b>	-	-	-
Provisions for employee benefits	-	-	146
Non-current financial assets	-	-	(937)

## 6. FINANCIAL STATEMENTS

### Operating assets and liabilities, equity

At 31 December 2018, EDF Energy's EEGSG and BEGG pension schemes (see note 1.3.22.2.2) were overfunded to the extent of €937 million compared to €910 million at 31 December 2017.

The surplus funding, which has increased due to the good performance by fund assets, is recognised in balance sheet assets as "non-current financial assets".

On 26 October 2018 in the litigation between Lloyds Banking Group Pensions Trustees Limited and Lloyds Bank plc, the High Court of Justice ruled that the minimum guaranteed pension relating to rights vested between May 1990 and April 1997 must be equalised for men and women. Application of this decision to EDF Energy's pension schemes (BEGG and EEGSG) resulted in a €15 million increase in provisions for employee benefits in 2018, with a corresponding entry in other income and expenses.

#### 31.3.2 Post-employment benefit and other long-term employee benefit expenses

<i>(in millions of euros)</i>	2018	2017
Current service cost	(258)	(267)
Past service cost	(15)	-
Actuarial gains and losses – other long-term benefits	-	-
<b>Net expenses recorded as operating expenses</b>	<b>(273)</b>	<b>(267)</b>
Interest expense (discount effect)	(232)	(244)
Return on fund assets	248	249
<b>Net interest expense included in financial result</b>	<b>16</b>	<b>5</b>
<b>EMPLOYEE BENEFIT EXPENSES RECORDED IN THE INCOME STATEMENT</b>	<b>(257)</b>	<b>(262)</b>
Actuarial gains and losses – post-employment benefits	518	(194)
Actuarial gains and losses on fund assets	(463)	558
<b>Actuarial gains and losses</b>	<b>55</b>	<b>364</b>
<b>Translation adjustments</b>	<b>(6)</b>	<b>(17)</b>
<b>GAINS AND LOSSES ON EMPLOYEE BENEFITS RECORDED DIRECTLY IN EQUITY</b>	<b>49</b>	<b>347</b>

#### 31.3.3 Breakdown of obligations by type of beneficiary

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Current employees	4,948	5,412
Retirees	3,300	3,544
<b>OBLIGATIONS</b>	<b>8,248</b>	<b>8,956</b>

#### 31.3.4 Fund assets

Pension obligations in the United Kingdom are partly covered by external funds with a present value of €9,039 million at 31 December 2018 (€9,684 million at 31 December 2017).

The investment strategy applied in these funds is a liability driven investment strategy. The allocation between growth and back-to-back is regularly reviewed by

the trustees, at least after every actuarial valuation, to ensure that the funds' overall investment strategy remains coherent in order to achieve the target coverage level required.

These assets break down as follows:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
BEGG pension fund	6,963	7,597
EEGSG pension fund	1,267	1,283
EEPS pension fund	809	804
<b>FUND ASSETS</b>	<b>9,039</b>	<b>9,684</b>
<b>Comprising (%)</b>		
Listed equity instruments (shares)	9%	27%
Listed debt instruments (bonds)	61%	50%
Real estate properties	8%	7%
Cash and cash equivalents	3%	1%
Other	19%	15%

At 31 December 2018, the equities held as part of fund assets are distributed as follows:

- approximately 40% of the total are shares in North American companies;
- approximately 37% of the total are shares in European companies;
- approximately 23% of the total are shares in companies in the Asia-Pacific zone and emerging countries.

At 31 December 2018, the bonds held as part of fund assets are distributed as follows:

- approximately 64% of the total are AAA and AA-rated bonds;
- approximately 36% of the total are bonds with A, BBB and other ratings.

Around 61% of all these bonds are sovereign bonds, mainly issued by the United Kingdom. The balance mainly consists of bonds issued by financial and non-financial firms.

The portion of sovereign bonds issued by the United Kingdom was 2 percentage points lower than at 31 December 2017.



### 31.3.5 Future cash flows

Cash flows related to future employee benefits are as follows:

<i>(in millions of euros)</i>	<b>Cash flow under year-end economic conditions</b>	<b>Amount covered by provisions (present value)</b>
Less than one year	253	250
One to five years	1,030	975
Five to ten years	1,460	1,241
More than ten years	13,179	5,782
<b>CASH FLOWS RELATED TO EMPLOYEE BENEFITS</b>	<b>15,922</b>	<b>8,248</b>

The contribution to funds for 2019 is estimated at approximately €282 million (€267 million contributed by the employer and €15 million by the employees).

The average weighted duration of funds in the United Kingdom is 19.6 years at 31 December 2018.

### 31.3.6 Actuarial assumptions

<i>(in %)</i>	<b>31/12/2018</b>	<b>31/12/2017</b>
Discount rate/rate of return on assets <sup>(1)</sup>	2.86%	2.56%
Inflation rate	2.99%	3.00%
Wage increase rate	2.39%	2.40%

<sup>(1)</sup> The interest income generated by assets is calculated using the discount rate. The difference between this interest income and the return on assets is recorded in equity.

In the United Kingdom, the discount rate used for employee benefit obligations is determined by applying the yield rate on high-quality non-financial corporate bonds based on their duration to maturities corresponding to the future disbursements resulting from these obligations.

### 31.3.7 Sensitivity analyses

Sensitivity analyses on the amount of the obligations are as follows:

<i>(in %)</i>	<b>31/12/2018</b>
Impact of a 25bp increase or decrease in the discount rate	-4.7% / +4.9%
Impact of a 25bp increase or decrease in the inflation rate	+3.5% / -3.3%
Impact of a 25bp increase or decrease in the wage increase rate	+0.5% / -0.5%

## NOTE 32 OTHER PROVISIONS

Details of changes in other provisions are as follows:

(in millions of euros)	31/12/2017	Increases	Decreases		Changes in scope	Other Changes	31/12/2018
			Utilisations	Reversals			
Provisions for contingencies related to subsidiaries and investments	913	184	(38)	(1)	-	(124)	934
Provisions for tax liabilities	573	36	(126)	(43)	-	8	448
Provisions for litigation	589	43	(34)	(40)	-	4	562
Provisions for onerous contracts and losses on completion <sup>(1)</sup>	273	923	(94)	(47)	-	153	1,208
Provisions related to environmental schemes <sup>(2)</sup>	901	1,448	(1,200)	(3)	-	(9)	1,137
Other provisions for risks and liabilities <sup>(3)</sup>	1,636	730	(459)	(183)	4	(5)	1,723
<b>TOTAL</b>	<b>4,885</b>	<b>3,364</b>	<b>(1,951)</b>	<b>(317)</b>	<b>4</b>	<b>27</b>	<b>6,012</b>

(1) The increase in provisions for onerous contracts is mainly attributable to the long-term contract with Dunkerque LNG (see note 3.3).

(2) Provisions related to environmental schemes include provisions for greenhouse gas emission rights and renewable energy certificates (see note 49).

(3) These provisions cover various contingencies and expenses related to operations (employers' matching contributions to employee profit sharing, contractual maintenance obligations, etc). None of these provisions is significant individually.

## NOTE 33 SPECIAL FRENCH PUBLIC ELECTRICITY DISTRIBUTION CONCESSION LIABILITIES

The changes in special concession liabilities for existing assets and assets to be replaced are as follows:

(in millions of euros)	31/12/2018	31/12/2017
Value in kind of assets <sup>(1)</sup>	49,327	47,813
Unamortised financing by the operator	(25,669)	(24,172)
<b>Rights in existing assets – net value</b>	<b>23,658</b>	<b>23,641</b>
Amortisation of financing by the grantor	13,792	13,149
Provisions for renewal	9,474	9,533
<b>Rights in assets to be replaced</b>	<b>23,266</b>	<b>22,682</b>
<b>SPECIAL FRENCH PUBLIC ELECTRICITY DISTRIBUTION CONCESSION LIABILITIES</b>	<b>46,924</b>	<b>46,323</b>

(1) Including contributions received to finance concession assets, amounting to €131 million (€144 million in 2017).

## NOTE 34 TRADE PAYABLES

(in millions of euros)	31/12/2018	31/12/2017
Trade payables – excluding EDF Trading	11,177	10,738
Trade payables – EDF Trading	2,244	3,256
<b>TRADE PAYABLES</b>	<b>13,421</b>	<b>13,994</b>

The Group has a reverse factoring programme allowing suppliers to transfer their receivables on EDF to a factoring company, at their own initiative.

For the Group, this programme does not cause any change in the substance and features of the receivables held by suppliers on EDF. In particular it does not affect

the sequences of operating cash flows. The associated liabilities are therefore included in "trade payables" in the Group's financial statements.

## NOTE 35 OTHER LIABILITIES

Details of other liabilities are as follows:

<i>(in millions of euros)</i>	<b>31/12/2018</b>	<b>31/12/2017 restated <sup>(1)</sup></b>
Advances and progress payments received	1,920	1,819
Liabilities related to property, plant and equipment	3,757	3,711
Tax liabilities	4,624	4,672
Social charges	4,388	4,171
Deferred income on long-term contracts	3,413	3,606
Other deferred income	609	499
Other	2,198	2,436
<b>OTHER LIABILITIES</b>	<b>20,908</b>	<b>20,914</b>
Non-current portion	4,896	4,864
Current portion	16,012	16,050

(1) The published figures at 31 December 2017 have been restated according to IFRS 15 (note 2.1.3.2).

### 35.1 ADVANCES AND PROGRESS PAYMENTS RECEIVED

Advances and progress payments received comprise €679 million of payments made by the customers in Framatome's long-term contracts (€738 million at 31 December 2017).

### 35.2 TAX LIABILITIES

At 31 December 2018, tax liabilities mainly include an amount of €659 million for the CSPE to be collected by EDF on energy supplied but not yet billed, less the CSPE collected on advances from customers who pay in regular monthly instalments (€711 million at 31 December 2017).

### 35.3 DEFERRED INCOME ON LONG-TERM CONTRACTS

EDF's deferred income on long-term contracts at 31 December 2018 comprises €1,663 million (€1,711 million at 31 December 2017) of partner advances made to EDF under the nuclear plant financing plans.

Deferred income on long-term contracts also includes an advance of €1.7 billion paid to the EDF group in 2010 under the agreement with the Exeltium consortium. This advance is transferred to the income statement progressively over the term of the contract (24 years).

### 35.4 OTHER ITEMS

The "Other" line of the table includes investment subsidies received during 2018, amounting to €351 million (€348 million in 2017).

### 35.5 CONTRACT LIABILITIES

Contract liabilities represent an entity's obligations to provide customers with goods or services for which it has already been paid, or for which payment is due.

These liabilities consist of practically all the advances and progress payments received, amounting to €1,858 million (principally concerning the Framatome, United Kingdom and France – Regulated activities segments), and practically all the deferred income (on long-term and other contracts), amounting to €3,990 million (principally concerning the France – Generation and Supply segment). They thus total €5,848 million at 31 December 2018 (€5,876 million at 31 December 2017).

Contracts expiring in more than one year on which obligations are unfulfilled or partially fulfilled at the reporting date should generate sales revenues of approximately €12,852 million which have not yet been recognised. €1,400 million of these sales revenues will be recognised progressively until 2034 on the Exeltium contract, and the balance will be recognised over the operating period for contracts relating to jointly-operated power plants, and over the term of the contract for other firm sale contracts (excluding energy sales).

## FINANCIAL ASSETS AND LIABILITIES

### NOTE 36 CURRENT AND NON-CURRENT FINANCIAL ASSETS

#### 36.1 BREAKDOWN BETWEEN CURRENT AND NON-CURRENT FINANCIAL ASSETS

Current and non-current financial assets break down as follows:

(in millions of euros)	31/12/2018			31/12/2017		
	Current	Non-current	Total	Current	Non-current	Total
Instruments at fair value through OCI with recycling	17,659	5,279	22,938	-	-	-
Instruments at fair value through OCI with no recycling	6	407	413	-	-	-
Instruments at fair value through profit and loss	3,175	16,985	20,160	-	-	-
Available-for-sale financial assets	-	-	-	19,312	21,612	40,924
<b>Debt and equity securities</b>	<b>20,840</b>	<b>22,671</b>	<b>43,511</b>	<b>19,312</b>	<b>21,612</b>	<b>40,924</b>
Trading derivatives – Positive fair value in profit and loss	6,404	-	6,404	2,614	-	2,614
Hedging derivatives – Positive fair value in profit and loss	1,646	2,737	4,383	837	2,743	3,580
Loans and financial receivables <sup>(1)</sup>	2,253	11,696	13,949	2,190	12,432	14,622
<b>CURRENT AND NON-CURRENT FINANCIAL ASSETS</b>	<b>31,143</b>	<b>37,104</b>	<b>68,247</b>	<b>24,953</b>	<b>36,787</b>	<b>61,740</b>

(1) Including impairment of €(281) million at 31 December 2018 (€(189) million at 31 December 2017).

#### 36.2 DEBT AND EQUITY SECURITIES

Details of debt and equity securities are shown in the table below.

(in millions of euros)	31/12/2018				31/12/2017
	At fair value through OCI with recycling	At fair value through OCI with no recycling	At fair value through profit and loss	Total	At fair value through OCI with recycling
	(IFRS 9)				(IAS 39)
<b>Debt and equity securities</b>					
EDF dedicated assets	5,292	-	16,528	21,820	20,848
Liquid assets	17,575	-	2,963	20,538	18,963
Other securities <sup>(1)</sup>	71	413	669	1,153	1,113
<b>TOTAL</b>	<b>22,938</b>	<b>413</b>	<b>20,160</b>	<b>43,511</b>	<b>40,924</b>

(1) Investments in non-consolidated companies, principally EDF Invest.

Information on EDF's dedicated assets is given in note 45.

Changes in the fair value of debt and equity securities were recorded in equity (EDF share) over the period as follows:

(in millions of euros)	2018 (IFRS 9)			2017 (IAS 39)	
	Gross changes in fair value recorded in OCI with no recycling <sup>(1)</sup>	Gross changes in fair value recorded in OCI with recycling <sup>(1)</sup>	Gross changes in fair value recycled to profit and loss <sup>(2)</sup>	Gross changes in fair value recorded in equity <sup>(1)</sup>	Gross changes in fair value recycled to profit and loss <sup>(2)</sup>
EDF dedicated assets	-	(72)	(12)	807	673
Liquid assets	-	(43)	12	22	34
Other assets	(37)	-	-	(5)	10
<b>DEBT AND EQUITY SECURITIES <sup>(3)</sup></b>	<b>(37)</b>	<b>(115)</b>	<b>-</b>	<b>824</b>	<b>717</b>

(1) + / (-): increase/(decrease) in equity (EDF share).

(2) + / (-): increase/(decrease) in income (EDF share).

(3) Excluding associates and joint ventures.

In 2018, gross changes in fair value recorded in OCI with recycling principally concern EDF (€(115) million, including €(60) million for dedicated assets).

In 2017, gross changes in fair value principally concerned EDF (€107 million, including €134 million for dedicated assets).

No significant impairment was recorded in 2018.

### 36.2.1 Dedicated assets

Diversified bond investments and equities included in EDF's dedicated assets are recorded as "debt and equity securities". The general management policy for dedicated assets is presented in note 45.

### 36.2.2 Liquid assets

Liquid assets are financial assets consisting of funds or interest rate instruments with initial maturity of over three months that are readily convertible into cash, and are managed according to a liquidity-oriented policy.

EDF's monetary UCITS, included in liquid assets, amount to €2,863 million at 31 December 2018 (€2,646 million at 31 December 2017).

## 36.3 LOANS AND FINANCIAL RECEIVABLES

Loans and financial receivables consist of the following:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Loans and financial receivables – amounts receivable from the NLF	9,220	8,650
Loans and financial receivables – CSPE <sup>(1)</sup>	2,060	3,294
Loans and financial receivables – other	2,669	2,678
<b>LOANS AND FINANCIAL RECEIVABLES</b>	<b>13,949</b>	<b>14,622</b>

<sup>(1)</sup> Including €2,060 million allocated to dedicated assets at 31 December 2018 (€3,294 million at 31 December 2017).

At 31 December 2018 loans and financial receivables mainly include:

- amounts representing reimbursements receivable from the NLF and the British government for coverage of long-term nuclear obligations, totalling €9,220 million at 31 December 2018 (€8,650 million at 31 December 2017), discounted at the same rate as the provisions they finance;

- the receivable corresponding to the balance of the shortfall in the Contribution to the Public Electricity Service (CSPE) at 31 December 2017 and the costs of bearing that shortfall. Reimbursements of principal and interest during 2018 amounted to €1,281 million, in line with the schedule published in the ministerial orders of 13 May 2016 and 2 December 2016, made in application of Article R. 121-31 of the French Energy Code. This CSPE receivable is allocated in its entirety to dedicated assets.

## 36.4 CHANGE IN FINANCIAL ASSETS OTHER THAN DERIVATIVES

The variation in financial assets is as follows:

### 36.4.1 At 31 December 2018

<i>(in millions of euros)</i>	31/12/2017 restated	Change of method	Net variations	Changes in fair value	Discount effect	Changes in scope	Translation adjustments	Other	31/12/2018
Available-for-sale financial assets	40,924	(40,924)	-	-	-	-	-	-	-
Instruments at fair value through OCI with recycling	-	20,828	2,060	(102)	-	-	112	40	22,938
Instruments at fair value through OCI with no recycling	-	444	(9)	(37)	-	7	-	8	413
Instruments at fair value through profit and loss	-	19,652	1,489	(847)	-	(6)	-	(128)	20,160
Loans and financial receivables	14,622	-	(1,362)	-	460	(34)	(96)	359	13,949

The net decrease in loans and financial receivables includes the €(1,234) million change in the CSPE receivable.

Other changes in loans and financial receivables consist of the €404 million change in the receivable corresponding to amounts reimbursable by the NLF and the British

government for coverage of long-term nuclear obligations, and the change in the financial asset reflecting the overfunding of EDF Energy's EEGSG and BEGG pension plans (€937 million at 31 December 2018, compared to €916 million at 31 December 2017).

### 36.4.2 At 31 December 2017

<i>(in millions of euros)</i>	<b>31/12/2016</b>	<b>Net variations</b>	<b>Changes in fair value</b>	<b>Discount effect</b>	<b>Changes in scope</b>	<b>Translation adjustments</b>	<b>Other</b>	<b>31/12/2017</b>
Available-for-sale financial assets	40,290	344	588	-	144	(137)	(305)	40,924
Loans and financial receivables	14,956	(979)	-	442	174	(377)	406	14,622

## NOTE 37 CASH AND CASH EQUIVALENTS

Cash and cash equivalents comprise cash in hand and at bank and investments in money market instruments. Cash and cash equivalents as stated in the cash flow statements include the following amounts recorded in the balance sheet:

<i>(in millions of euros)</i>	<b>31/12/2018</b>	<b>31/12/2017</b>
Cash	2,855	3,328
Cash equivalents <sup>(1)</sup>	435	364
Financial current accounts	-	-
<b>CASH AND CASH EQUIVALENTS</b>	<b>3,290</b>	<b>3,692</b>

(1) Items stated at fair value amount to €435 million at 31 December 2018 (€364 million at 31 December 2017).

### Cash restrictions

Cash and cash equivalents include €235 million of cash subject to restrictions at 31 December 2018 (€298 million at 31 December 2017) (see note 1.3.26).



## NOTE 38 CURRENT AND NON-CURRENT FINANCIAL LIABILITIES

### 38.1 BREAKDOWN BETWEEN CURRENT AND NON-CURRENT FINANCIAL LIABILITIES

Current and non-current financial liabilities break down as follows:

(in millions of euros)	31/12/2018			31/12/2017		
	Non-current	Current	Total	Non-current	Current	Total
Loans and other financial liabilities	50,901	8,287	59,188	49,734	7,112	56,846
Negative fair value of derivatives held for trading	-	7,160	7,160	-	2,787	2,787
Negative fair value of hedging derivatives	1,228	1,720	2,948	1,631	1,243	2,874
<b>FINANCIAL LIABILITIES</b>	<b>52,129</b>	<b>17,167</b>	<b>69,296</b>	<b>51,365</b>	<b>11,142</b>	<b>62,507</b>

### 38.2 LOANS AND OTHER FINANCIAL LIABILITIES

#### 38.2.1 Changes in loans and other financial liabilities

(in millions of euros)	Bonds	Loans from financial institutions	Other financial liabilities	Loans related to finance-leased assets	Accrued Interest	Total
<b>Balances at 31/12/2017</b>	<b>47,325</b>	<b>3,094</b>	<b>4,725</b>	<b>368</b>	<b>1,334</b>	<b>56,846</b>
Increases	4,259	1,269	183	-	179	5,890
Decreases	(1,621)	(265)	(989)	(55)	(154)	(3,084)
Translation adjustments	(47)	(28)	48	-	1	(26)
Changes in scope of consolidation	(49)	(976)	(41)	7	(11)	(1,070)
Changes in fair value	534	-	161	2	-	697
Other changes	-	4	(61)	2	(10)	(65)
<b>BALANCES AT 31/12/2018</b>	<b>50,401</b>	<b>3,098</b>	<b>4,026</b>	<b>324</b>	<b>1,339</b>	<b>59,188</b>

The increases/decreases in loans and other financial liabilities (excluding accrued interest) shown in the above table do not include monetary variations of €86 million on settlement of hedging instruments (these variations are included in the cash flow statement).

Loans and other financial liabilities of the Group's main entities are as follows:

(in millions of euros)	31/12/2018	31/12/2017
EDF and other related subsidiaries <sup>(1)</sup>	48,650	44,367
EDF Energy <sup>(2)</sup>	3,345	6,118
EDF Renewables	5,741	5,276
Edison <sup>(3)</sup>	549	241
Other	903	844
<b>LOANS AND OTHER FINANCIAL LIABILITIES</b>	<b>59,188</b>	<b>56,846</b>

(1) Enedis, EDF PEI, EDF International, EDF Holding SAS, C3 and EDF Investissements Groupe.

(2) Including holding companies.

(3) Edison excluding TdE SpA.

At 31 December 2018, none of these entities had defaulted on any borrowing.

The Group's principal borrowings at 31 December 2018 are as follows:

<b>Type of borrowing</b> <i>(in millions of currencies)</i>	<b>Entity</b>	<b>Issue <sup>(1)</sup></b>	<b>Maturity</b>	<b>Issue amount</b>	<b>Currency</b>	<b>Rate</b>
Bond	EDF	01/2009	01/2019	2,000	USD	6.50%
Bond	EDF	01/2014	01/2019	1,250	USD	2.15%
Bond	EDF	01/2010	01/2020	1,400	USD	4.60%
Euro MTN	EDF	05/2008	05/2020	1,200	EUR	5.38%
Bond	EDF	10/2015	10/2020	1,500	USD	2.35%
Euro MTN	EDF	01/2009	01/2021	2,000	EUR	6.25%
Euro MTN (green bond)	EDF	11/2013	04/2021	1,400	EUR	2.25%
Euro MTN	EDF	01/2012	01/2022	2,000	EUR	3.88%
Euro MTN	EDF	09/2012	03/2023	2,000	EUR	2.75%
Euro MTN	EDF	09/2009	09/2024	2,500	EUR	4.63%
Bond (green bond)	EDF	10/2015	10/2025	1,250	USD	3.63%
Euro MTN	EDF	11/2010	11/2025	750	EUR	4.00%
Euro MTN (green bond)	EDF	10/2016	10/2026	1,750	EUR	1.00%
Bond	EDF	01/2017	01/2027	107,900	JPY	1.09%
Euro MTN	EDF	03/2012	03/2027	1,000	EUR	4.13%
Bond	EDF	09/2018	09/2028	1,800	USD	4.50%
Euro MTN	EDF	04/2010	04/2030	1,500	EUR	4.63%
Euro MTN	EDF	10/2018	10/2030	1,000	EUR	2.00%
Euro MTN	EDF	07/2001	07/2031	650	GBP	5.88%
Euro MTN	EDF	02/2003	02/2033	850	EUR	5.63%
Euro MTN	EDF	06/2009	06/2034	1,500	GBP	6.13%
Euro MTN	EDF	10/2016	10/2036	750	EUR	1.88%
Bond	EDF	09/2018	09/2038	650	USD	4.88%
Bond	EDF	01/2009	01/2039	1,750	USD	6.95%
Euro MTN	EDF	11/2010	11/2040	750	EUR	4.50%
Euro MTN	EDF	10/2011	10/2041	1,250	GBP	5.50%
Bond	EDF	01/2014	01/2044	1,000	USD	4.88%
Bond	EDF	10/2015	10/2045	1,500	USD	4.75%
Bond	EDF	10/2015	10/2045	1,150	USD	4.95%
Bond	EDF	09/2018	09/2048	1,300	USD	5.00%
Euro MTN	EDF	09/2010	09/2050	1,000	GBP	5.13%
Euro MTN	EDF	10/2016	10/2056	2,164	USD	4.99%
Bond	EDF	01/2014	01/2114	1,350	GBP	6.00%

(1) Date funds were received.

On 19 and 25 September 2018, EDF raised respectively USD3.75 billion through a multi-tranche US Dollar senior bond, and €1 billion through a senior bond (see note 3.4).

At 31 December 2018, the total ceiling on EDF's EMTN (Euro Medium Term Notes) programme, allowing issuance of borrowings under the programme, is €45 billion.

### 38.2.2 Maturity of loans and other financial liabilities

AT 31 DECEMBER 2018:

(in millions of euros)	Bonds	Loans from financial institutions	Other financial liabilities	Loans related to finance-leased assets	Accrued Interest	Total
Less than one year	3,316	464	3,382	45	1,080	8,287
From one to five years	11,908	650	81	111	39	12,789
More than five years	35,177	1,984	563	168	220	38,112
<b>LOANS AND OTHER FINANCIAL LIABILITIES AT 31/12/2018</b>	<b>50,401</b>	<b>3,098</b>	<b>4,026</b>	<b>324</b>	<b>1,339</b>	<b>59,188</b>

AT 31 DECEMBER 2017:

(in millions of euros)	Bonds	Loans from financial institutions	Other financial liabilities	Loans related to finance-leased assets	Accrued Interest	Total
Less than one year	1,557	549	3,881	52	1,073	7,112
From one to five years	13,021	653	50	147	71	13,942
More than five years	32,747	1,892	794	169	190	35,792
<b>LOANS AND OTHER FINANCIAL LIABILITIES AT 31/12/2017</b>	<b>47,325</b>	<b>3,094</b>	<b>4,725</b>	<b>368</b>	<b>1,334</b>	<b>56,846</b>

### 38.2.3 Breakdown of loans and other financial liabilities by currency

(in millions of euros)	31/12/2018			31/12/2017		
	Initial debt structure	Impact of hedging instruments <sup>(1)</sup>	Debt structure after hedging	Initial debt structure	Impact of hedging instruments <sup>(1)</sup>	Debt structure after hedging
Euro (EUR)	26,783	21,438	48,221	27,609	18,454	46,063
American dollar (USD)	20,546	(17,564)	2,982	17,224	(14,752)	2,472
Pound sterling (GBP)	9,250	(2,414)	6,836	9,495	(2,331)	7,164
Other	2,609	(1,460)	1,149	2,518	(1,371)	1,147
<b>LOANS AND OTHER FINANCIAL LIABILITIES</b>	<b>59,188</b>	<b>-</b>	<b>59,188</b>	<b>56,846</b>	<b>-</b>	<b>56,846</b>

(1) Hedges of liabilities and net assets of foreign subsidiaries.

### 38.2.4 Breakdown of loans and other financial liabilities by type of interest rate

(in millions of euros)	31/12/2018			31/12/2017		
	Initial debt structure	Impact of derivatives	Final debt structure	Initial debt structure	Impact of derivatives	Final debt structure
Fixed rates	55,810	(21,949)	33,861	52,900	(21,469)	31,431
Floating rates	3,378	21,949	25,327	3,946	21,469	25,415
<b>LOANS AND OTHER FINANCIAL LIABILITIES</b>	<b>59,188</b>	<b>-</b>	<b>59,188</b>	<b>56,846</b>	<b>-</b>	<b>56,846</b>

The breakdown of loans and financial liabilities by interest rate includes the impact of all derivatives classified as hedges in accordance with IFRS 9.

A large portion of the EDF group's fixed-rate loans is swapped to variable rates.

### 38.2.5 Credit lines

At 31 December 2018, the Group has unused credit lines with various banks totalling €11,393 million (€11,943 million at 31 December 2017). These amounts include a €4 billion syndicated revolving credit facility which was modified and renewed on 14 December 2018 (see note 3.7).

	31/12/2018			31/12/2017
	Maturity			
(in millions of euros)	Total	< 1 year	1-5 years	> 5 years
<b>CONFIRMED CREDIT LINES</b>	<b>11,393</b>	<b>3,166</b>	<b>8,142</b>	<b>85</b>
				<b>11,943</b>

### 38.2.6 Early repayment clauses

Project financing loans to EDF Renewables from non-Group parties generally include early repayment clauses, mainly applicable when the borrower fails to maintain a minimum Debt Service Coverage Ratio (DSCR). In general, early repayment clauses are activated when this ratio falls below 1.

In other Group entities, certain clauses contained in contracts for financing or other commitments may make reference to Group ratings, but are not classified as covenants.

Two borrowings with a combined total of €725 million contain a review clause stipulating that if the borrower's rating falls below a certain level, the borrower and the lender must review and possibly renegotiate the terms of the loan, and the borrower may voluntarily proceed to early repayment.

No early repayment took place in 2018 as a result of any Group entity's failure to comply with contractual clauses concerning loans.

### 38.3 NET INDEBTEDNESS

Net indebtedness is not defined in the accounting standards and is not directly presented in the consolidated balance sheet. It comprises total loans and financial liabilities, less cash and cash equivalents and liquid assets. Liquid assets are financial assets consisting of funds or interest rate instruments with initial maturity of over three months that are readily convertible into cash and are managed according to a liquidity-oriented policy.

(in millions of euros)	Notes	31/12/2018	31/12/2017
Loans and other financial liabilities	38.2.1	59,188	56,846
Derivatives used to hedge liabilities	41	(1,972)	(1,176)
Cash and cash equivalents	37	(3,290)	(3,692)
Debt and equity securities – liquid assets	36.2.2	(20,538)	(18,963)
Net indebtedness of assets held for sale		-	-
<b>NET INDEBTEDNESS</b>		<b>33,388</b>	<b>33,015</b>

## NOTE 39 OTHER INFORMATION ON FINANCIAL ASSETS AND LIABILITIES

### 39.1 FAIR VALUE OF FINANCIAL INSTRUMENTS

The following tables show the breakdown of financial assets and liabilities in the balance sheet, by level.

#### 39.1.1 At 31 December 2018

(in millions of euros)	Balance sheet value	Fair value	Level 1 Unadjusted quoted prices	Level 2 Observable data	Level 3 Non-observable data
Financial assets at fair value through profit and loss <sup>(1)</sup>	6,404	6,404	569	5,497	338
Debt and equity securities	43,511	43,511	2,442	40,470	599
Positive fair value of hedging derivatives	4,383	4,383	68	4,315	-
Cash equivalents carried at fair value	435	435	181	254	-
<b>FINANCIAL ASSETS CARRIED AT FAIR VALUE IN THE BALANCE SHEET</b>	<b>54,733</b>	<b>54,733</b>	<b>3,260</b>	<b>50,536</b>	<b>937</b>
Loans and financial receivables – assets receivable from the NLF	9,220	9,220	-	9,220	-
Loans and financial receivables – CSPE	2,060	2,080	-	2,080	-
Other loans and financial receivables	2,669	2,669	-	2,669	-
<b>FINANCIAL ASSETS CARRIED AT AMORTISED COST</b>	<b>13,949</b>	<b>13,969</b>	<b>-</b>	<b>13,969</b>	<b>-</b>
Negative fair value of hedging derivatives	2,948	2,948	96	2,852	-
Negative fair value of trading derivatives	7,160	7,160	554	6,274	332
<b>FINANCIAL LIABILITIES CARRIED AT FAIR VALUE IN THE BALANCE SHEET</b>	<b>10,108</b>	<b>10,108</b>	<b>650</b>	<b>9,126</b>	<b>332</b>
Loans and other financial liabilities <sup>(2)</sup>	59,188	63,772	-	63,772	-
<b>FINANCIAL LIABILITIES CARRIED AT AMORTISED COST</b>	<b>59,188</b>	<b>63,772</b>	<b>-</b>	<b>63,772</b>	<b>-</b>

(1) Including €6,404 million for the positive fair value of trading derivatives.

(2) Loans and other financial liabilities are carried in the balance sheet at amortised cost, adjusted for changes in the fair value of risks covered by a fair value hedge.

Level 3 debt and equity securities are principally non-consolidated investments.

Cash equivalents, which principally take the form of negotiable debt instruments and short-term investments, are generally valued using yield curves, and therefore observable market data.

#### 39.1.2 At 31 December 2017

(in millions of euros)	Balance sheet value	Fair value	Level 1 Unadjusted quoted prices	Level 2 Observable data	Level 3 Non-observable data
Financial assets carried at fair value with changes in fair value included in income <sup>(1)</sup>	2,614	2,614	233	2,252	129
Debt and equity securities	40,924	40,924	2,499	37,792	633
Positive fair value of hedging derivatives	3,580	3,580	21	3,559	-
Cash equivalents carried at fair value	364	364	198	166	-
<b>FINANCIAL ASSETS CARRIED AT FAIR VALUE IN THE BALANCE SHEET</b>	<b>47,482</b>	<b>47,482</b>	<b>2,951</b>	<b>43,769</b>	<b>762</b>
Loans and financial receivables – Assets receivable from the NLF	8,650	8,650	-	8,650	-
Loans and financial receivables – CSPE	3,294	3,349	-	3,349	-
Other loans and financial receivables	2,678	2,678	-	2,678	-
<b>FINANCIAL ASSETS RECORDED AT AMORTISED COST</b>	<b>14,622</b>	<b>14,677</b>	<b>-</b>	<b>14,677</b>	<b>-</b>
Negative fair value of hedging derivatives	2,874	2,874	75	2,799	-
Negative fair value of trading derivatives	2,787	2,787	200	2,467	120
<b>FINANCIAL LIABILITIES CARRIED AT FAIR VALUE IN THE BALANCE SHEET</b>	<b>5,661</b>	<b>5,661</b>	<b>275</b>	<b>5,266</b>	<b>120</b>
Loans and other financial liabilities <sup>(2)</sup>	56,846	63,334	-	63,334	-
<b>FINANCIAL LIABILITIES RECORDED AT AMORTISED COST</b>	<b>56,846</b>	<b>63,334</b>	<b>-</b>	<b>63,334</b>	<b>-</b>

(1) Including €2,614 million for the positive fair value of trading derivatives.

(2) Loans and other financial liabilities are carried in the balance sheet at amortised cost, adjusted for changes in the fair value of risks covered by a fair value hedge.

## 39.2 OFFSETTING OF FINANCIAL ASSETS AND LIABILITIES

### 39.2.1 At 31 December 2018

(in millions of euros)	As reported in balance sheet	Balance without offsetting	Balance with offsetting under IAS 32			Amounts covered by a general offsetting agreement but not offset under IAS 32		
			Gross amount recognised (before offsetting)	Gross amount offset under IAS 32	Net amount recognised after offsetting under IAS 32	Financial instruments	Fair value of financial collateral	Net amount
Fair value of derivatives – assets	10,787	218	16,481	(5,912)	10,569	(1,711)	(960)	7,898
Fair value of derivatives – liabilities	(10,108)	(848)	(15,172)	5,912	(9,260)	1,711	959	(6,590)

### 39.2.2 At 31 December 2017

(in millions of euros)	As reported in balance sheet	Balance without offsetting	Balance with offsetting under IAS 32			Amounts covered by a general offsetting agreement but not offset under IAS 32		
			Gross amount recognised (before offsetting)	Gross amount offset under IAS 32	Net amount recognised after offsetting under IAS 32	Financial instruments	Fair value of financial collateral	Net amount
Fair value of derivatives – assets	6,194	234	11,067	(5,107)	5,960	(1,652)	(1,073)	3,235
Fair value of derivatives – liabilities	(5,661)	(844)	(9,924)	5,107	(4,817)	1,652	768	(2,397)



## NOTE 40 MANAGEMENT OF MARKET AND COUNTERPARTY RISKS

As an operator in the energy sector worldwide, the EDF group is exposed to financial market risks, energy market risks and counterparty risks. All these risks could generate volatility in the financial statements.

### ■ Financial market risks

The main financial market risks to which the Group is exposed are the liquidity risk, the foreign exchange risk, the interest rate risk and the equity risk.

The objective of the Group's liquidity risk management is to seek resources at optimum cost and ensure their constant accessibility.

The foreign exchange risk relates to the diversification of the Group's businesses and geographical locations, and results from exposure to the risk of exchange rate fluctuations. These fluctuations can affect the Group's translation differences, balance sheet items, financial expenses, equity and net income.

The interest rate risk results from exposure to the risk of fluctuations in interest rates that can affect the value of assets invested by the Group, the value of the liabilities covered by provision, or its financial expenses.

The Group is exposed to equity risks, particularly through its dedicated asset portfolio held for secure financing of long-term nuclear commitments, through external pension funds, and to a lesser extent through its cash assets and directly-held investments.

A more detailed description of these risks can be found in section 5.1.6.1 of the Reference Document, "Financial Information – Management and control of financial risks".

### ■ Energy market risks

With the opening of the final customer market, development of the wholesale markets and international business expansion, the EDF group operates on deregulated energy markets, mainly in Europe, through its generation and supply activities. This exposes the Group to price variations on the wholesale markets for energy (electricity, gas, coal, oil products) and the CO<sub>2</sub> emissions quota market, with a potentially significant impact on the financial statements.

A more detailed description of these risks can be found in section 5.1.6.2 of the Reference Document, "Financial Information – Management and control of energy market risks".

### ■ Counterparty risks

Counterparty risk is defined as the total loss that the EDF group would sustain on its business and market transactions if a counterparty defaulted and failed to perform its contractual obligations.

A more detailed description of these risks can be found in section 5.1.6.1.7 of the Reference Document, "Financial Information – Management and control of counterparty/credit risks".

Regarding the customer risk, which is another component of the counterparty risk, a statement of receivables not yet due and overdue is shown in note 25.

The sensitivity analyses required by IFRS 7 are presented in section 5.1.6.1 of the Reference Document, "Financial Information – Management and control of financial risks":

- foreign exchange risks: section 5.1.6.1.3;
- interest rate risks: section 5.1.6.1.4;
- equity risk on financial assets: sections 5.1.6.1.5 and 5.1.6.1.6.

The principal information on financial assets and liabilities is described by theme in the following notes and sections:

- liquidity risks:
  - maturity of loans and other financial liabilities: note 38.2.2 to the consolidated financial statements,
  - credit lines: note 38.2.5 to the consolidated financial statements,
  - early repayment clauses for borrowings: note 38.2.6 to the consolidated financial statements,
  - off-balance sheet commitments: note 46 to the consolidated financial statements;
- foreign exchange risks:
  - breakdown of loans by currency and type of interest rate: notes 38.2.3 and 38.2.4 to the consolidated financial statements;
- equity risks (sections 5.1.6.1.5 and 5.1.6.1.6 of the Reference Document, "Financial Information Management of equity risks/Management of financial risk on EDF's dedicated asset portfolio"):
  - coverage of nuclear obligations: notes 46 and 29.1.5 to the consolidated financial statements,
  - coverage of social obligations: notes 31.2.5 and 31.3.4 to the consolidated financial statements,
  - long-term cash management,
  - direct investments;
- interest rate risks:
  - discount rate for nuclear provisions: calculation method and sensitivity: note 29.1.5.2 to the consolidated financial statements,
  - discount rate used for employee benefits: notes 31.2.7 and 31.3.6 to the consolidated financial statements,
  - breakdown of loans by currency and interest rate: notes 38.2.3 and 38.2.4 to the consolidated financial statements;
- balance sheet treatment of financial and market risks:
  - derivatives and hedge accounting: note 41 to the consolidated financial statements, and the statement of changes in equity,
  - derivatives not classified as hedges: note 42 to the consolidated financial statements.

## NOTE 41 DERIVATIVES AND HEDGE ACCOUNTING

Hedge accounting is applied in compliance with IFRS 9, and concerns interest rate derivatives used to hedge long-term indebtedness, currency derivatives used to

hedge net foreign investments and debts in foreign currencies, and currency and commodity derivatives used to hedge future cash flows.

The fair value of hedging derivatives reported in the balance sheet breaks down as follows:

<i>(in millions of euros)</i>	Notes	31/12/2018	31/12/2017
Positive fair value of hedging derivatives	36.1	4,383	3,580
Negative fair value of hedging derivatives	38.1	(2,948)	(2,874)
<b>FAIR VALUE OF HEDGING DERIVATIVES</b>		<b>1,435</b>	<b>706</b>
Interest rate hedging derivatives	41.4.1	1,550	1,689
Exchange rate hedging derivatives	41.4.2	582	(606)
Commodity-related cash flow hedges	41.4.3	(645)	(411)
Commodity-related fair value hedges	41.5	(52)	34

An alternative breakdown of hedging derivatives is shown below:

<i>(in millions of euros)</i>	Notes	31/12/2018	31/12/2017
Fair value of derivatives hedging liabilities	38.3	1,972	1,176
Fair value of derivatives hedging net foreign investments		106	90
Fair value of other hedging derivatives (commodities)		(643)	(560)
<b>FAIR VALUE OF HEDGING DERIVATIVES</b>		<b>1,435</b>	<b>706</b>

### 41.1 FAIR VALUE HEDGES

The EDF group hedges the exposure to changes in the fair value of fixed-rate debts. The derivatives used for this hedging are fixed/floating interest rate swaps and cross currency swaps, with changes in fair value recorded in the income statement. Fair value hedges also include currency hedging instruments on certain firm purchase commitments.

In 2018, the ineffective portion of fair value hedges represents a loss of € (3) million (gain of 37 million in 2017), included in the financial result.

### 41.2 CASH FLOW HEDGES

The EDF group uses cash flow hedging principally for the following purposes:

- to hedge its floating-rate debt, using interest-rate swaps (floating/fixed rate);
- to hedge the exchange rate risk related to debts contracted in foreign currencies, using cross currency swaps;
- to hedge future cash flows related to expected sales and purchases of electricity, gas, and coal, using futures, forwards and swaps.

The EDF group also hedges the currency risk associated with fuel and commodity purchases.

The ineffective portion of cash flow hedges in 2018 represents a gain of €5 million which was included in the financial result (nil in 2017).

### 41.3 HEDGES OF NET INVESTMENTS IN FOREIGN ENTITIES

Hedging of net foreign investments is used for protection against exposure to the exchange rate risk related to net investments in the Group's foreign entities.

This risk is hedged at Group level either by contracting debts for investments in the same currency, or through the markets, in which case the Group uses currency swaps and forward exchange contracts.

## 41.4 IMPACT OF HEDGING DERIVATIVES ON EQUITY

Changes during the period in the fair value of hedging instruments included in equity (EDF share) are detailed below:

	2018			2017		
(in millions of euros)	Gross changes in fair value recorded in equity <sup>(1)</sup>	Gross changes in fair value transferred to income – Recycling <sup>(2)</sup>	Gross changes in fair value transferred to income – Ineffectiveness	Gross changes in fair value recorded in equity <sup>(1)</sup>	Gross changes in fair value transferred to income – Recycling <sup>(2)</sup>	Gross changes in fair value transferred to income – Ineffectiveness
Interest rate hedging	(73)	-	1	31	-	-
Exchange rate hedging	890	443	(5)	(1,588)	(1,331)	(3)
Net foreign investment hedging	(85)	-	-	518	(120)	-
Commodity hedging	(1,043)	(788)	(9)	(613)	(1,714)	5
<b>HEDGING DERIVATIVES <sup>(3)</sup></b>	<b>(311)</b>	<b>(345)</b>	<b>(13)</b>	<b>(1,652)</b>	<b>(3,165)</b>	<b>2</b>

(1) +/(-): increase/(decrease) in equity (EDF share).

(2) +/(-): increase/(decrease) in net income (EDF share).

(3) Excluding associates and joint ventures.

### 41.4.1 Interest rate hedging derivatives

Interest rate hedging derivatives break down as follows:

	Notional at 31/12/2018				Notional at 31/12/2017	Fair value	
(in millions of euros)	< 1 year	1-5 years	> 5 years	Total	Total	31/12/2018	31/12/2017
Fixed rate payer/floating rate receiver	118	815	235	1,168	1,148	(75)	(75)
Floating rate payer/fixed rate receiver	-	5,634	17,509	23,143	22,740	1,619	1,928
Floating rate/floating rate	-	1,415	1,616	3,031	1,252	56	(9)
Fixed rate/fixed rate	4,901	1,654	7,498	14,053	10,062	(50)	(155)
<b>Interest rate swaps</b>	<b>5,019</b>	<b>9,518</b>	<b>26,858</b>	<b>41,395</b>	<b>35,202</b>	<b>1,550</b>	<b>1,689</b>
<b>INTEREST RATE HEDGING DERIVATIVES</b>	<b>5,019</b>	<b>9,518</b>	<b>26,858</b>	<b>41,395</b>	<b>35,202</b>	<b>1,550</b>	<b>1,689</b>

The fair value of interest rate/exchange rate cross-currency swaps comprises the interest rate effect only.

A large portion of the EDF group's fixed-rate loans is swapped to variable rates.

The notional value of cross-currency swaps is included both in this note and the note on Exchange rate hedging derivatives (41.4.2).

### 41.4.2 Exchange rate hedging derivatives

Exchange rate hedging derivatives break down as follows:

AT 31 DECEMBER 2018:

	Notional amount to be received at 31/12/2018				Notional amount to be given at 31/12/2018				Fair value
(in millions of euros)	< 1 year	1-5 years	> 5 years	Total	< 1 year	1-5 years	> 5 years	Total	31/12/2018
Forward exchange transactions	1,550	393	-	1,943	1,540	387	-	1,927	17
Swaps	17,085	9,543	16,884	43,512	16,791	9,163	16,785	42,739	565
<b>EXCHANGE RATE HEDGING DERIVATIVES</b>	<b>18,635</b>	<b>9,936</b>	<b>16,884</b>	<b>45,455</b>	<b>18,331</b>	<b>9,550</b>	<b>16,785</b>	<b>44,666</b>	<b>582</b>

AT 31 DECEMBER 2017:

	Notional amount to be received at 31/12/2017				Notional amount to be given at 31/12/2017				Fair value
(in millions of euros)	< 1 year	1-5 years	> 5 years	Total	< 1 year	1-5 years	> 5 years	Total	31/12/2017
Forward exchange transactions	2,478	518	-	2,996	2,475	514	-	2,989	-
Swaps	12,469	10,614	12,724	35,807	12,592	10,384	13,155	36,131	(606)
<b>EXCHANGE RATE HEDGING DERIVATIVES</b>	<b>14,947</b>	<b>11,132</b>	<b>12,724</b>	<b>38,803</b>	<b>15,067</b>	<b>10,898</b>	<b>13,155</b>	<b>39,120</b>	<b>(606)</b>

The notional value of cross-currency swaps shown in this note is also included in the note on interest rate hedging derivatives (note 41.4.1).

### 41.4.3 Commodity-related cash flow hedges

For commodities, changes in fair value are mainly explained by:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Electricity hedging contracts	(629)	(916)
Gas hedging contracts	(231)	69
Coal hedging contracts	(107)	36
Oil product hedging contracts	(446)	149
CO <sub>2</sub> emission rights hedging contracts	370	49
<b>CHANGES IN FAIR VALUE BEFORE TAXES</b>	<b>(1,043)</b>	<b>(613)</b>

The main components of the amount transferred to income in respect of commodity hedges terminated during the year are:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Electricity hedging contracts	(388)	(1,744)
Gas hedging contracts	(280)	50
Coal hedging contracts	(109)	31
Oil product hedging contracts	(194)	(66)
CO <sub>2</sub> emission rights hedging contracts	183	15
<b>CHANGES IN FAIR VALUE BEFORE TAXES</b>	<b>(788)</b>	<b>(1,714)</b>

Details of commodity-related cash flow hedges are as follows:

		31/12/2018				31/12/2017		
		Net notional				Net notional		
<i>(in millions of euros)</i>	Units of measure	< 1 year	1-5 years	> 5 years	Total	Fair value		Fair value
Swaps		(4)	-	-	(4)	50	2	58
Forwards/futures		(4)	(47)	-	(51)	(859)	(72)	(688)
<b>Electricity</b>	<b>Terawatt hours</b>	<b>(8)</b>	<b>(47)</b>	<b>-</b>	<b>(55)</b>	<b>(809)</b>	<b>(70)</b>	<b>(630)</b>
Swaps		(205)	15	-	(190)	9	(233)	(16)
Forwards/futures		1,049	455	-	1,504	25	1,451	65
<b>Gas</b>	<b>Millions of therms</b>	<b>844</b>	<b>470</b>	<b>-</b>	<b>1,314</b>	<b>34</b>	<b>1,218</b>	<b>49</b>
Swaps		4,180	6,222	-	10,402	(53)	14,175	109
Options		180	-	-	180	-	379	2
<b>Oil products</b>	<b>Thousands of barrels</b>	<b>4,360</b>	<b>6,222</b>	<b>-</b>	<b>10,582</b>	<b>(53)</b>	<b>14,554</b>	<b>111</b>
Swaps		-	-	-	-	-	-	40
<b>Coal</b>	<b>Millions of tonnes</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>40</b>
Swaps		-	-	-	-	-	-	-
Forwards/futures		4,500	8,988	-	13,488	183	19,576	19
<b>CO<sub>2</sub></b>	<b>Thousands of tonnes</b>	<b>4,500</b>	<b>8,988</b>	<b>-</b>	<b>13,488</b>	<b>183</b>	<b>19,576</b>	<b>19</b>
<b>COMMODITY-RELATED CASH FLOW HEDGES</b>						<b>(645)</b>		<b>(411)</b>

### 41.5 COMMODITY-RELATED FAIR VALUE HEDGES

Details of commodity-related fair value hedges are as follows:

		31/12/2018		31/12/2017	
<i>(in millions of euros)</i>	Units of measure	Net notional	Fair value	Net notional	Fair value
Coal and freight	Millions of tonnes	(3)	2	4	3
Oil products	Thousands of barrels	5,136	(23)	-	-
Gas	Millions of therms	(93)	(31)	(583)	31
<b>COMMODITY-RELATED FAIR VALUE HEDGES</b>			<b>(52)</b>		<b>34</b>

## NOTE 42 NON-HEDGING DERIVATIVES

Details of the fair value of trading derivatives reported in the balance sheet are as follows:

(in millions of euros)	Notes	31/12/2018	31/12/2017
Positive fair value of trading derivatives	36.1	6,404	2,614
Negative fair value of trading derivatives	38.1	(7,160)	(2,787)
<b>FAIR VALUE OF TRADING DERIVATIVES</b>		<b>(756)</b>	<b>(173)</b>
Interest rate derivatives held for trading	42.1	(60)	(33)
Currency derivatives held for trading	42.2	(96)	73
Non-hedging commodity derivatives	42.3	(641)	(213)
Other contracts		41	-

### 42.1 INTEREST RATE DERIVATIVES HELD FOR TRADING

Interest rate derivatives held for trading break down as follows:

(in millions of euros)	Notional at 31/12/2018				Notional at 31/12/2017	Fair value	
	< 1 year	1-5 years	> 5 years	Total		31/12/2018	31/12/2017
Purchases of options	-	-	516	516	519	7	15
<b>Interest rate operations</b>	-	-	<b>516</b>	<b>516</b>	<b>519</b>	<b>7</b>	<b>15</b>
Fixed rate payer/floating rate receiver	1,517	1,247	1,121	3,885	2,978	(64)	(42)
Floating rate payer/fixed rate receiver	-	122	-	122	416	(4)	(8)
Floating rate/floating rate	-	5	-	5	351	-	1
Fixed rate/fixed rate	28	42	70	140	338	1	1
<b>Interest rate swaps</b>	<b>1,545</b>	<b>1,416</b>	<b>1,191</b>	<b>4,152</b>	<b>4,083</b>	<b>(67)</b>	<b>(48)</b>
<b>INTEREST RATE DERIVATIVES HELD FOR TRADING</b>	<b>1,545</b>	<b>1,416</b>	<b>1,707</b>	<b>4,668</b>	<b>4,602</b>	<b>(60)</b>	<b>(33)</b>

### 42.2 CURRENCY DERIVATIVES HELD FOR TRADING

Currency derivatives held for trading break down as follows:

#### AT 31 DECEMBER 2018:

(in millions of euros)	Notional amount to be received at 31/12/2018				Notional amount to be given at 31/12/2018				Fair value
	< 1 year	1-5 years	> 5 years	Total	< 1 year	1-5 years	> 5 years	Total	31/12/2018
Forward transactions	3,223	2,017	4	5,244	3,215	1,989	5	5,209	2
Swaps	11,885	6,570	70	18,525	11,981	6,689	69	18,739	(98)
<b>CURRENCY DERIVATIVES HELD FOR TRADING</b>	<b>15,108</b>	<b>8,587</b>	<b>74</b>	<b>23,769</b>	<b>15,196</b>	<b>8,678</b>	<b>74</b>	<b>23,948</b>	<b>(96)</b>

#### AT 31 DECEMBER 2017:

(in millions of euros)	Notional amount to be received at 31/12/2017				Notional amount to be given at 31/12/2017				Fair value
	< 1 year	1-5 years	> 5 years	Total	< 1 year	1-5 years	> 5 years	Total	31/12/2017
Forward transactions	2,438	1,079	8	3,525	2,443	1,089	9	3,541	(23)
Swaps	11,986	4,823	74	16,883	11,960	4,764	73	16,797	96
<b>CURRENCY DERIVATIVES HELD FOR TRADING</b>	<b>14,424</b>	<b>5,902</b>	<b>82</b>	<b>20,408</b>	<b>14,403</b>	<b>5,853</b>	<b>82</b>	<b>20,338</b>	<b>73</b>

### 42.3 NON-HEDGING COMMODITY DERIVATIVES

Details of commodity derivatives not classified as hedges are as follows:

(in millions of euros)	Unit of measure	31/12/2018		31/12/2017	
		Net notional	Fair value	Net notional	Fair value
Swaps		3	502	(5)	479
Options		4	(22)	4	106
Forwards/futures		(50)	(123)	(54)	(403)
<b>Electricity</b>	<b>Terawatt hours</b>	<b>(43)</b>	<b>357</b>	<b>(55)</b>	<b>182</b>
Swaps		(510)	(515)	894	(132)
Options		32	185	(68)	171
Forwards/futures		16,323	80	19,784	57
<b>Gas</b>	<b>Millions of therms</b>	<b>15,845</b>	<b>(250)</b>	<b>20,610</b>	<b>96</b>
Swaps		27,715	(82)	3,400	94
Options		500	1	1,920	3
Forwards/futures		(360)	(3)	108	(3)
<b>Oil products</b>	<b>Thousands of barrels</b>	<b>27,855</b>	<b>(84)</b>	<b>5,428</b>	<b>94</b>
Swaps		(2,521)	6	(1)	(151)
Options		-	(14)	3	(1)
Forwards/futures		-	-	4	9
Freight		3,232	(2)	(4)	17
<b>Coal and freight</b>	<b>Millions of tonnes</b>	<b>711</b>	<b>(10)</b>	<b>2</b>	<b>(126)</b>
Swaps		-	-	43	-
Options		(5,000)	(150)	-	-
Forwards/futures		(56,433)	(446)	35,583	(57)
<b>CO<sub>2</sub></b>	<b>Thousands of tonnes</b>	<b>(61,433)</b>	<b>(596)</b>	<b>35,626</b>	<b>(57)</b>
Swaps/options			29		(56)
Forwards/futures			(87)		(346)
<b>Other commodities</b>			<b>(58)</b>		<b>(402)</b>
<b>Embedded commodity derivatives</b>			-		-
<b>NON-HEDGING COMMODITY DERIVATIVES</b>			<b>(641)</b>		<b>(213)</b>

These mainly include contracts included in EDF Trading's portfolio.

## ASSETS HELD FOR SALE AND RELATED LIABILITIES

### NOTE 43 ASSETS HELD FOR SALE AND RELATED LIABILITIES

(in millions of euros)	31/12/2018	31/12/2017
<b>ASSETS HELD FOR SALE</b>	-	-
<b>LIABILITIES RELATED TO ASSETS HELD FOR SALE</b>	-	-



## CASH FLOWS AND OTHER INFORMATION

### NOTE 44 CASH FLOWS

#### 44.1 CHANGE IN WORKING CAPITAL

<i>(in millions of euros)</i>	2018	2017 restated <sup>(1)</sup>
Change in inventories	(18)	543
Change in the receivable for Contribution to the Public Electricity Service (CSPE)	357	499
Change in trade receivables	1,259	376
Change in trade payables	(707)	550
Change in other receivables and payables (excluding CSPE)	(429)	(492)
<b>CHANGE IN WORKING CAPITAL</b>	<b>462</b>	<b>1,476</b>

(1) The published figures at 31 December 2017 have been restated according to IFRS 15 (note 2.1.3.2).

#### 44.2 INVESTMENTS IN INTANGIBLE AND TANGIBLE ASSETS

<i>(in millions of euros)</i>	2018	2017
Acquisitions of intangible assets	(1,828)	(1,165)
Acquisitions of tangible assets	(13,990)	(14,329)
Change in payables to suppliers of fixed assets	(368)	747
<b>INVESTMENTS IN INTANGIBLE AND TANGIBLE ASSETS</b>	<b>(16,186)</b>	<b>(14,747)</b>

## **NOTE 45 EDF'S DEDICATED ASSETS**

### **45.1 REGULATIONS**

Article L. 594 of France's Environment Code and its implementing regulations require assets (dedicated assets) to be set aside for secure financing of nuclear plant decommissioning expenses and long-term storage expenses for radioactive waste. These regulations govern the way dedicated assets are built up, and the management and governance of the funds themselves. Dedicated assets are clearly identified and managed separately from the company's other financial assets and investments. They are also subject to specific monitoring and control by the Board of Directors and the administrative authorities.

The law requires the realisable value of dedicated assets to be higher than the value of the provisions corresponding to the present value of the long-term nuclear expenses defined above.

The Decree of 29 December 2010 made RTE shares eligible for inclusion in dedicated assets subject to certain conditions and administrative authorisation. The Decree of 24 July 2013 also revised the list of eligible assets by reference to the Insurance Code, making unlisted assets eligible subject to certain conditions.

The Decree of 24 March 2015 contains two measures concerning dedicated assets:

- the annual allocation to dedicated assets, net of any increases to provisions, must be positive or zero as long as their realisable value is below 110% of the amount of the provisions concerned;
- subject to certain conditions, real estate property owned by the operators of nuclear facilities may be allocated to coverage of these provisions.

Subject to certain conditions, the Decree of 19 December 2016 authorised allocation of the shares of CTE, which holds 100% of the capital of RTE, to the portfolio of dedicated assets at 31 December 2017 (see note 45.2.2 below).

EDF also received ministerial authorisation on 31 May 2018 to increase the portion of unlisted assets in its dedicated assets from 10% to 15% subject to conditions (this does not apply to the shares of CTE or real estate assets).

### **45.2 PORTFOLIO CONTENTS AND MEASUREMENT**

Given the applicable regulations, these dedicated assets are a highly specific category of assets.

Dedicated assets are structured and managed according to a strategic allocation defined by the Board of Directors and reported to the administrative authorities. The strategic allocation is designed to meet the overall objective of long-term coverage of obligations, and determines the structure and management of the portfolio as a whole. It takes into account regulatory constraints concerning the nature and liquidity of the dedicated assets, the financial outlook for the equity and bond markets, and the diversifying contribution of unlisted assets.

As part of the strategic allocation review process and in order to pursue the diversification into unlisted assets begun in 2010 with the shares in RTE, in 2013 the Board of Directors approved the introduction of an unlisted asset portfolio alongside the diversified equity and bond investments. This portfolio is managed by the EDF Invest Division, which was formed following the Decree of 24 July 2013 on securing the funding for nuclear expenses. EDF Invest has the following target asset classes: infrastructures, real estate and debt or equity funds.

Following the French government's authorisation issued on 8 February 2013, and the approval of the Nuclear Commitments Monitoring Committee and the Board of Directors' decision of 13 February 2013, EDF allocated the entire receivable recognised by the French State, representing the accumulated shortfall in CSPE financing at 31 December 2012, to its dedicated assets.

This financial receivable was increased in the financial statements at 31 December 2015 by an additional amount estimated at €644 million that was not allocated to dedicated assets, corresponding to the shortfalls in compensation that arose between the beginning of 2013 and the end of 2015, as acknowledged by the

State in a ministerial letter of 26 January 2016. In accordance with this letter, the total financial receivable bears interest at 1.72% and will be repaid under a revised schedule ending in late 2020. This schedule was laid down in a ministerial order of 2 December 2016, based on the CRE's confirmation of the shortfall for 2015.

On 22 December 2016, EDF assigned a 26.4% portion of this financial receivable, including the additional receivable corresponding to the shortfalls in compensation between 2013 and 2015, to a pool of investors.

Consequently, the realisable value of the non-assigned portion of the receivable, which is totally allocated to dedicated assets, is calculated based on the assignment value at that date.

The amount received for assignment of the portion of the CSPE receivable that was allocated to dedicated assets (€894 million) was reinvested in dedicated assets, in the same way as the reimbursements received (see note 3.11.3).

After receiving the ministerial letter of 31 May 2018 authorising EDF, subject to conditions, to increase the portion of unlisted assets in its dedicated assets, on 29 June 2018 the Board of Directors validated the following new strategic allocation for dedicated assets:

- yield assets (target: 30% of dedicated assets), consisting of infrastructure assets, including the shares of CTE, and real estate property;
- growth assets (target: 40% of dedicated assets), consisting of equity funds investing in listed or unlisted equities;
- fixed-income assets (target: 30% of dedicated assets), consisting of listed bonds or listed bond funds, unlisted debt funds, receivables and cash.

These targets should be reached gradually, mainly by reinvesting fixed-income assets in yield assets and growth assets.

#### **45.2.1 Growth assets and fixed-income assets**

Certain growth and fixed-income assets take the form of bonds held directly by EDF. Others consist of specialised collective investment funds on leading international markets, managed by independent asset management companies. They take the form of open-end funds and "reserved" funds established for the Group (which does not participate in the fund management).

The listed equity funds consist of international equities (mainly in North America but also in Europe, Asia-Pacific and emerging countries). Listed bonds and listed bond funds consist of sovereign and corporate bonds.

These investments are structured and managed in line with the strategic allocation, which takes into consideration international stock market cycles, for which the statistical inversion generally observed between equity market cycles and bond market cycles – as well as between geographical areas – has led the Group to define a long-term investment policy with appropriate allocation between growth assets and fixed-income assets.

Under the new strategic allocation, growth assets also include a small portion of funds invested in unlisted equities, and fixed-income assets also include a small portion of funds invested in unlisted debt. These funds are managed by EDF Invest (see note 45.2.2).

Since the application of IFRS 9 from 1 January 2018, all these assets have been included in debt and equity securities.

At the year-end, dedicated assets are presented in debt and equity securities in the balance sheet, at their liquidation value.

In the course of operational asset monitoring, the Group applies long-term, specific management rules defined and supervised by its governance bodies (maximum investment ratios, volatility analyses and assessment of individual fund manager quality).

#### **45.2.2 Yield assets**

The yield assets managed by EDF Invest consist of assets related to investments in infrastructures and real estate.

Through investment funds, EDF Invest also manages growth assets and fixed-income assets (see note 45.2.1).

At 31 December 2018, the assets managed by EDF Invest represent a total realisable value of €5,680 million, including €5,356 million of yield assets. Yield assets particularly include:

- 50.1% of the Group's shares in CTE, the joint venture that owns RTE, in compliance with Decree 2016-1781 of 19 December 2016 amending the Decree of 23 February 2007. These shares amount to €2,738 million at 31 December 2018 (€2,705 million at 31 December 2017) (see note 3.11.3);

- the Group's investment in Terega, Porterbrook, Autostrade per l'Italia, Q-Park and companies that own wind farms in the United Kingdom (Bicker Fen, Glass Moor II, Green Rigg, Rusholme), which are presented in debt and equity securities in the consolidated balance sheet;

- the Group's investments in Madrileña Red de Gas (MRG), Géosel, Thyssengas, Aéroports de la Côte d'Azur, Central Sicaf, Fallago Rig, Fenland, Ecowest SCI A and B and Nam Theun Power Company, which are presented in investments in associates in the consolidated balance sheet.

## 45.3 VALUATION OF EDF'S DEDICATED ASSETS

EDF's dedicated assets are included in the Group's consolidated financial statements at the following values:

		31/12/2018		31/12/2017	
		Book value	Realisable value	Book value	Realisable value
<i>(in millions of euros)</i>					
<b>Consolidated balance sheet presentation</b>					
<b>Yield assets (EDF Invest)</b>		<b>3,919</b>	<b>5,356</b>	<b>3,652</b>	<b>5,210</b>
CTE	Investments in associates <sup>(1)</sup>	1,406	2,738	1,241	2,705
Other associates	Investments in associates <sup>(2)</sup>	1,167	1,234	893	944
Other unlisted assets	Debt and equity securities and other net assets <sup>(3)</sup>	1,346	1,384	1,518	1,561
<b>Growth assets</b>		<b>10,108</b>	<b>10,108</b>	<b>10,099</b>	<b>10,099</b>
Equities <sup>(4)</sup>	Debt securities	9,844	9,844	9,942	9,942
Unlisted equity funds (EDF Invest)	Debt securities	219	219	127	127
Derivatives	Fair value of derivatives	45	45	30	30
<b>Fixed-income assets</b>		<b>12,205</b>	<b>12,225</b>	<b>12,751</b>	<b>12,806</b>
Bonds	Debt securities	10,010	10,010	9,282	9,282
Unlisted debt funds (EDF Invest)	Debt securities	105	105	71	71
Cash portfolio <sup>(5)</sup>	Debt securities	30	30	104	104
CSPE receivable <sup>(6)</sup>	Loans and financial receivables	2,060	2,080	3,294	3,349
<b>TOTAL EDF DEDICATED ASSETS</b>		<b>26,232</b>	<b>27,689</b>	<b>26,502</b>	<b>28,115</b>

(1) The Group's investment of 50.1% of CTE, the company that holds 100% of the shares in RTE. The CTE shares are included at their equity value in the consolidated financial statements (book value in the table). The realisable value of CTE at 31 December 2018 in the above table has been determined by an independent assessor, in the same way as for EDF Invest's other assets. The realisable value of CTE at 31 December 2017 was based on the sale transaction price of 31 March 2017.

(2) Including the value of the share in equity of the controlled companies owning these investments.

(3) Including debt and equity securities amounting to €1,221 million and the value of the share in equity of other controlled companies.

(4) Including €391 million of securities acquired in late December 2018 for which payment took place in early January 2019.

(5) After deduction of the €391 million of liabilities on securities acquired in late December 2018 for which payment took place in early January 2019.

(6) The receivable consisting of accumulated shortfalls in compensation at 31 December 2015, less the portion assigned on 22 December 2016 and reimbursements received since then, in line with the repayment schedule. The realisable value of the CSPE receivable is estimated based on market rates.

## Structured entities – Investment funds

The investment funds held by the Group (see note 1.3.2.9) reported in the table under "Debt and equity securities" are located in France and owned by EDF. The Group has not given these funds any financial support.

The value of the assets of these investment funds amounts to €4,898 million at 31 December 2018 (€3,294 million at 31 December 2017). The funds mainly consist of 11 listed funds with total value of €4,340 million (at 31 December 2017, 12 listed funds with total value of €2,906 million).

## 45.4 COVERAGE OF LONG-TERM NUCLEAR OBLIGATIONS

At 31 December 2018, by the regulatory calculations provisions are 98.3% covered by dedicated assets. The regulatory limit on the realisable value of certain investments (decree 2007-243) has no effect at 31 December 2018.

At 31 December 2017, by the regulatory calculations provisions were 108.5% covered by dedicated assets. The regulatory limit on the realisable value of certain investments (decree 2007-243) also had no effect at 31 December 2017.

The coverage of nuclear provisions at 31 December 2018 complies with the ministerial decision of 28 December 2018 which extended the scope of provisions to be covered by dedicated assets. Following that ministerial decision, €298 million of provisions previously considered to belong to the operating cycle as defined by the regulations were transferred to long-term provisions, with an effect of -1.05% on the coverage rate.

## 6. FINANCIAL STATEMENTS

### Cash flows and other information

Withdrawals from dedicated assets in 2018 totalled €403 million, equivalent to payments made in respect of the long-term nuclear obligations to be covered during the year (€378 million in 2017).

Over a 10-year horizon, disbursements will be made to the following extent (at year-end economic conditions, *i.e.* in 2018 euros):

- 14% of provisions for long-term radioactive waste management;
- 11% of provisions for decommissioning.

Over a 50-year horizon, disbursements will be made to the following extent (at year-end economic conditions, *i.e.* in 2018 euros):

- 35% of provisions for long-term radioactive waste management;
- 93% of provisions for decommissioning.

The Group's long-term nuclear obligations in France concerned by the regulations for dedicated assets related to nuclear generation are included in the EDF group's consolidated financial statements at the following values:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Provisions for spent fuel management – portion unrelated to the operating cycle as defined in the regulations	1,067	983
Provisions for long-term radioactive waste management	9,846	8,814
Provisions for waste removal and conditioning	751	726
Provisions for nuclear plant decommissioning	15,985	14,920
Provisions for last cores – portion for future long-term radioactive waste management	518	467
<b>PRESENT COST OF LONG-TERM NUCLEAR OBLIGATIONS</b>	<b>28,167</b>	<b>25,910</b>

Because of changes (other than regulatory modifications) in the assumptions used to calculate long-term nuclear provisions, particularly the change in the discount rate, the required allocation to dedicated assets for 2018 is amounting to €1,337 million. The administrative authorities authorised EDF to spread this allocation as follows: €540 million in 2019 and 2020, and €257 million in 2021. Including the allocation to be made in 2019 for 2018, all other things being equal, the coverage rate at 31 December 2018 would be 100.2%.

#### 45.5 CHANGES IN DEDICATED ASSETS IN 2018

Following a ministerial letter of 31 May 2018 authorising EDF, subject to conditions, to increase the portion of unlisted assets in its dedicated assets, on 29 June 2018 the Board of Directors validated a new strategic allocation for dedicated assets (see note 45.2).

The regulatory allocation to dedicated assets for 2017 amounted to €386 million and was made during 2018.

EDF Invest continued over 2018 to build up a portfolio of infrastructures, real estate property and investment funds. Among its new investments, in November 2018 EDF Invest completed the purchase of a minority interest in six UK companies (Bicker Fen, Fallago Rig, Fenland, Glass Moor II, Green Rigg, Rusholme) from EDF Renewables.

In December 2018, EDF Invest acquired EDF International's minority interest in Nam Theun Power Company (NTPC), a hydroelectric dam in Laos, part of which was allocated to dedicated assets at that date. The rest will be allocated in 2019.

These new investments have been added to the infrastructures assets that are part of EDF Invest's yield assets, alongside investments including CTE (the company that owns RTE), Terega (formerly TIGF), Porterbrook, Madrileña Red de Gas, Géosel, Thyssengas, Aéroports de la Côte d'Azur, Autostrade per l'Italia and Q-Park.

Negative changes of €989 million in the fair value of the dedicated asset portfolio (investment funds and equities) were recognised in the financial result in 2018 in application of IFRS 9 (see note 15.3).

Negative changes of €60 million in the fair value of the dedicated asset portfolio (bonds) were recognised in OCI in 2018 in application of IFRS 9 (see note 36.2).

#### 45.6 DEDICATED ASSETS OF FRAMATOME AND SOCODEI

The dedicated assets of Framatome and SOCODEI relating to Basic nuclear facilities (INB) in France have realisable values of €72 million and €47 million respectively and the degree of coverage of provisions according to the regulations is 92.8% for Framatome and 103.5% for SOCODEI (calculated using EDF group discount and inflation rates for nuclear provisions in France – see note 30).

These two entities' long-term nuclear obligations in France concerned by the regulations for dedicated assets are included in the EDF group's consolidated financial statements at the amounts of €78 million for Framatome and €46 million for SOCODEI (see note 30).

## NOTE 46 OFF-BALANCE SHEET COMMITMENTS

This note presents off-balance sheet commitments given and received by the Group at 31 December 2018. The amounts of commitments correspond to non-discounted contractual values.

### 46.1 COMMITMENTS GIVEN

The table below shows off-balance sheet commitments given by the Group that have been valued. Other commitments are described separately in the detailed notes.

<i>(in millions of euros)</i>	Notes	31/12/2018	31/12/2017
Operating commitments given	46.1.1	45,370	44,705
Investment commitments given	46.1.2	17,572	17,222
Financing commitments given	46.1.3	5,494	5,123
<b>TOTAL COMMITMENTS GIVEN</b>		<b>68,436</b>	<b>67,050</b>

In almost all cases, these are reciprocal commitments, and the third parties concerned are under a contractual obligation to supply the Group with assets or services related to operating, investment and financing activities.

#### 46.1.1 Operating commitments given

Operating commitments given by the Group at 31 December 2018 are as follows:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Fuel and energy purchase commitments <sup>(1)</sup>	26,878	26,728
Operating contract performance commitments given	14,117	13,739
Operating lease commitments as lessee	4,375	4,238
<b>TOTAL OPERATING COMMITMENTS GIVEN</b>	<b>45,370</b>	<b>44,705</b>

(1) Excluding gas purchases and related services.

##### 46.1.1.1 Fuel and energy purchase commitments

In the course of its ordinary generation and supply activities, the Group has entered into long-term contracts for purchases of electricity, gas, other energies and commodities and nuclear fuel, for periods of up to 20 years.

The Group has also entered into long-term purchase contracts with a certain number of electricity producers, by contributing to the financing of power plants.

At 31 December 2018, fuel and energy purchase commitments mature as follows:

<i>(in millions of euros)</i>		31/12/2018				31/12/2017
		Maturity				
	Total	< 1 year	1-5 years	5-10 years	> 10 years	Total
Electricity purchases and related services <sup>(1)</sup>	10,368	2,077	3,571	2,319	2,401	9,767
Other energy and commodity purchases <sup>(2)</sup>	377	94	194	89	-	391
Nuclear fuel purchases	16,133	1,469	6,232	5,148	3,284	16,570
<b>FUEL AND ENERGY PURCHASE COMMITMENTS</b>	<b>26,878</b>	<b>3,640</b>	<b>9,997</b>	<b>7,556</b>	<b>5,685</b>	<b>26,728</b>

(1) Including commitments given by controlled entities to joint ventures, amounting to €604 million at 31 December 2018 (€606 million at 31 December 2017).

(2) Excluding gas purchases and related services – see note 46.1.1.1.4.

##### 46.1.1.1.1 Electricity purchases and related services

Electricity purchase commitments mainly concern EDF and EDF Energy. In the case of EDF many of these commitments are borne by the Island Energy Systems (SEI), which have made commitments to purchase the electricity generated using bagasse and coal.

In addition to the obligations reported above and under Article 10 of the Law of 10 February 2000, in mainland France EDF is obliged, at the producer's request and subject to compliance with certain technical features, to purchase the power produced by co-generation plants and renewable energy generation units (wind turbines, small hydro-electric plants, photovoltaic power, etc). The additional costs

generated by this obligation are offset, after validation by the CRE, by the CSPE. These purchase obligations total 53TWh for 2018 (47TWh for 2017), including 7TWh for co-generation (6TWh for 2017), 26TWh for wind power (23TWh for 2017), 9TWh for photovoltaic power (9TWh for 2017) and 3TWh for hydropower (3TWh for 2017).

##### 46.1.1.1.2 Other energy and commodity purchases

Purchase commitments for other energies and commodities mainly concern coal and oil used to operate the fossil-fired plants, and purchases of biomass fuel used by Dalkia in the course of its business.

#### 46.1.1.1.3 Nuclear fuel purchases

Commitments for purchases of nuclear fuel arise from supply contracts for the nuclear plants intended to cover the EDF group's needs for uranium and fluorination, enrichment and fuel assembly production services.

#### 46.1.1.1.4 Gas purchases and related services

Gas purchase commitments are principally undertaken by Edison and EDF. The volumes concerned for both entities at 31 December 2018 are as follows:

	31/12/2018				31/12/2017
	Maturity				
(in billions of m <sup>3</sup> )	Total	< 1 year	1-5 years	> 5 years	Total
Edison	140	13	40	87	154
EDF	22	1	5	16	24

#### Gas purchase contracts

Edison has entered into agreements to import natural gas from Russia, Libya, Algeria and Qatar, for a total maximum volume of 14.4 billion m<sup>3</sup> per year. The terms of these contracts vary between 3 and 18 years, with the exception of the contracts with Algeria and Russia which terminate at the end of 2019.

#### Gas-related service contracts

Under the contract with Terminale GNL Adriatico, Edison also benefits from approximately 80% of the terminal's regasification capacities until 2034, for an annual premium of approximately €100 million.

Under the contract with the Dunkerque LNG methane terminal, EDF benefits from approximately 61% of the terminal's regasification capacities until 2037, in return for payment of an annual premium of approximately €150 million. A provision for onerous contract has been recorded in connection with this contract – see note 3.3.

#### 46.1.1.2 Operating contract performance commitments given

At 31 December 2018, these commitments mature as follows:

	31/12/2018				31/12/2017
	Maturity				
(in millions of euros)	Total	< 1 year	1-5 years	> 5 years	Total
Operating guarantees given	7,047	3,185	2,124	1,738	7,074
Operating purchase commitments <sup>(1)</sup>	6,898	3,960	2,352	586	6,460
Other operating commitments	172	64	95	13	205
<b>OPERATING CONTRACT PERFORMANCE COMMITMENTS GIVEN <sup>(2)</sup></b>	<b>14,117</b>	<b>7,209</b>	<b>4,571</b>	<b>2,337</b>	<b>13,739</b>

(1) Excluding fuel and energy.

(2) Including commitments given by controlled entities to joint ventures, amounting to €982 million at 31 December 2018 (€835 million at 31 December 2017).

In the course of its business, the Group provides contract performance guarantees, generally through the intermediary of banks.

Operating guarantees given at 31 December 2018 mainly consist of guarantees given by EDF, Edison and EDF Renewables in connection with its development projects.

#### 46.1.1.2.1 Operating guarantees given

Operating guarantees given are as follows:

	31/12/2018	31/12/2017
(in millions of euros)		
EDF	2,038	2,270
EDF Renewables	1,677	1,363
Edison	1,262	1,215
EDF Energy	795	732
Framatome	517	714
Other entities	758	780
<b>TOTAL</b>	<b>7,047</b>	<b>7,074</b>



#### 46.1.1.2.2 Operating purchase commitments

Operating purchase commitments are as follows:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
EDF	2,533	2,480
Framatome	2,024	1,878
EDF Energy	524	627
Enedis	764	601
Other entities	1,053	874
<b>TOTAL</b>	<b>6,898</b>	<b>6,460</b>

#### 46.1.1.3 Operating lease commitments as lessee

At 31 December 2018, operating lease commitments as lessee break down as follows:

	31/12/2018				31/12/2017
		Maturity			
(in millions of euros)	Total	< 1 year	1-5 years	> 5 years	Total
OPERATING LEASE COMMITMENTS AS LESSEE	4.375	728	2.019	1.628	4.238

The Group is bound as lessee by irrevocable operating lease contracts, principally for premises, equipment, land and vehicles used in the course of its business and maritime freight contracts for trading activities. The corresponding rents are subject to renegotiation at intervals defined in the contracts. Operating leases mainly concern EDF, EDF Renewables and Enedis.

IFRS 16 "Leases" will be mandatory for financial years beginning on or after 1 January 2019 (see note 1.2.4.1).

6.

#### 46.1.2 Investment commitments given

At 31 December 2018, details of investment commitments are as follows:

	31/12/20				31/12/2017
		Maturity			
(in millions of euros)	Total	< 1 year	1-5 years	> 5 years	Total
Commitments related to acquisition of tangible and intangible assets	16,545	8,138	7,674	733	15,827
Commitments related to acquisition of financial assets	746	219	429	98	1,013
Other commitments related to investments	281	238	43	-	382
<b>TOTAL INVESTMENT COMMITMENTS GIVEN <sup>(1)</sup></b>	<b>17,572</b>	<b>8,595</b>	<b>8,146</b>	<b>831</b>	<b>17,222</b>

(1) Including commitments given by controlled entities to joint ventures, amounting to €399 million at 31 December 2018 (€428 million at 31 December 2017).

#### 46.1.2.1 Commitments related to acquisition of tangible and intangible fixed assets

The commitments related to acquisition of tangible and intangible fixed assets are as follows:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
EDF	4,715	4,689
EDF Energy	6,082	6,428
Enedis	3,092	2,383
EDF Renewables	1,622	1,242
Framatome	587	562
Other entities	447	523
<b>TOTAL</b>	<b>16,545</b>	<b>15,827</b>

The increase in commitments given for acquisition of tangible and intangible assets is principally attributable to contracts for the rollout of Linky meters by Enedis and development of new projects in the United States by EDF Renewables. The decrease in commitments by EDF Energy is explained by progress on the HPC project.

### 46.1.2.2 Commitments related to acquisition of financial assets

Commitments related to acquisition of financial assets in 2017 included €193 million for the acquisition of Gas Natural Vendita Italia (now Edison Energie), which was finalised on 22 February 2018 (see note 5.3).

The main share purchase commitments that cannot be valued concern EDF Luminus.

EDF Luminus signed an amendment to the shareholder pact on 26 October 2015 defining a liquidity clause for the investments held by its minority shareholders, which could, in certain conditions under the control of EDF, result in sale of their shares through an IPO, or purchase of their shares by the Group at market value. This liquidity clause is valid at all times from 1 July 2018 to 31 December 2025.

Regarding the investment in EDF Investissements Groupe (EIG), C3 (a fully-owned EDF subsidiary) and NBI (Natixis Belgique Investissement, a subsidiary of the Natixis group) amended the agreements for their investment in EIG on 19 December 2018.

C3 now has a call option to buy EIG shares held by NBI at a fixed price, exercisable at any time until May 2026. Meanwhile, NBI has a put option to sell EDF all of its EIG shares for a fixed amount of cash, exercisable subject to certain conditions between February 2024 and May 2025.

Due to their features, in compliance with IAS 32, NBI's put option and C3's call option are considered as derivatives and their net value is included in the positive or negative fair value of trading derivatives. At 31 December 2018, the fair value of these trading derivatives is not significant.

### 46.1.2.3 Other commitments related to investments

Other commitments given related to investments at 31 December 2018 mainly comprise guarantees given by EDF Norte Fluminense in connection with its 51% investment in CES, the company in charge of constructing and operating a hydroelectric dam on the Teles Pires river in Brazil.

### 46.1.3 Financing commitments given

Financing commitments given by the Group at 31 December 2018 comprise the following:

		31/12/2018			31/12/2017
		Maturity			
(in millions of euros)	Total	< 1 year	1-5 years	> 5 years	Total
Security interests in real property	4,226	31	1,805	2,390	4,250
Guarantees related to borrowings	974	138	335	501	613
Other financing commitments	294	271	23	-	260
<b>TOTAL FINANCING COMMITMENTS GIVEN <sup>(1)</sup></b>	<b>5,494</b>	<b>440</b>	<b>2,163</b>	<b>2,891</b>	<b>5,123</b>

(1) Including commitments given by controlled entities to joint ventures, amounting to €917 million at 31 December 2018 (€692 million at 31 December 2017). These financing commitments to joint ventures mainly concern EDF Renewables.

Security interests and assets provided as guarantees mainly concern pledges or mortgages of tangible assets and shares representing investments in consolidated subsidiaries which own property, plant and equipment, for EDF Renewables.

## 46.2 COMMITMENTS RECEIVED

The table below shows off-balance sheet commitments received by the Group that have been valued. Other commitments received are described separately in the detailed notes.

(in millions of euros)	Notes	31/12/2018	31/12/2017 restated <sup>(1)</sup>
Operating commitments received <sup>(2)</sup>	46.2.1	9,539	9,057
Investment commitments received	46.2.2	183	214
Financing commitments received	46.2.3	31	72
<b>TOTAL COMMITMENTS RECEIVED <sup>(3)</sup></b>		<b>9,753</b>	<b>9,343</b>

(1) Commitments at 31 December 2017 have been restated by €5,422 million in application of IFRS 15. They mainly concerned other commitments received by Framatome and EDF Renewables for sales of goods and services.

(2) Excluding commitments related to supplies of energy and related services (see note 46.2.1.4).

(3) Excluding commitments related to credit lines, which are described in note 38.2.5.

## 46.2.1 Operating commitments received

Operating commitments received by the Group at 31 December 2018 comprise the following:

	31/12/2018				31/12/2017
	Maturity				
(in millions of euros)	Total	< 1 year	1-5 years	> 5 years	Total
Operating lease commitments as lessor	678	124	399	154	780
Operating sale commitments <sup>(1)</sup>	7,004	1,745	4,224	1,035	6,748
Operating guarantees received	1,791	1,014	591	186	1,483
Other operating commitments received	66	17	35	14	46
<b>OPERATING COMMITMENTS RECEIVED</b>	<b>9,539</b>	<b>2,900</b>	<b>5,249</b>	<b>1,389</b>	<b>9,057</b>

(1) Commitments at 31 December 2017 have been restated by €5,422 million in application of IFRS 15. They mainly concerned other commitments received by Framatome and EDF Renewables for sales of goods and services.

### 46.2.1.1 Operating lease commitments as lessor

The Group benefits from commitments as lessor in operating leases amounting to €678 million.

Most of these commitments derive from contracts classified as operating leases under IFRIC 4, "Determining whether an arrangement contains a lease". They mainly concern the Asian Independent Power Projects (IPPs) and real estate leases.

### 46.2.1.2 Operating sale commitments

Operating sale commitments received principally concern firm orders made through contracts recorded on a percentage-of-completion basis at Framatome (construction and engineering contracts) and EDF Renewables (agreements for operation services, maintenance services, and development and sale of structured assets).

### 46.2.1.3 Operating guarantees received

Operating guarantees received primarily concern EDF and relate to guarantees received from suppliers, particularly in connection with deliveries under the ARENH system.

### 46.2.1.4 Electricity supply commitments

In the course of its business, the EDF group has signed long-term contracts to supply electricity as follows:

- long-term contracts with a number of European electricity operators, for a specific plant or for a defined group of plants in the French nuclear generation fleet, corresponding to installed power capacity of 3.5GW;
- in execution of France's NOME Law on organisation of the French electricity market, EDF has a commitment to sell some of the energy generated by its existing nuclear power plants to other suppliers. This covers volumes of up to 100TWh each year until 31 December 2025.

## 46.2.2 Investment commitments received

	31/12/2018				31/12/2017
	Maturity				
(in millions of euros)	Total	< 1 year	1-5 years	> 5 years	Total
<b>INVESTMENT COMMITMENTS RECEIVED</b>	<b>183</b>	<b>49</b>	<b>16</b>	<b>118</b>	<b>214</b>

Under the terms of the agreement signed with Exelon on 29 July 2013 and finalised on 1 April 2014, EDF has an option to sell its share in CENG to Exelon at fair value, which can be exercised between January 2016 and June 2022. Due to its features, this commitment has nil value at 31 December 2018.

## 46.2.3 Financing commitments received

	31/12/2018				31/12/2017
	Maturity				
(in millions of euros)	Total	< 1 an	1-5 years	> 5 years	Total
<b>FINANCING COMMITMENTS RECEIVED</b>	<b>30</b>	<b>6</b>	<b>4</b>	<b>20</b>	<b>72</b>

## NOTE 47 CONTINGENT LIABILITIES

In addition to the matters reported in note 4.3, the principal contingent liabilities at 31 December 2018 are the following.

### 47.1 TAX INSPECTIONS

#### EDF

For the period 2008 to 2015, EDF was notified of proposed tax adjustments, notably concerning the tax-deductibility of certain long-term liabilities. This recurrent reassessment, which is applied for each year, represents a cumulative financial risk of some €563 million in income taxes at 31 December 2018. In September 2017 the

Montreuil Administrative Court issued two rulings that recognised the tax-deductibility of these liabilities and validated the position taken by the Company.

For the years 2012 to 2015, the French tax authorities notified the Company of certain recurrent tax reassessments concerning the *Contribution sur la Valeur ajoutée des Entreprises* (tax on corporate value added), and questioned the deductibility of long-term provisions.

#### EDF International

Following the tax inspections of EDF International for the years 2009 to 2014, the French tax authorities questioned the valuation of the bond convertible into shares issued to refinance the acquisition of British Energy. The total amount concerned is

approximately €310 million. EDF International has contested this reassessment, and considers it has good chances of winning the dispute.

### 47.2 LABOUR LITIGATION

EDF is party to a number of labour lawsuits, primarily regarding working hours. EDF estimates that none of these lawsuits, individually, is likely to have a significant impact on its financial results or financial position. However, because they relate to situations that could concern a large number of EDF's employees in France, any increase in such litigations could have a potentially negative impact on the Group's financial position (although the risk has been mitigated by the signature of the agreement on fixed numbers of working days in 2016).

### 47.3 ENEDIS –LITIGATION WITH PHOTOVOLTAIC PRODUCERS

The French authorities' announcement in autumn 2010 of a forthcoming downward revision to photovoltaic electricity purchase prices triggered an upsurge in connection applications (since at the time the applicable tariff depended on the date at which a complete connection application was filed). Several successive ministerial decisions were issued reducing purchase prices.

As these price decreases were not sufficient to stem the flow of connection applications, by a decree of 9 December 2010 the Government suspended the conclusion of new contracts for a three-month period, and stated that if the financial and technical proposal for a request had not been approved by 2 December 2010, a new connection application would have to be submitted at the end of this three-month period.

A certain number of producers who, as a result of these circumstances, lost their entitlement to the pre-moratorium purchase obligation price brought legal proceedings against EDF as operator of the distribution network in the non-interconnected zones, and against Enedis as network operator for mainland France, claiming that the electricity network operator did not issue the technical and financial connection proposals in time for them to benefit from more advantageous electricity purchase terms.

In an order of 15 March 2017, the Court of Justice of the European Union confirmed that the decisions of 10 July 2006 and 12 January 2010 setting the purchase tariffs for photovoltaic energy constitute "intervention by the State or using State resources", one of the four criteria that characterise State aid. The Court stated that such a support measure, implemented without prior notification to the European Commission, is illegal. It is now up to the national courts to act accordingly, particularly by banning application of these illegal decisions.

Several courts have found in favour of Enedis during 2018. Notably, in early July 2018 Versailles Court of Appeal dismissed 150 producers' claims, because there was no evidence establishing misconduct by Enedis, or because there was no causal link between Enedis' misconduct and the prejudice, or because the prejudice was not deemed eligible for compensation since the tariff decisions of 2006 and 2010 are illegal, as the European Commission did not receive the prior notification required by State aid control rules. Appeals have been filed before the Court of Cassation against most of these decisions.

Similarly, in recent months a certain number of court decisions have been issued in favour of EDF, considering that the producers' prejudice is not reparable because it is founded on illegal grounds.

In parallel to the compensation claims before civil courts, EDF and Enedis sought to apply their Civil Liability insurance policy, but the insurers refused their claim. The French Court of Cassation considered in a ruling of 9 June 2015 (for the Green Yellow case) that the insurance payment was due and that the network operator was at fault. Following that ruling, Enedis and EDF brought action against their insurers in April 2017, applying to the courts for formal recognition of two partial serial claims. If the courts were to recognize the existence of two partial serial claims, a single excess and a single limit would apply for all claims with the same technical cause.

#### 47.3.1 SUN'R

On 21 June 2012, SUN'R filed a complaint against EDF and Enedis, along with an application for interim measures, with France's Competition Authority, the ADLC. SUN'R accused Enedis of delays in the procedure for connecting its photovoltaic facilities and EDF of delays in the establishment of the purchase obligation contracts and payment of the related invoices. SUN'R also claimed that EDF ENR had benefited from special treatment from Enedis for the connection of its facilities and from EDF for the payment of its invoices.

In a decision of 14 February 2013, the ADLC rejected all the applications made by SUN'R for interim measures but decided to continue the investigation on the merits of the case.

On 12 January 2018 the ADLC's investigation departments sent the parties a proposal to dismiss the matter due to the absence of anticompetitive practices by EDF, Enedis and RTE. On 4 July 2018, the ADLC closed the proceedings by issuing a decision dismissing the case. Concurrently with its complaint to the ADLC in 2012, on 29 August 2012 SUN'R filed a petition at an urgent applications hearing for expert assessment and provision for costs before the Paris Administrative Court, including a claim for provisional compensation of €1 million from EDF and €2.5 million from Enedis. By order of 27 November 2012, the urgent applications judge (*juge des référés*) at the Administrative Court of Paris dismissed this petition.

On 30 April 2015, SUN'R issued proceedings against Enedis and EDF before the Paris Commercial Court, seeking compensation for the loss allegedly caused to it by the delays in the procedure for the connecting its solar energy plant projects to the electricity distribution network. It asked the Court to suspend proceedings pending the ADLC's decision on the merits of the case, and claimed a provisional amount of €10 million to be applied against future compensation for its loss. In a ruling of 7 November 2016 the Paris Commercial Court dismissed SUN'R's claim for provisional compensation and suspended proceedings until the ADLC issues a decision on the merits of the case.

On 24 November 2015, Sun West, Azimut 56 and JB Solar issued proceedings against Enedis and EDF before the Paris Commercial Court on the same grounds. They are currently claiming almost €4 million for the alleged prejudice, but asked the Court to suspend proceedings pending the ADLC's decision on the merits of the case. In a ruling of 4 December 2017, the Paris Commercial Court rejected claims for provisional compensation made by Sun West, Azimut 56 and JB Solar and suspended proceedings until the ADLC issued a decision on the merits of the case.

That decision was announced on 4 July 2018 when the ADLC dismissed the case, without possibility of appeal. The behaviours alleged by the plaintiff are consequently considered never to have taken place. The Paris Commercial Court formally noted the withdrawal of SUN'R's action for compensation in a judgement of 10 December 2018, and the withdrawal of the claims by Sun West, Azimut 56 and JB Solar in a further judgement of 12 December 2018. This matter is thus definitively closed.

## NOTE 48 RELATED PARTIES

Details of transactions with related parties are as follows:

(in millions of euros)	Associates and joint ventures		Joint operations		French State or State-owned entities <sup>(1)</sup>		Group Total	
	31/12/2018	31/12/2017	31/12/2018	31/12/2017	31/12/2018	31/12/2017	31/12/2018	31/12/2017
Sales	560	580	-	-	1,708	1,549	2,268	2,129
Energy purchases	4,071	3,817	5	4	2,031	2,313	6,107	6,134
External purchases	4	9	3	4	251	1,163	258	1,176
Financial assets	294	238	-	-	-	-	294	238
Other assets	730	729	-	-	486	596	1,216	1,325
Financial liabilities	-	-	-	-	-	-	-	-
Other liabilities	1,162	1,282	1	1	631	552	1,794	1,835

(1) Excluding tax and social liabilities and the CSPE receivable.

### 48.1 TRANSACTIONS WITH ENTITIES INCLUDED IN THE SCOPE OF CONSOLIDATION

Transactions with the principal associates (CTE, (the company that owns RTE), CENG, Taishan and Alpiq) are presented in note 23.

Transactions with other associates, joint ventures, and partner entities in joint arrangements with the Group mainly consist of sales and purchases of energy.

### 48.2 RELATIONS WITH THE FRENCH STATE AND STATE-OWNED ENTITIES

#### 48.2.1 Relations with the French State

The French State holds 83.67% of the capital of EDF at 31 December 2018, and is thus entitled in the same way as any majority shareholder to control decisions that require approval by the shareholders.

In accordance with the legislation applicable to all companies having the French State as their majority shareholder, the EDF group is subject to certain inspection procedures, in particular economic and financial inspections by the State, audits by the French Court of Auditors (*Cour des Comptes*) or Parliament, and verifications by the French General Finance Inspectorate (*Inspection générale des finances*).

The public service contract between the French State and EDF was signed on 24 October 2005. This contract is intended to form the framework for public service missions assigned to EDF by the lawmaker for an unlimited period. The Law of 9 August 2004 does not stipulate the duration of the contract.

EDF, like other electricity producers, also participates in implementation of the multi-year energy programme established by the Decree of 27 October 2016, which defines objectives for generation and load shedding.

Finally, the French State intervenes through the regulation of electricity and gas markets, particularly for authorisation to build and operate generation facilities, establishment of sales tariffs for customers that have stayed on the regulated tariffs, transmission and distribution tariffs, and also determination of the ARENH price in accordance with France's Energy Code, and the system for compensation of public service charges.

#### 48.2.2 Relations with Engie

The common service function shared by Enedis and GRDF is defined by Article L. 111-71 of the French Energy Code. Its missions in the electricity and gas distribution sector are building structures, site project management, network operation and maintenance, and metering operations. This service is not a legal entity in its own right.

Enedis and GRDF's relations in this common service are governed by an agreement that defines the scope of the service and the resulting division of costs. The agreement has an unlimited term and can be terminated at any time subject to 18 months notice: in such a case, the parties undertake to renegotiate the agreement during the notice period. It is updated regularly.

In July 2014, Enedis and GRDF issued a joint announcement that their joint activities of meter reading and work on meter panels would be discontinued in the future. Currently, Enedis prioritises a structure consisting of regional Divisions covering all its operational missions at local level. A network of smaller units is used for very local activities.

In March 2018, Enedis and GRDF decided to set up two mixed entities: UONRH-MS for employment contracts, studies and medical/social matters and OIT, the IT and telecoms operator, for all telephone and office technology activities. These two mixed entities take effect from 1 January 2019.

For Enedis, other support functions (Vehicles and Machines, Litigation and Insurance, Training and Recruitment, and Office purchases) are grouped into a Support Services Division.

#### 48.2.3 Relations with public sector entities

The EDF group's relations with public sector entities mainly concern the two entities belonging to the former AREVA group (Orano and AREVA SA).

Transactions with Orano concern:

- the front-end of the nuclear fuel cycle (uranium supplies, conversion and enrichment services);
- the back-end of the nuclear fuel cycle (transportation, storage, processing and recycling services for spent fuel).

### Front-end of the cycle

Several important agreements were negotiated between EDF and Orano:

- for supplies of natural uranium: Orano Mining contracts covering the period 2021-2030;
- for fluorination: a contract covering the period 2019-2030;
- for enrichment of natural uranium into uranium 235: an Orano Cycle contract for the period 2019-2030.

As part of the plan to construct two EPRs in the United Kingdom at the Hinkley Point site, on 29 September 2016 EDF and Orano signed a uranium contract with Orano Mining, and a conversion contract and enrichment contract with Orano Cycle.

### Back-end of the cycle

Relations between EDF and Orano concerning transportation, processing and recycling of spent fuels are described in note 29.1.1.

## 48.3 MANAGEMENT COMPENSATION

The Company's key management and governance personnel are the Chairman and CEO, the members of the COMEX (Executive Committee) throughout 2018 or since their date of appointment if they joined the COMEX during the year, and the Directors. Directors representing the employees receive no remuneration for their services.

The total compensation paid by EDF and controlled companies to the Group's key management and governance personnel amounted to €12.4 million in 2018 (€12.2 million in 2017). This amount covered short-term benefits (basic salaries, performance-related salary, profit share and benefits in kind), special IEG post-employment benefits where relevant, and the corresponding employer contributions, plus any director's fees.

EDF's key management and governance personnel benefit from no special pension system, starting bonus or severance payment entitlement except by contractual negotiation. EDF's Chairman and CEO could benefit from a termination indemnity if his term of office were ended.



## NOTE 49 ENVIRONMENT

### 49.1 GREENHOUSE GAS EMISSION RIGHTS

In ratifying the Kyoto Protocol Europe made a commitment to reduce its greenhouse gas emissions. EU Directive 2003/87/EC set up a greenhouse gas emission quota system for the European Union which has been in operation since 1 January 2005.

This system was incorporated into national laws. Among other things it requires obligated actors, which is the case of EDF, to surrender to the State a number of greenhouse gas emission credits each year, corresponding to their emissions for the year. This Directive came into effect in 2005 for an initial three-year period, followed by a second period from 2008 to 2012, with progressive reduction of the emission rights allocated.

One of the main features of the third phase, running from 2013 to 2020, is the discontinuation of free allocation of emission rights in certain countries, including France and United Kingdom.

In the EDF group, the entities subject to this Directive are EDF, EDF Energy, Edison, Dalkia, and EDF Luminus.

In 2018, the Group surrendered 30 million tonnes in respect of emissions generated in 2017. In 2017, the Group surrendered 38 million tonnes in respect of emissions generated in 2016.

The Group's total emission rights allocation for 2018 recorded in the national registers is 1 million tonnes (3 million tonnes for 2017).

The volume of emissions at 31 December 2018 stood at 24 million tonnes (40 million tonnes for 2017). The provision resulting from over-quota emissions amounts to €175 million at 31 December 2018 (€120 million at 31 December 2017).

### 49.2 ENERGY SAVINGS CERTIFICATES

In all its subsidiaries, the Group is engaged in a process to control energy consumption through various measures developed by national legislations, in application of European Union Directives.

In France, the Law of 13 July 2005 introduced a system of energy savings certificates. Suppliers of energy (electricity, gas, heat, cold, domestic fuel oil and fuel for vehicles) with sales above a certain level are subject to energy savings obligations for a three-year period. They fulfil these obligations by making direct or indirect energy savings rewarded by certificates, or by purchasing energy savings certificates. At the end of the set period, the entities concerned must provide

evidence of compliance with obligations by surrendering the certificates, or pay a fine to the Treasury.

In application of Article 30 of the Law of 17 August 2015 on the energy transition for green growth, a new additional energy savings obligation for 2016-2017 applies from 1 January 2016, for the benefit of households in situation of energy poverty. This new obligation is added to the energy savings obligations for the third period. The annual volume of the obligation is proportional to the annual energy savings obligation.

A fourth three-year period of energy savings obligations began on 1 January 2018 (see note 4.6).

### 49.3 RENEWABLE ENERGY CERTIFICATES

In application of EU Directive 2009/28/EC on the promotion of the use of energy from renewable sources, every EU member state has set national targets for consumption of electricity from renewable sources.

There are two ways for States to meet these targets:

- incorporating the costs of generating such electricity into the sale price for electricity (this is the approach taken in France);
- introducing a renewable energy certificate system (as is the case in the United Kingdom and Belgium).

The renewable energy certificates system may apply to:

- non-obligated electricity producers when the obligation applies to energy sales (EDF Renewables);
- obligated electricity producers when the obligation applies to generation;
- producers who are also sellers of electricity when the obligation applies to energy sales (EDF Energy, EDF Luminus).

Through the renewable energy certificates scheme, the EDF group has an obligation to surrender renewable energy certificates, particularly in the United Kingdom and Belgium.

At 31 December 2018, a provision of €962 million was booked in connection with the obligation to surrender renewable energy certificates at that date, essentially concerning EDF Energy (United Kingdom) and EDF Luminus (Belgium). A large portion of these obligations is covered by purchases of certificates included in intangible assets.

## NOTE 50 SUBSEQUENT EVENTS

No development have occurred since the year-end in addition to those presented in other notes.

## NOTE 51 SCOPE OF CONSOLIDATION AT 31 DECEMBER 2018

The Group's activities are defined as follows:

- **"Generation/Supply"** (G): energy generation and energy sales to industry, local authorities, small businesses and residential consumers. This segment also includes EDF's commodity trading activities;
- **"Distribution"** (D): management of the low and medium-voltage public electricity distribution networks;
- **"Transmission"** (T): operation, maintenance and development of the high-voltage and very-high-voltage electricity transmission networks;

- **"Reactors and Services (Framatome)"** (R): services and production of equipment and fuel for nuclear reactors;
- **"Other"** (O): energy services (district heating, thermal energy services, etc.) for industry and local authorities, and new businesses mainly aimed at boosting electricity generation through cogeneration and renewable energy sources (e.g. wind turbines, photovoltaic panels, etc.). This activity also includes EDF Invest's holding companies and entities that are classified as dedicated assets.

### 51.1 FULLY CONSOLIDATED COMPANIES

		Percentage of ownership at 31/12/2018	Percentage of ownership at 31/12/2017	Business sector
<b>FRANCE-GENERATION AND SUPPLY</b>				
Electricité de France – Parent Company		100.00	100.00	G, D, O
Group Support Services (G2S)		100.00	100.00	O
Edvance		95.10	95.10	O
Société pour le Conditionnement des Déchets et Effluents Industriels (SOCODEI)		100.00	100.00	O
CHAM SAS		100.00	100.00	O
Sowee		100.00	100.00	O
Immo C47		51.00	100.00	O
Other holding companies (EDF Invest)		100.00	100.00	O
<b>FRANCE – REGULATED ACTIVITIES</b>				
Enedis		100.00	100.00	D
Électricité de Strasbourg		88.64	88.64	G, D
EDF Production Électrique Insulaire (EDF PEI)		100.00	100.00	G
<b>FRAMATOME</b>				
Framatome	France	75.50	75.50	R
<b>UNITED KINGDOM</b>				
EDF Energy Holdings Limited (EDF Energy)		100.00	100.00	G, O
EDF Energy UK Ltd.		100.00	100.00	O
EDF Development Company Ltd.		100.00	100.00	O
<b>ITALY</b>				
Edison SpA (Edison)		97.45	97.45	G, O
Transalpina di Energia SpA (TdE SpA)		100.00	100.00	O
<b>OTHER INTERNATIONAL</b>				
EDF International SAS	France	100.00	100.00	O
EDF Belgium SA	Belgium	100.00	100.00	G
EDF Luminus SA	Belgium	68.63	68.63	G, O
EDF Norte Fluminense SA	Brazil	100.00	100.00	G
Ute Paracambi SA	Brazil	100.00	100.00	G
French Investment Guangxi Laibin Electric Power Co, Ltd. (Figlec)	China	100.00	100.00	G
EDF (China) Holding Ltd.	China	100.00	100.00	O
EDF Inc.	USA	100.00	100.00	O
Unistar Nuclear Energy LLC <sup>(1)</sup>	USA	-	100.00	G
EDF Alpes Investissements SARL	Switzerland	100.00	100.00	O
Mekong Energy Company Ltd. (MECO)	Vietnam	56.25	56.25	G
EDF Chile Spa	Chile	100.00	100.00	G

Business segments: G = Generation, D = Distribution, T = Transmission, R = Reactors, O = Other

(1) Unistar has been merged into EDF Inc.

		Percentage of ownership at 31/12/2018	Percentage of ownership at 31/12/2017	Business sector
<b>EDF RENEWABLES</b>				
EDF Renewables (formerly EDF Énergies Nouvelles)	France	100.00	100.00	G, O
<b>DALKIA</b>				
Dalkia	France	99.94	99.94	O
<b>OTHER ACTIVITIES</b>				
EDF Développement Environnement SA	France	100.00	100.00	O
Société Française d'Ingénierie Électronucléaire et d'Assistance (SOFINEL)	France	88.98	88.98	O
Dunkerque LNG <sup>(1)</sup>	France	-	65.01	O
EDF IMMO and real estate subsidiaries	France	100.00	100.00	O
Société C2	France	100.00	100.00	O
Société C3	France	100.00	100.00	O
EDF Holding SAS	France	100.00	100.00	O
Citelum	France	100.00	100.00	O
EDF Trading Ltd.	UK	100.00	100.00	O
EDF DIN UK Ltd. <sup>(2)</sup>	UK	-	100.00	O
Wagram Insurance Company DAC	Ireland	100.00	100.00	O
EDF Investissements Groupe SA	Belgium	93.89	93.89	O
Océane Re	Luxembourg	99.98	99.98	O
EDF Gas Deutschland GmbH	Germany	100.00	100.00	O

Business segments: G = Generation, D = Distribution, T = Transmission, R = Reactors, O = Other.

(1) Dunkerque LNG was sold on 30 October 2018 (see note 3.3).

(2) EDF DIN UK Ltd has been liquidated.

## 51.2 COMPANY HELD IN THE FORM OF A JOINT OPERATION

		Percentage of ownership at 31/12/2018	Percentage of ownership at 31/12/2017	Business sector
<b>OTHER ACTIVITIES</b>				
Friedeburger Speicherbetriebsgesellschaft GmbH (Crystal)	Germany	50.00	50.00	O

Business segments: G = Generation, D = Distribution, T = Transmission, R = Reactors, O = Other.

### 51.3 COMPANIES ACCOUNTED FOR BY THE EQUITY METHOD

		Percentage of ownership at 31/12/2018	Percentage of ownership at 31/12/2017	Business sector
<b>FRANCE – GENERATION AND SUPPLY</b>				
Domofinance	France	45.00	45.00	O
CTE (EDF Invest) <sup>(1)</sup>	France	50.10	50.10	O
Elisandra IV (Madrileña Red de Gas Holding) (EDF Invest)	Spain	20.00	20.00	O
Alba Real Estate SCS (EDF Invest)	Luxembourg	46.50	46.50	O
Géosel Manosque (EDF Invest)	France	38.35	38.35	O
Transport Stockage Hydrocarbures (TSH) (EDF Invest)	France	50.00	50.00	O
Central Sicaf (EDF Invest)	Italy	24.50	20.00	O
Thyssengaz (EDF Invest)	Germany	50.00	50.00	O
Aéroports Côte d'Azur (EDF Invest)	France	19.40	19.40	O
Ecowest SCI A and B (EDF Invest)	France	50.00	-	O
Fallago Rig (EDF Invest)	United Kingdom	20.00	-	G
Fenland Wind Farm (EDF Invest)	United Kingdom	20.00	-	G
<b>OTHER INTERNATIONAL</b>				
Compagnie Énergétique de Sinop (CES)	Brazil	51.00	51.00	G
Constellation Energy Nuclear Group LLC (CENG)	USA	49.99	49.99	G
SLOE Centrale Holding BV	Netherlands	50.00	50.00	G
Shandong Zhonghua Power Company, Ltd.	China	19.60	19.60	G
Datang Sanmenxia Power Generation Co., Ltd.	China	35.00	35.00	G
Taishan Nuclear Power Joint Venture Company Ltd. (TNPJVC)	China	30.00	30.00	G
Jiangxi Datang International Fuzhou Power Generation Company Ltd.	China	49.00	49.00	G
Nam Theun 2 Power Company (NTPC) (EDF Invest) <sup>(2)</sup>	Laos	40.00	40.00	G
Alpiq	Switzerland	25.04	25.04	G, D, T, O

Business segments: G = Generation, D = Distribution, T = Transmission, R = Reactors, O = Other

(1) Coentreprise de Transport d'Electricité or CTE, the company holding 100% of RTE.

(2) NPTC was partly allocated to dedicated assets in 2018.

### 51.4 COMPANIES IN WHICH THE EDF GROUP'S VOTING RIGHTS DIFFER FROM ITS PERCENTAGE OWNERSHIP

The percentage of voting rights, which is decisive for assessing control, differs from the Group's percentage ownership for the following entities:

	Percentage of ownership at 31/12/2018	Percentage of voting rights at 31/12/2018
Edison SpA	97.45	99.48
EDF Investissements Groupe SA	93.89	50.00

## NOTE 52 STATUTORY AUDITORS' FEES

The following table sets forth the fees paid for work done by the Statutory Auditors and their network during 2018:

	Deloitte network		KPMG network	
	Amount (excluding taxes)	%	Amount (excluding taxes)	%
<i>(in thousands of euros)</i>				
<b>Audit</b>				
Statutory audit, certification, review of company and consolidated accounts				
EDF	3,133	21.1	2,954	18.2
Controlled entities <sup>(1)</sup>	7,249	48.8	10,839	66.9
<b>SUB-TOTAL</b>	<b>10,382</b>	<b>69.9</b>	<b>13,793</b>	<b>85.1</b>
<b>Non-audit services <sup>(2)</sup></b>				
EDF	397	2.7	772	4.8
Controlled entities <sup>(1)</sup>	4,071	27.4	1,640	10.1
<b>SUB-TOTAL</b>	<b>4,468</b>	<b>30.1</b>	<b>2,412</b>	<b>14.9</b>
<b>TOTAL</b>	<b>14,850</b>	<b>100</b>	<b>16,204</b>	<b>100</b>

(1) Fully consolidated subsidiaries and jointly controlled entities whose auditors' fees are included in the consolidated income statement.

(2) Services required by laws and regulations, and services supplied at the request of the Group. Non-audit services mainly correspond to (i) certifications of financial and accounting information or Independent Reports on social, environmental and societal information required under Article L. 225-102-1 of the French Commercial Code, (ii) services relating to disposals of entities, (iii) tax services authorised by local legislation, and (iv) operating process reviews and information system consulting services that are unrelated to the production of accounting and financial information.

6.

### Statutory Auditors' fees for 2017

The following table sets forth the fees paid for work done by the Statutory Auditors and their network during 2017:

	Deloitte network		KPMG network	
	Amount (excluding taxes)	%	Amount (excluding taxes)	%
<i>(in thousands of euros)</i>				
<b>Audit</b>				
Statutory audit, certification, review of company and consolidated accounts				
EDF	3,103	22.1	3,012	19.7
Controlled entities	5,133	36.4	10,024	65.6
<b>SUB-TOTAL</b>	<b>8,236</b>	<b>58.5</b>	<b>13,036</b>	<b>85.3</b>
<b>Non-audit services</b>				
EDF	906	6.4	778	5.1
Controlled entities	4,944	35.1	1,473	9.6
<b>SUB-TOTAL</b>	<b>5,850</b>	<b>41.5</b>	<b>2,251</b>	<b>14.7</b>
<b>TOTAL</b>	<b>14,086</b>	<b>100</b>	<b>15,287</b>	<b>100</b>

## 6.2 STATUTORY AUDITORS' REPORT ON THE CONSOLIDATED FINANCIAL STATEMENTS

### For the year ended December 31, 2018

*This is a translation into English of the statutory auditors' report on the consolidated financial statements of the Company issued in French and it is provided solely for the convenience of English speaking users.*

*This statutory auditors' report includes information required by European regulation and French law, such as information about the appointment of the statutory auditors or verification of the information concerning the Group presented in the management report. This report should be read in conjunction with, and construed in accordance with, French law and professional auditing standards applicable in France.*

To the Shareholders,

### Opinion

In compliance with the engagement entrusted to us by your General Meeting, we have audited the accompanying consolidated financial statements of Électricité de France S.A. (« EDF », the « Company » or the « Group ») for the year ended December 31, 2018.

In our opinion, the consolidated financial statements give a true and fair view of the assets and liabilities and of the financial position of the Group as at December 31, 2018 and of the results of its operations for the year then ended in accordance with International Financial Reporting Standards as adopted by the European Union.

The audit opinion expressed above is consistent with our report to the Audit Committee.

### Basis for Opinion

#### Audit Framework

We conducted our audit in accordance with professional standards applicable in France. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Our responsibilities under those standards are further described herein in the *Statutory Auditors' Responsibilities for the Audit of the Consolidated Financial Statements* section of our report.

### Independence

We conducted our audit engagement in compliance with independence rules applicable to us, for the period from January 1, 2018 to the date of our report and specifically we did not provide any prohibited non-audit services referred to in Article 5(1) of Regulation (EU) No 537/2014 or in the French Code of ethics (*Code de Déontologie*) for statutory auditors.

### Observation

Without qualifying our conclusion, we draw your attention to the notes 1.2.1, 1.3.7, 1.3.16 and 2 of the consolidated financial statements, which disclose the effects of the application of IFRS 15 "Revenue from contracts with customers" and IFRS 9 "Financial instruments", new standards adopted in the European Union and applicable for financial years beginning on or after 1 January 2018.

### Justification of Assessments – Key Audit Matters

In accordance with the requirements of Articles L. 823-9 and R. 823-7 of the French Commercial Code (*Code de Commerce*) relating to the justification of our assessments, we inform you of the key audit matters relating to risks of material misstatement that, in our professional judgment, were of most significance in our audit of the consolidated financial statements of the current period, as well as how we addressed those risks.

These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on specific items of the consolidated financial statements.

## VALUATION OF PROVISIONS RELATED TO NUCLEAR GENERATION IN FRANCE – BACK END OF THE NUCLEAR CYCLE, PLANT DECOMMISSIONING AND LAST CORES – AND DEDICATED ASSETS

*Notes 1.3.2.2, 1.3.16.2, 1.3.21.1, 29.1 and 45 to the consolidated financial statements*

### Key Audit Matter

As at December 31, 2018, the provisions recorded to cover obligations relating to nuclear power plants for which EDF is the operator in France total €39,806 million, including €21,295 million with respect to the back-end of the nuclear cycle (management of spent fuel and radioactive waste) and €18,511 million with respect to the decommissioning of nuclear power plants and last cores.

The valuation of these provisions is described in Notes 1.3.2.2, 1.3.21.1 and 29.1. It requires defining technical and financial assumptions and using complex calculation models and falls within the scope of the regulatory context described in Note 29.1.

They are updated and the assumptions taken into consideration in the models are reviewed at least once a year. These assumptions reflect management's best estimate at the reporting date of the impacts of the applicable regulation, the implementation of decommissioning and storage processes or changes in the main financial parameters.

Furthermore, the Company is required to allocate so-called "dedicated" assets to secure financing of certain categories of nuclear provisions in France. The realisable value of these assets should allow the Company's commitments relating to the decommissioning of nuclear power plants and long-term storage of radioactive waste in France to be covered (Notes 1.3.16.2 and 45). The realisable value of these dedicated assets, for an amount of €27,689 million (or a net carrying amount of €26,232 million) as of December 31, 2018, was determined based on the fair value of diversified equity and bonds investments, and the equity value of a non-listed assets portfolio managed by the division EDF Invest.

### Responses

We have analysed the measures for recognising provisions related to nuclear generation in France and gained an understanding of the industrial scenarios for decommissioning nuclear power plants and the solutions adopted in terms of management of spent fuel and radioactive waste. We have assessed the compliance of the provisions with regard to applicable accounting, legal and regulatory measures.

We have verified the calculation models used by the Company and assessed the sensitivity of the valuations to the assumptions adopted in terms of cost, forecast cash outflows and financial parameters (discount and inflation rates).

Our work also consisted in verifying the type of costs used to determine provisions, assessing the consistency of industrial scenarios adopted by the Company and verifying the reconciliation of forecast costs and forecast cash outflows with these scenarios as well as the available studies and quotes.

We have also assessed the reasonableness of:

- margins for uncertainties and risks included in the provisions, to take into account the degree of control over decommissioning techniques and the management of spent fuel and radioactive waste.
- the series and mutualisation effects adopted in the quotes for decommissioning nuclear power plants in operation, for which the nominal cost represents €20,755 million to economic conditions at the end of the period, for a provision of €12,480 million in discounted value (Notes 29.1.3 and 29.1.5.2).



## VALUATION OF PROVISIONS RELATED TO NUCLEAR GENERATION IN FRANCE – BACK END OF THE NUCLEAR CYCLE, PLANT DECOMMISSIONING AND LAST CORES – AND DEDICATED ASSETS

Notes 1.3.2.2, 1.3.16.2, 1.3.21.1, 29.1 and 45 to the consolidated financial statements

### Key Audit Matter

We considered the valuation of nuclear provisions and dedicated assets to be a key audit matter due to:

- the sensitivity of the assumptions on which the valuation of these provisions is based, notably in terms of cost, inflation and long-term discount rates, as well as the depreciation periods of nuclear power plants in operation, and forecast cash outflows; the modification of these parameters can lead to a material revision in the provisioned amounts;
- the negative impacts on the financial position of the Company (cash earmarked to increase the amount of dedicated assets) in the event of an increase in nuclear provisions in France, a change in the realisable values of dedicated assets or changes in the coverage rate of nuclear provisions for dedicated assets,

it being specified that the valuation of provisions covers and includes uncertainties related to the fact that certain scenarios and technical solutions have never been implemented.

### Responses

Concerning the inflation and discount rates adopted by management, we have verified their compliance with applicable accounting standards and regulatory measures, notably the ministerial order of March 21, 2007, as amended. We have reconciled the data used for this purpose with market data and available historical information.

Concerning the securing of financing for certain of these provisions through dedicated assets, we have verified, by sampling, the portfolio movements and reconciled the realisable value of the dedicated assets in the portfolio at the reporting date with the available certificate of depository statements, and available external data and valuations. We have also assessed the accounting treatment and their valuation, in particular, the compliance with the accounting standard of the impairment criteria described in Note 1.3.16.2.

Finally, we have verified the appropriateness of the disclosures given for the provisions related to nuclear generation in France and the dedicated assets in the notes to the consolidated financial statements, notably regarding the sensitivity of the valuation of provisions to changes in macro-economic assumptions (Note 29.1.5.2).

6.

## VALUATION OF GOODWILL, INTANGIBLE ASSETS WITH INDEFINITE USEFUL LIVE, PROPERTY, PLANTS AND EQUIPMENTS, AND INVESTMENTS IN ASSOCIATES AND JOINT VENTURES

Notes 1.3.2.4, 1.3.15, 13 and 23 to the consolidated financial statements

### Key Audit Matter

As at December 31, 2018, the goodwill, intangible assets with indefinite useful live and investments in associates and joint ventures represent 45% of the Group's equity. They are mainly related to non-regulated activities in which the EDF Group operates.

Notes 1.3.2.4, 1.3.15 and 13 describe the methodologies adopted and applied to determine if indicators exist showing that an asset may be subject to an impairment loss. These notes also describe the methods for performing impairment tests. The tests and the determination of recoverable amounts are carried out annually at the cash-generating unit (CGU) level for those holding intangible assets with indefinite lives or goodwill. The recoverable amount corresponds, for the majority of these CGU, to the value in use determined based on the discounted value of future cash flows.

We considered the valuation of non-regulated assets in France, the United Kingdom and in Italy, and associates in the United States, to be a key audit matter, due to the sensitivity of valuations to macro-economic, industry and financial assumptions to determine recoverable amounts and the estimates and judgments that they require from management.

In particular, an unfavorable and volatile market with low electricity market prices and persistent electricity generation over-capacity, added to a stagnation of the demand for energy in the main markets where EDF operates, significantly decreases the recoverable amount of certain goodwill, intangible assets, property, plant and equipment or investments in associates and joint ventures allocated to non-regulated activities and may lead to significant impairment losses.

### Responses

As part of our work, we analysed the existence of indicators of impairment losses at the CGU level. We have also gained an understanding of the process for formulating estimates and assumptions made by management as part of impairment testing and we have also assessed the appropriateness of the valuation model.

We have verified, for the CGU tested, that the discounted future cash flow projections correspond to those generated by the assets included in these CGU and that they were consistent with (i) the budget data, medium-term plans (MTP) and, beyond, with the Group's long-term assumptions, (ii) past performances, (iii), market outlook and (iv) the expected operating life of the assets.

We have assessed, by conducting interviews with management, the different underlying assumptions (economic growth, price of raw material and CO<sub>2</sub>, electricity demands, production capacities and interconnections and changes in energetic mix) on which the medium and long-term price assumptions are based, by substantiating them with external studies carried out by international organisms or experts in energy.

We have verified the determination methods and the consistency of the discount rate assumptions, based on the weighted average cost of capital (WACC) by geographic area and by activity and, in particular, analysed, with the assistance of our internal experts, the consistency of risk-free rates and the risk premiums adopted by management with the underlying market assumptions.

If necessary, we have assessed the highly probable aspect of the disposals decided by the Group and the items considered to evaluate the recoverable amount.

Finally, we have assessed if Notes 1.3.15, 13 and 23 of the consolidated financial statements provide appropriate disclosure in particular in terms of assumptions adopted to perform impairment tests and sensitivity analyses.

### Specific Verifications

As required by law, we have also verified in accordance with professional standards applicable in France the information pertaining to the Group presented in the management report of the Board of Directors.

We have no matters to report as to its fair presentation and its consistency with the consolidated financial statements.

We attest that the consolidated non-financial statement required by Article L.225-102-1 of the French Commercial Code is included in the information pertaining to the Group presented in the management report, being specified that, in accordance with the provisions of Article L.823-10 of the code, we have not verified the fair presentation and the consistency with the consolidated financial statements of the information contained therein and should be reported on by an independent insurance services provide.

### Report on Other Legal and Regulatory Requirements

#### Appointment of the Statutory Auditors

We were appointed as statutory auditors of Electricité de France S.A. by the General meeting of June 6, 2005 for KPMG Audit and by decision of the Board of Directors of April 25, 2002 for Deloitte & Associés.

As at December 31, 2018, KPMG Audit was in the 14<sup>th</sup> year of total uninterrupted engagement and Deloitte & Associés was in the 17<sup>th</sup> year of total uninterrupted engagement, which for both 14 years since securities of the Company were admitted to trading on a regulated market.

### Responsibilities of Management and Those Charged with Governance for the Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of the consolidated financial statements in accordance with International Financial Reporting Standards as adopted by the European Union, and for such internal control as management determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is responsible for assessing the Company's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless it is expected to liquidate the Company or to cease operations.

The Audit Committee is responsible for monitoring the financial reporting process and the effectiveness of internal control and risks management systems and where applicable, its internal audit, regarding the accounting and financial reporting procedures.

The consolidated financial statements were approved by the Board of Directors.

### Statutory Auditors' Responsibilities for the Audit of the Consolidated Financial Statements

#### Objectives and audit approach

Our role is to issue a report on the consolidated financial statements. Our objective is to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with professional standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

As specified in Article L.823-10-1 of the French Commercial Code (*Code de Commerce*), our statutory audit does not include assurance on the viability of the Company or the quality of management of the affairs of the Company.

As part of an audit conducted in accordance with professional standards applicable in France, the statutory auditor exercises professional judgment throughout the audit and furthermore:

- Identifies and assesses the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, designs and performs audit procedures responsive to those risks, and obtains audit evidence considered to be sufficient and appropriate to provide a basis for his opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtains an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the internal control.
- Evaluates the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management in the consolidated financial statements.
- Assesses the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Company's ability to continue as a going concern. This assessment is based on the audit evidence obtained up to the date of his audit report. However, future events or conditions may cause the Company to cease to continue as a going concern. If the statutory auditor concludes that a material uncertainty exists, there is a requirement to draw attention in the audit report to the related disclosures in the consolidated financial statements or, if such disclosures are not provided or inadequate, to modify the opinion expressed therein.
- Evaluates the overall presentation of the consolidated financial statements and assesses whether these statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Obtains sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Group to express an opinion on the consolidated financial statements. The statutory auditor is responsible for the direction, supervision and performance of the audit of the consolidated financial statements and for the opinion expressed on these consolidated financial statements.

### Report to the Audit Committee

We submit a report to the Audit Committee which includes in particular a description of the scope of the audit and the audit program implemented, as well as the results of our audit. We also report, if any, significant deficiencies in internal control regarding the accounting and financial reporting procedures that we have identified.

Our report to the Audit Committee includes the risks of material misstatement that, in our professional judgment, were of most significance in the audit of the consolidated financial statements of the current period and which are therefore the key audit matters, that we are required to describe in this report.

We also provide the Audit Committee with the declaration provided for in Article 6 of Regulation (EU) No 537/2014, confirming our independence within the meaning of the rules applicable in France such as they are set in particular by Articles L.822-10 to L.822-14 of the French Commercial Code (*Code de Commerce*) and in the French Code of Ethics (*Code de Déontologie*) for statutory auditors. Where appropriate, we discuss with the Audit Committee the risks that may reasonably be thought to bear on our independence, and the related safeguards.

Paris La Défense, February 14, 2019

### The Statutory Auditors

**KPMG S.A.**

Jay Nirsimloo

Michel Piette

**Deloitte & Associés**

Damien Leurent

Christophe Patrier

## 6.3 FINANCIAL STATEMENTS

NB: Most figures in the tables are reported in millions of euros. The resulting approximation can lead to slight differences in totals or movements and changes.

### INCOME STATEMENT

<i>(in millions of euros)</i>	<b>Notes</b>	<b>2018</b>	<b>2017</b>
<b>SALES <sup>(1)</sup></b>	<b>4</b>	<b>44,874</b>	<b>42,371</b>
Change in inventories and capitalised production		1,217	1,138
Operating subsidies	5	6,566	6,558
Reversals of provisions and depreciation	6	2,996	3,231
Other operating income and transfers of charges	7	850	823
<b>I TOTAL OPERATING INCOME</b>		<b>56,503</b>	<b>54,121</b>
<b>Purchases and other external expenses</b>	<b>8</b>	<b>37,410</b>	<b>36,723</b>
Fuel purchases used		3,172	3,186
Energy purchases		17,057	15,870
Services and other purchases used		17,181	17,667
<b>Taxes other than Income taxes</b>	<b>9</b>	<b>2,662</b>	<b>2,567</b>
<b>Personnel expenses</b>	<b>10</b>	<b>6,565</b>	<b>6,754</b>
<b>Depreciation, amortisation and provisions</b>	<b>11</b>	<b>6,471</b>	<b>5,441</b>
Depreciation and amortisation	11.1	3,531	3,366
Provisions and impairment	11.2	2,940	2,075
<b>Other operating expenses</b>	<b>12</b>	<b>1,743</b>	<b>1,644</b>
<b>II TOTAL OPERATING EXPENSES</b>		<b>54,851</b>	<b>53,129</b>
<b>OPERATING PROFIT (I - II)</b>		<b>1,652</b>	<b>992</b>
<b>III JOINT OPERATIONS</b>		<b>0</b>	<b>1</b>
<b>IV FINANCIAL RESULT</b>	<b>13</b>	<b>(1,756)</b>	<b>(988)</b>
<b>PROFIT OR LOSS BEFORE INCOME TAXES AND EXCEPTIONAL ITEMS (I - II + III + IV)</b>		<b>(104)</b>	<b>5</b>
<b>V EXCEPTIONAL RESULT</b>	<b>14</b>	<b>939</b>	<b>1,232</b>
<b>VI INCOMES TAXES</b>	<b>15</b>	<b>756</b>	<b>687</b>
<b>PROFIT OR LOSS (I - II + III + IV + V + VI )</b>		<b>1,591</b>	<b>1,924</b>

(1) Production of goods for export in 2018: €10,287 million; production of services for export in 2018: €423 million.

## BALANCE SHEET

### ASSETS

		31/12/2018			31/12/2017
	Notes	Gross values	Amortisation, depreciation and impairment	Net values	Net values
<i>(in millions of euros)</i>					
<b>Intangible assets</b>	<b>16 -17</b>	<b>2,091</b>	<b>1,074</b>	<b>1,017</b>	<b>933</b>
Property, plant and equipment owned by EDF	16 -17	85,326	57,921	27,405	26,066
Property, plant and equipment operated under concessions	16 -17	14,711	8,755	5,956	5,871
<b>Tangible and intangible assets in progress</b>	<b>16 -17</b>	<b>21,114</b>	<b>177</b>	<b>20,937</b>	<b>19,655</b>
Investments and related receivables		59,258	307	58,951	58,445
Investment securities		21,076	655	20,421	18,092
Loans and other financial assets		12,545	61	12,484	12,386
<b>Financial assets</b>	<b>18</b>	<b>92,879</b>	<b>1,023</b>	<b>91,856</b>	<b>88,923</b>
<b>TOTAL I FIXED ASSETS</b>		<b>216,121</b>	<b>68,950</b>	<b>147,171</b>	<b>141,448</b>
<b>Inventories and work-in-progress</b>	<b>19</b>	<b>10,096</b>	<b>189</b>	<b>9,907</b>	<b>9,969</b>
<b>Advances on orders</b>	<b>20</b>	<b>690</b>	<b>1</b>	<b>689</b>	<b>785</b>
<b>Trade and other receivables</b>	<b>20</b>	<b>21,094</b>	<b>397</b>	<b>20,697</b>	<b>20,791</b>
<b>Marketable securities</b>	<b>21</b>	<b>16,913</b>	<b>52</b>	<b>16,861</b>	<b>14,527</b>
<b>Cash instruments</b>	<b>20</b>	<b>2,605</b>	<b>-</b>	<b>2,605</b>	<b>2,096</b>
<b>Cash and cash equivalents</b>	<b>22</b>	<b>4,619</b>	<b>-</b>	<b>4,619</b>	<b>5,110</b>
<b>Prepaid expenses</b>	<b>20</b>	<b>1,449</b>	<b>-</b>	<b>1,449</b>	<b>1,358</b>
<b>TOTAL II CURRENT ASSETS</b>		<b>57,466</b>	<b>639</b>	<b>56,827</b>	<b>54,636</b>
<b>Deferred charges (III)</b>		<b>255</b>	<b>-</b>	<b>255</b>	<b>265</b>
<b>Bond redemption premiums (IV)</b>		<b>758</b>	<b>251</b>	<b>507</b>	<b>453</b>
<b>Unrealised foreign exchange losses (V)</b>	<b>23</b>	<b>767</b>	<b>-</b>	<b>767</b>	<b>572</b>
<b>TOTAL ASSETS ( I + II + III + IV + V)</b>		<b>275,367</b>	<b>69,840</b>	<b>205,527</b>	<b>197,374</b>

## EQUITY AND LIABILITIES

<i>(in millions of euros)</i>		Notes	31/12/2018	31/12/2017
<b>Capital</b>			<b>1,505</b>	<b>1,464</b>
<b>Capital-related premiums</b>			<b>15,672</b>	<b>14,866</b>
<b>Revaluation surplus</b>			<b>676</b>	<b>680</b>
<b>Reserves</b>				
Legal reserves			146	105
Other reserves			3,000	3,000
<b>Retained earnings</b>			<b>7,351</b>	<b>6,809</b>
<b>Profit or loss for the financial year</b>			<b>1,591</b>	<b>1,924</b>
<b>Interim dividend</b>			<b>(451)</b>	<b>(433)</b>
<b>Investment subsidies</b>			<b>166</b>	<b>163</b>
<b>Tax-regulated provisions</b>			<b>6,056</b>	<b>6,098</b>
<b>EQUITY</b>	<b>24</b>		<b>35,712</b>	<b>34,676</b>
<b>Additional equity</b>	<b>25</b>		<b>10,620</b>	<b>10,449</b>
<b>Special concession accounts</b>	<b>26</b>		<b>2,199</b>	<b>2,159</b>
<b>TOTAL I EQUITY AND CONCESSION ACCOUNTS</b>			<b>48,531</b>	<b>47,284</b>
<b>Provisions for risks</b>	<b>27</b>		<b>2,544</b>	<b>1,384</b>
Provisions related to nuclear generation (Back-end of the nuclear cycle, plant decommissioning and last cores)	28		39,806	37,633
Provisions for decommissioning of non-nuclear facilities	29		659	626
Provisions for employee benefits	30		11,240	11,055
Provisions for other expenses	31		866	938
<b>Provisions for expenses</b>			<b>52,571</b>	<b>50,252</b>
<b>TOTAL II PROVISIONS</b>			<b>55,115</b>	<b>51,636</b>
<b>Financial liabilities</b>	<b>33</b>		<b>54,644</b>	<b>51,441</b>
<b>Advances and progress payments received</b>	<b>32</b>		<b>7,134</b>	<b>6,861</b>
<b>Operating, investment and other liabilities</b>	<b>32</b>		<b>33,229</b>	<b>31,911</b>
<b>Cash instruments</b>	<b>32</b>		<b>3,462</b>	<b>4,471</b>
<b>Deferred income</b>	<b>32</b>		<b>3,116</b>	<b>3,285</b>
<b>TOTAL III LIABILITIES</b>	<b>32</b>		<b>101,585</b>	<b>97,969</b>
<b>Unrealised foreign exchange gains (IV)</b>	<b>34</b>		<b>296</b>	<b>485</b>
<b>TOTAL EQUITY AND LIABILITIES ( I + II + III + IV)</b>			<b>205,527</b>	<b>197,374</b>

## CASH FLOW STATEMENT

(in millions of euros)

	Notes	2018	2017
<b>Operating activities:</b>			
Profit/(loss) before income tax		835	1,237
Amortisation, depreciation and provisions		7,153	4,010
Capital (gains)/losses <sup>(1)</sup>		(499)	(859)
Financial income and expenses		(2,133)	(827)
Changes in working capital <sup>(2)</sup>		3,238	2,530
<b>NET CASH FLOW FROM OPERATIONS</b>		<b>8,594</b>	<b>6,091</b>
Net financial expenses, including dividends received		1,435	620
Income taxes paid		(29)	(677)
<b>NET CASH FLOW FROM OPERATING ACTIVITIES (A)</b>		<b>10,000</b>	<b>6,034</b>
<b>Investing activities:</b>			
Investments in property, plant and equipment and intangible assets		(5,982)	(5,984)
Proceeds from sale of property, plant and equipment and intangible assets		24	17
Changes in financial assets <sup>(3)</sup>		(4,776)	1,022
<b>NET CASH FLOW USED IN INVESTING ACTIVITIES (B)</b>		<b>(10,734)</b>	<b>(4,945)</b>
<b>Financing activities:</b>			
Issuance of borrowings and underwriting agreements		4,938	1,282
Repayment of borrowings and underwriting agreements		(2,435)	(5,204)
Dividends paid	24	(513)	(110)
Issuance of perpetual subordinated bonds	24	-	4,005
Funding contributions received for assets operated under concessions		6	8
Investment subsidies		11	4
<b>NET CASH FLOW FROM FINANCING ACTIVITIES (C)</b>		<b>2,007</b>	<b>(15)</b>
<b>NET INCREASE/(DECREASE) IN CASH AND CASH EQUIVALENTS (A)+(B)+(C)</b>		<b>1,273</b>	<b>1,074</b>
<b>CASH AND CASH EQUIVALENTS - OPENING BALANCE</b>	<b>22</b>	<b>(2,875)</b>	<b>(3,981)</b>
Effect of currency fluctuations		(13)	(23)
Financial income on cash and cash equivalents		52	55
<b>CASH AND CASH EQUIVALENTS - CLOSING BALANCE <sup>(4)</sup></b>	<b>22</b>	<b>(1,563)</b>	<b>(2,875)</b>

(1) Including the balance of the gain on sale of all the shares of RTE to CTE, amounting to €388 million in 2017.

(2) Including in 2018 a positive impact of €2,068 million on working capital and therefore on cash, following changes in the classification of cash management and underwriting agreements, particularly concerning the holding companies (see note 22).

(3) In 2017, this item includes the acquisition of Framatome for €1,894 million.

(4) "Cash and cash equivalents – opening balance" and "Cash and cash equivalents – closing balance" do not include investment funds or negotiable debt instruments maturing in more than three months. Details of the variation in cash and cash equivalents are presented in note 22.



## NOTES TO THE FINANCIAL STATEMENTS

<b>Note 1</b>	<b>Accounting principles and methods</b>	<b>439</b>	<b>INCOME STATEMENT</b>	<b>454</b>	
1.1	Accounting standards	439	<b>Note 4</b>	<b>Sales</b>	<b>454</b>
1.2	Management judgments and estimates	439	<b>Note 5</b>	<b>Operating subsidies</b>	<b>454</b>
1.3	Sales	440	<b>Note 6</b>	<b>Reversals of provisions and impairment</b>	<b>454</b>
1.4	Intangible assets	440	<b>Note 7</b>	<b>Other operating income and transfers of charges</b>	<b>454</b>
1.5	Property, plant and equipment	440	<b>Note 8</b>	<b>Purchases and other external expenses</b>	<b>455</b>
1.6	Long-term asset impairment	441	<b>Note 9</b>	<b>Taxes other than income taxes</b>	<b>455</b>
1.7	Financial assets	441	<b>Note 10</b>	<b>Personnel expenses</b>	<b>455</b>
1.8	Inventories and work-in-progress	442	<b>Note 11</b>	<b>Operating depreciation, amortisation and provisions</b>	<b>456</b>
1.9	Accounts receivable and marketable securities	442	11.1	Depreciation and amortisation	456
1.10	Bond issuance expenses and redemption premiums	443	11.2	Provisions and impairment	456
1.11	Unrealised foreign exchange gains and losses	443	<b>Note 12</b>	<b>Other operating expenses</b>	<b>456</b>
1.12	Tax-regulated provisions	443	<b>Note 13</b>	<b>Financial result</b>	<b>457</b>
1.13	Additional equity	443	<b>Note 14</b>	<b>Exceptional result</b>	<b>457</b>
1.14	Special concession liabilities	443	<b>Note 15</b>	<b>Income taxes</b>	<b>458</b>
1.15	Provisions other than employee benefit provisions	443	15.1	Tax group	458
1.16	Employee benefits	444	15.2	Income tax payable	458
1.17	Derivatives	445	15.3	Tax credit for competitiveness and employment (CICE)	458
1.18	Commodity contracts	445	15.4	Deferred taxes	458
1.19	Environment	445	<b>BALANCE SHEET</b>	<b>459</b>	
<b>Note 2</b>	<b>Significant events and transactions</b>	<b>447</b>	<b>Note 16</b>	<b>Gross values of intangible and tangible fixed assets</b>	<b>459</b>
2.1	Completion of the sale of EDF’s stake in Dunkerque LNG	447	<b>Note 17</b>	<b>Depreciation, amortisation and impairment of intangible and tangible fixed assets</b>	<b>460</b>
2.2	Senior bond issues: EDF raises \$3.75 billion and €1 billion	447	17.1	Impairment tests on assets	460
2.3	Issuance of perpetual subordinated bonds	447	<b>Note 18</b>	<b>Financial assets</b>	<b>461</b>
2.4	Redemption of certain series of hybrid bonds	447	18.1	Change in financial assets	461
2.5	Syndication of an innovative ESG-indexed revolving credit facility	448	18.2	Subsidiaries and investments of at least 50% of capital	462
2.6	Confirmation of the European Commission decision on the tax treatment of provisions established between 1987 and 1996 for renewal of general network facilities	448	18.3	Subsidiaries and investments under 50%	463
2.7	Flamanville 3 EPR project	448	18.4	Investment securities portfolio	463
2.8	Acquisition of 75.5% of Framatome	449	18.5	Variation in treasury shares	464
<b>Note 3</b>	<b>Regulatory changes in France</b>	<b>450</b>	18.6	Financial loans and receivables related to investments	464
3.1	France’s multi-year energy programme (PPE)	450			
3.2	Regulated electricity sales tariffs in France – “Blue” tariffs	450			
3.3	Supplier commissioning	451			
3.4	Electricity equalisation fund	451			
3.5	Compensation for public energy service charges (CSPE)	451			
3.6	Capacity mechanism	452			
3.7	Energy savings certificates	452			
3.8	ARENH	453			

<b>Note 19 Inventories and work-in-progress</b>	<b>465</b>	<b>Note 31 Provisions for other expenses</b>	<b>478</b>
<b>Note 20 Other current assets</b>	<b>465</b>	<b>Note 32 Liabilities</b>	<b>478</b>
<b>Note 21 Marketable securities</b>	<b>465</b>	<b>Note 33 Financial liabilities</b>	<b>479</b>
<b>Note 22 Variation in cash and cash equivalents reported in the cash flow statement</b>	<b>466</b>	33.1 Breakdown of loans by currency, before and after hedging instruments	479
<b>Note 23 Unrealised foreign exchange losses</b>	<b>466</b>	33.2 Breakdown of loans by type of interest rate before and after hedging	480
<b>Note 24 Changes in equity</b>	<b>467</b>	<b>Note 34 Unrealised foreign exchange gains</b>	<b>480</b>
24.1 Share capital	467	<b>OTHER INFORMATION</b>	<b>481</b>
24.2 Dividends	467	<b>Note 35 Financial instruments</b>	<b>481</b>
<b>Note 25 Additional equity</b>	<b>468</b>	35.1 Off-balance sheet commitments related to currency and interest rate derivatives	481
<b>Note 26 Special concession liabilities</b>	<b>468</b>	35.2 Impacts of financial instrument transactions on net income	482
<b>Note 27 Provisions for risks</b>	<b>468</b>	35.3 Fair value of derivative financial instruments	482
<b>Note 28 Provisions related to nuclear generation - back-end of the nuclear cycle, plant decommissioning and last cores</b>	<b>469</b>	<b>Note 36 Other off-balance sheet commitments and operations</b>	<b>483</b>
28.1 Provisions for spent nuclear fuel management	470	36.1 Commitments given	483
28.2 Provision for waste removal and conditioning - Provision for long-term radioactive waste management	470	36.2 Commitments received	484
28.3 Decommissioning provisions for nuclear power plants	471	36.3 Other types of commitment	484
28.4 Provisions for last cores	473	<b>Note 37 Contingent liabilities</b>	<b>484</b>
28.5 Discounting of provisions related to nuclear generation and sensitivity analyses	473	<b>Note 38 Dedicated assets</b>	<b>485</b>
<b>Note 29 Other provisions for decommissioning</b>	<b>474</b>	38.1 Regulations	485
<b>Note 30 Provisions for employee benefits</b>	<b>475</b>	38.2 Portfolio contents and measurement	485
30.1 Provisions for post-employment benefits	476	<b>Note 39 Related parties</b>	<b>487</b>
30.2 Provisions for other long-term benefits for current employees	476	39.1 Relations with subsidiaries	487
30.3 Fund assets	477	39.2 Relations with the French State and state-owned entities	487
30.4 Actuarial assumptions	477	<b>Note 40 Environment</b>	<b>488</b>
		40.1 Greenhouse gas emission rights	488
		40.2 Energy savings certificates	488
		<b>Note 41 Management compensation</b>	<b>489</b>
		<b>Note 42 Subsequent events</b>	<b>489</b>

Électricité de France SA (EDF), the parent company of the EDF group, is a French *société anonyme* operating in electricity generation and electricity and gas supply. EDF also covers all the business activities of Island Energy Systems (SEI) for Corsica and France's overseas departments.

## **NOTE 1 ACCOUNTING PRINCIPLES AND METHODS**

### **1.1 ACCOUNTING STANDARDS**

EDF's financial statements are prepared in accordance with the accounting principles and methods defined in regulation 2014-03 of 5 June 2014 issued by the ANC (*Autorité des normes comptables*, France's Accounting Standards Authority) concerning the revised national chart of accounts.

The accounting and valuation methods applied are identical to those used in the financial statements for the year ended 31 December 2017, except for regulation 2018-01 of 20 April 2018 concerning changes of method, changes of estimate and correction of errors, which is applicable for financial years current at the date of the regulation's publication, i.e. for the 31 December 2018 year-end.

### **1.2 MANAGEMENT JUDGMENTS AND ESTIMATES**

The preparation of the financial statements requires the use of judgments, best estimates and assumptions in determining the value of assets and liabilities, income and expenses recorded for the period, considering positive and negative contingencies existing at year-end. The figures in EDF's future financial statements could differ significantly from current estimates due to changes in these assumptions or economic conditions.

In a context characterised by financial market volatility, the parameters used to prepare estimates are based on macro-economic assumptions appropriate to the very long-term cycle of EDF's assets.

The principal operations for which EDF uses estimates and judgments are the following:

#### **1.2.1 Depreciation period of nuclear power plants**

In the specific case of the depreciation period of its nuclear power plants, EDF's industrial strategy is to continue operation beyond 40 years, in optimum conditions as regards safety and efficiency.

The depreciation period of 900MW series power plants was extended from 40 years to 50 years in 2016 (except for Fessenheim) since all the technical, economic and governance conditions were fulfilled. The depreciation period of other Group series in France (1300MW and 1450MW), which are more recent, is currently unchanged at 40 years, as the conditions for extension are not yet fulfilled.

These depreciation periods take into account the date of recoupling with the network after the most recent 10-year inspection.

As explained in note 3.1, under the proposed new multi-year energy programme (PPE), two nuclear reactors would, subject to certain conditions, be shut down in 2027 and 2028, ahead of their fifth 10-year inspection. If this is confirmed in the final PPE adopted, it could lead to prospective modification of the depreciation period for the two units concerned. As this situation would bring forward the shutdown of two reactors in the fleet by a few years, the potential effect on the annual depreciation expense, which will depend on the reactors selected for shutdown, is expected to be limited.

The proposed PPE also stipulates that the closure of the two reactors at Fessenheim should take place "by spring 2020, in application of the cap on installed electronuclear power, so that the Flamanville EPR can be put into operation". The

depreciation period for Fessenheim, which is currently due to end in November 2019, will be modified prospectively in accordance with the provisions of the final PPE.

#### **1.2.2 Nuclear provisions**

The measurement of provisions for the back-end of the nuclear cycle, decommissioning and last cores is sensitive to assumptions concerning technical processes, costs, inflation rates, long-term discount rates, the depreciation period of plants currently in operation and disbursement schedules.

As explained in note 3.1, under the proposed new PPE, two nuclear reactors would, subject to certain conditions, be shut down in 2027 and 2028, ahead of their fifth 10-year inspection. If this is confirmed in the final PPE adopted, it could lead to a change in the amount of corresponding nuclear provisions. As this situation would bring forward the shutdown of two reactors in the fleet by a few years, the potential impact on nuclear provisions could be an increase of some tens of millions of euros, with an adjustment to the relevant balance sheet assets.

The provision parameters are re-estimated at each closing date to ensure that the amounts accrued correspond to the best estimate of the costs eventually to be borne by EDF.

EDF considers that the assumptions used at 31 December 2018 are appropriate and justified. However, any future change in assumptions could have a significant impact on EDF's balance sheet and income statement.

The main assumptions and sensitivity analyses relating to nuclear provisions are presented in note 28.5.

The calculation of provisions incorporates a level of risks and unknowns as appropriate to the operations concerned. The valuation of costs carries uncertainty factors such as:

- changes in the regulations, particularly on safety, security and environmental protection, and financing of nuclear expenses;
- changes in the regulatory decommissioning process and the time necessary for issuance of administrative authorisation;
- future methods for storing long-lived radioactive waste and provision of storage facilities by the French agency for radioactive waste management ANDRA (*Agence nationale pour la gestion des déchets radioactifs*);
- changes in certain financial parameters such as discount rates, notably in relation to the regulatory limit, inflation rates, or changes in the contractual terms of spent fuel management.

#### **1.2.3 Pensions and other long-term and post-employment benefit obligations**

The value of pensions and other long-term and post-employment benefit obligations is based on actuarial valuations that are sensitive to all the actuarial assumptions used, particularly concerning discount rates, inflation rates and wage increase rates.

The principal actuarial assumptions used to calculate these post-employment and long-term benefits at 31 December 2018 are presented in note 30.4. These assumptions are updated annually. EDF considers the actuarial assumptions used at 31 December 2018 appropriate and well-founded, but future changes in these assumptions could have a significant effect on the amount of the obligations and EDF's net income.

### 1.2.4 Energy supplied but not yet measured and billed

As explained in note 1.3, the quantities of energy supplied but not yet measured and billed are calculated at the reporting date based on consumption statistic models and selling price estimates. Determination of the unbilled portion of sales revenues at the year-end is sensitive to the assumptions used to prepare these statistics and estimates.

## 1.3 SALES

Sales essentially comprise income from energy sales (to final customers and as part of trading activities), and sales of services. EDF's energy sales revenues include delivery services through the energy distribution network purchased from the subsidiary Enedis and invoiced to end-customers.

Sales are recognised when delivery of goods has taken place or the service has been completed.

The quantities of energy delivered to EDF customers but not yet measured and billed at the end of the period are calculated based on the quantities used by the sites of the EDF balance-responsible entity less the quantities billed, after losses measured by a statistical method presented to the *Commission de régulation de l'énergie* (CRE), the French Energy Regulation Commission. These quantities are valued using an average price determined by reference to energy invoiced in the previous month.

Sales of goods and services not completed at the balance sheet date are valued by reference to the stage of completion at that date.

Sales of energy to EDF Trading, the Group's trading company, are recorded at their contractually stipulated amount.

### 1.3.1 Capacity mechanism

A capacity mechanism has been set up in France to ensure secure power supplies during peak periods.

French law 2010-1488 of 7 December 2010 on the new organisation of the electricity market introduced an obligation in France to contribute to power supply security from 1 January 2017.

Operators of electricity generation facilities and load-shedding operators must have their capacities certified by RTE, and commit to a forecast level of availability for a given year of delivery. In return, they are awarded capacity certificates. Meanwhile, electricity suppliers and purchasers of power to compensate for network losses (obligated actors) must have capacity certificates equivalent to consumption by their customers in peak periods. Suppliers pass on the cost of the capacity mechanism to final customers through their sale prices.

The system is completed by registers for trading of capacities between actors. Capacity auctions are held several times a year.

EDF is concerned by both aspects of this system, both as an operator of electricity plants and as an electricity supplier.

The operations are recorded as follows:

- sales of certificates are recognised in income when the auctions or over-the-counter sales take place;
- the cost of the capacity mechanism passed on to final customers through regulated sales tariffs and market-price offers is recognised in sales revenues as and when the electricity is delivered. However, the ARENH has included a capacity value since 2017 when the capacity mechanism took effect, as the terms of transfer for the capacity guarantees associated with the ARENH system were defined by the CRE;
- stocks of certificates are stated either at their certification value (i.e. cost of certification by RTE) or at their purchase value on the markets;
- decreases in the stock of certificates are valued at the weighted average unit cost. The timing of recognition depends on the actor:
  - electricity plant operators: when the auction sales take place,

- obligated actors: spread on a straight-line basis over the 5-month peak period;

- for obligated actors, if there is a shortfall in the stocks of capacity certificates, a provision is recorded equivalent to the best estimate of the expense necessary to extinguish the obligation;

- at the closing date, if the realisable value of the stock of capacity certificates is lower than its net book value, impairment is recognised.

## 1.4 INTANGIBLE ASSETS

### 1.4.1 Research and development expenses

Research expenses are recognised as expenses in the financial period incurred.

Development costs that meet the requirements for capitalisation laid down in Article 211-5 of the French national chart of accounts are included in intangible assets and amortised on a straight-line basis over their foreseeable useful life.

### 1.4.2 Other intangible assets

Other intangible assets mainly consist of software and storage capacity reservation costs.

They are amortised on a straight-line basis over their useful lives regardless of whether they are generated in-house or purchased.

## 1.5 PROPERTY, PLANT AND EQUIPMENT

EDF's property, plant and equipment is reported under two balance sheet headings, as appropriate to the business and contractual circumstances of the assets' use:

- property, plant and equipment owned by EDF, essentially nuclear generation facilities;
- property, plant and equipment operated under concessions.

### 1.5.1 Initial measurement

Property, plant and equipment is recorded at acquisition or production cost.

- The cost of facilities developed in-house includes all labour and materials costs, and all other production costs attributable to the construction of the asset.
- The cost of property, plant and equipment also includes the initial estimate of decommissioning costs. These assets are associated with the provisions recorded to cover decommissioning obligations. At the date of commissioning, property, plant and equipment is measured and recorded in the same way as the corresponding provision (see note 1.15).
- Decommissioning costs for nuclear generation installations also include last core costs (see note 1.15).

When some of the decommissioning costs for a plant are to be borne by a partner, the expected reimbursement is recognised as accrued income in the assets. The difference between the provision and the accrued income is recorded in Property, plant and equipment, and subsequent payments by the partner are deducted from the accrued income.

EDF capitalises safety expenses incurred as a result of legal and regulatory obligations sanctioning non-compliance by an administrative ban from operation.

Strategic safety spare parts for generation facilities are treated as property, plant and equipment, and depreciated over the residual useful life of the installations.

The costs of major inspections that are necessary for continued operation by generation assets are capitalised and amortised over a period corresponding to the time elapsing between two inspections.

When a part of an asset has a different useful life from the overall asset's useful life, it is identified as an asset component and depreciated over a specific period.

Borrowing costs attributable to the financing of an asset incurred during the construction period are recognised as expenses.

## 1.5.2 Depreciation

Items of property, plant and equipment are depreciated on a straight-line basis over their useful life, defined as the period during which the company expects to draw future economic benefits from their use.

The expected useful lives for the main facilities are as follows:

- hydroelectric dams 75 years;
- electromechanical equipment used in hydropower plants 50 years;
- fossil-fired power plants 25 to 45 years;
- nuclear generation facilities 40 to 50 years;
- distribution installations (lines, substations) 20 to 45 years.

## 1.5.3 Concession agreements

EDF is the operator for two types of public service concessions:

- public electricity distribution concessions in which the grantors are local authorities (municipalities or syndicated municipalities);
- hydropower concessions with the French State as grantor.

The accounting treatment of concessions is based on the 1975 accounting guide for concession operator firms, as there are no specific instructions in the national chart of accounts.

### 1.5.3.1 Public electricity distribution concessions

EDF is the concession operator for the island public distribution networks located in Corsica and France's overseas departments, under concession agreements that generally use standard concession specifications established in 1992 (and updated in 2007), which were negotiated with the National Federation of Licensing Authorities (*Fédération nationale des collectivités concédantes et régies* - FNCCR) and approved by the public authorities.

On 21 December 2017, a framework agreement for a new concession agreement model was signed with FNCCR and France Urbaine. As of 2018, newly-signed concession agreements apply this new agreement model.

Assets used under concessions are reported in the balance sheet assets as property, plant and equipment operated under concessions, regardless of their initial financing, at acquisition cost or their estimated value at the transfer date when supplied by the grantor. An offsetting liability is recognised for any assets supplied for nil consideration by concession grantors.

### 1.5.3.2 Hydropower concessions

Hydropower concessions follow standard rules approved by decree.

Hydropower concession assets consist solely of hydropower generation equipment (dams, pipes, turbines, etc) for initial concessions. In other concessions, they comprise hydropower generation equipment and switching facilities (alternators, etc). Assets used in these concessions are recorded under "Property, plant and equipment operated under concessions" at acquisition cost.

Depreciation is calculated over their useful life, which is generally identical to the term of the concession.

Additional depreciation is booked in the balance sheet liabilities for assets operated under concessions (see note 1.14.2).

Hydropower concessions have an initial term of 75 years pursuant to the French Law of 16 October 1919 relating to hydropower use. Most hydropower concessions that expired before 2012 were renewed for terms of 30 to 50 years. However, the French government has not yet renewed 12 concessions that have expired. Since their expiry these concessions have thus been in the "rolling extension" situation defined by the law, which stipulates that at the expiry date of a concession, if no new concession has been established "the concession is extended on the existing terms until such time as a new concession is granted", so as to ensure continuity of operations in the meantime (Article L. 521-16 par. 3 of the French Energy Code).

## 1.6 LONG-TERM ASSET IMPAIRMENT

At each reporting date, EDF assesses whether there is an indication that an asset could have significantly lost value. If so, an impairment test is carried out as follows:

- EDF measures any long-term asset impairment by comparing the carrying value of these assets, combined into groups where necessary, and their recoverable amount, usually determined using the discounted future net cash flow method. When this recoverable amount is lower than the value in the balance sheet, an amount equivalent to the difference is written off under "Depreciation and impairment";
- the discount rates used for these purposes are based on the weighted average cost of capital (WACC) for each asset or group of assets concerned;
- future cash flows are calculated on the basis of the best available information at the valuation date:
  - for the first few years, the flows correspond to the Medium-Term Plan (MTP). Over the MTP horizon, energy and commodity prices are determined based on available forward prices, taking hedges into consideration,
  - beyond the MTP horizon, cash flows are estimated based on long-term assumptions prepared for each energy, using a process that is updated annually. Medium and long-term electricity prices are constructed analytically by assembling blocks of assumptions, e.g. economic growth, commodity (oil, gas, coal) and CO<sub>2</sub> prices, demand for electricity, interconnections, and developments in the energy mix (rise of renewable energies, installed nuclear capacity, etc) with fundamental models of supply-demand balance. EDF refers in particular to external analyses for each assumption object (for example, for commodities and CO<sub>2</sub>, which are primary factors in electricity prices, EDF compares its own scenarios with scenarios developed by organisations such as the IEA, IHS or Wood Mackenzie, bearing in mind that each of these analysts itself proposes a cone of scenarios corresponding to different macro-economic environments),
  - income from capacity market mechanisms is also taken into consideration in valuing generation assets.

These calculations may be influenced by several variables:

- changes in discount rates;
- changes in market prices for energy and commodities, and tariff regulations;
- changes in demand and EDF's market share, and the attrition rate on customer portfolios;
- the useful life of facilities, or the duration of concession agreements where relevant;
- the growth rates used beyond the medium-term plans and where relevant the terminal values taken into consideration.

## 1.7 FINANCIAL ASSETS

### 1.7.1 Investments

Investments are carried at acquisition cost.

Gains and losses on sales of investments are valued using the FIFO (first in first out) method.

Transfer duties, fees and commissions and legal fees related to acquisitions of investments are included in the cost of acquisition of the asset.

Expenses of this type relating to other shares are included in expenses. Tax-regulated amortisation of acquisition costs is recorded in an excess depreciation account.

When the book value of investments is higher than their value in use, impairment is recorded equivalent to the difference.

The value in use of listed securities in non-consolidated entities is based on stock market price.

For unlisted and listed securities in companies included in the EDF group consolidation, the value in use is determined by reference to the transaction value, equity value or net adjusted consolidated assets, taking into account expert valuation data and information that has become known since the previous year-end when necessary.

### 1.7.2 Investment securities

EDF has set up two investment portfolios:

- the first comprises dedicated financial assets intended to finance the end of nuclear fuel cycle operations, for which provisions have been accrued. These assets are managed separately from other financial assets and investments in view of their specific objective, and comprise bonds, equities, collective investment funds and "reserved" funds built up by EDF solely for its own use;
- the second comprises securities acquired to generate a satisfactory return on investment in the medium to long term, without participating in the management of the companies concerned.

Other investments also include treasury shares that cover obligations relating to debt instruments providing access to the Company's capital, acquired under a liquidity contract with an investment services company or through an external operation or capital reduction.

Shares are recorded at acquisition cost. Transfer duties, professional fees, commissions, legal expenses and purchasing costs are all charged to expenses, applying the option used for other investments.

Investment securities (shares and bonds) are recorded at acquisition cost. If the carrying amount of a security is lower than the acquisition cost, the unrealised capital loss is fully covered by a provision without being netted against potential gains on other securities. The carrying amount of listed securities is assessed individually, taking the stock market price into account. For unlisted securities, the carrying amount is also assessed individually, mainly by reference to the growth prospects of the companies concerned and their share prices.

### 1.7.3 Other financial assets

As part of Group activities, EDF grants short-term loans in foreign currencies to its subsidiaries.

In order to reduce exposure to foreign exchange risks, EDF mainly finances these loans by short-term commercial paper issues in foreign currencies and in euros, together with the use of currency hedging derivatives. Capitalised receivables are stated at nominal value. Impairment is recognised when the market value falls below the book value.

## 1.8 INVENTORIES AND WORK-IN-PROGRESS

The initial cost of inventories includes all direct material costs (including the effect of hedging), labour costs and a share of indirect production costs.

Inventory consumption is generally valued under the weighted average unit cost method. Consumption of greenhouse gas emission rights and energy savings certificates is valued under the FIFO (first in first out) method.

Inventories are carried at the lower of historical cost or net realisable value.

### 1.8.1 Nuclear fuel and materials

Inventory accounts include:

- nuclear materials, whatever their form during the fuel production cycle;
- fuel components in the warehouse or in the reactor.

The stated value of nuclear fuel and materials and work-in-progress is determined based on direct processing costs including materials, labour and subcontracted services (e.g. fluorination, enrichment, production, etc).

In application of the concept of "loaded fuel" as defined in the decision of 21 March 2007, the cost of inventories for fuel loaded in the reactors but not yet irradiated includes expenses for spent fuel management and long-term radioactive waste management. The corresponding amounts are taken into account in the relevant provisions.

Nuclear fuel consumption is determined by component (natural uranium, fluorination, enrichment, fuel assembly production) as a proportion of the expected output when the fuel is loaded in the reactor. These quantities are valued at weighted average cost of inventories, applied to each component. Inventories are periodically corrected in view of forecast spent quantities, based on neutronic measurements and physical inventories.

### 1.8.2 Other operating inventories

Other operating inventories include:

- fossil fuels required for operation of fossil-fired power plants;
- operating materials and equipment such as spare parts supplied under a maintenance programme (excluding capitalised strategic safety spare parts);
- greenhouse gas emission rights and Energy Savings Certificates acquired for the generation cycle (see notes 1.19.1 and 1.19.2);
- gas stocks, valued at weighted average cost, including direct and indirect purchase costs, especially transport costs;
- capacities held under the capacity mechanisms (capacity guarantees in France) (see note 3.6).

Impairment of spare parts depends mainly on the turnover of these parts.

## 1.9 ACCOUNTS RECEIVABLE AND MARKETABLE SECURITIES

### 1.9.1 Trade receivables

Trade receivables are initially stated at nominal value.

They also include the value of unbilled receivables for energy already supplied.

A write-down is recorded when, based on the probability of recovery assessed according to the type of receivable, the recoverable amount of receivables falls below their book value. Depending on the nature of the receivable, the risk associated with doubtful receivables is assessed individually or by experience-based statistical methods. EDF does not bear the risks of non-payment for the delivery portion of these receivables, which is borne by Enedis.

### 1.9.2 Marketable securities

Marketable securities are initially recorded as assets at acquisition cost, and restated at the lower of historical cost or present value at year-end.

For listed securities, the present value is equal to the year-end stock market price. For unlisted securities, the market value is the probable trading value taking the Company's growth prospects into consideration.



Impairment is recorded to fully cover any unrealised losses, without netting against unrecorded unrealised gains.

Gains and losses on sales of marketable securities are valued using the FIFO (first in first out) method.

## 1.10 BOND ISSUANCE EXPENSES AND REDEMPTION PREMIUMS

Bond redemption premiums are amortised in equal portions prorated to the duration of the bond (straight-line method), regardless of the redemption pattern, applying the option allowed by Article 212–10 of the national chart of accounts.

Commissions and external costs paid by EDF upon issuance of borrowings and included in “Deferred charges” are spread on a straight-line basis over the term of the related instruments.

## 1.11 UNREALISED FOREIGN EXCHANGE GAINS AND LOSSES

Foreign currency receivables and payables are translated into euros at the year-end exchange rates. The resulting translation differences are recorded in the balance sheet under “Unrealised foreign exchange gains” and “Unrealised foreign exchange losses”. Provisions are recorded to cover all unrealised exchange losses on foreign currency borrowings not hedged for exchange risks. Unrealised gains are not recognised in the income statement.

Unrealised gains and losses on currency derivatives classified as hedging instruments are recorded in the balance sheet in the revaluation surplus accounts, and netted with the translation adjustment booked in respect of the hedged items, in application of regulation 2015-05 of 2 July 2015 on forward financial instruments and hedging operations.

As of 1 January 2017, foreign exchange gains and losses on trade receivables and payables are recorded in operating income and expenses.

## 1.12 TAX-REGULATED PROVISIONS

This item mainly includes excess depreciation recorded for tax purposes and relates to:

- ordinary depreciation of generation and distribution facilities;
- exceptional depreciation of software developed in-house by the Company;
- amortisation of acquisition expenses for new investments by the Company.

## 1.13 ADDITIONAL EQUITY

Perpetual subordinated bonds issued by EDF in euros and other currencies are recorded in compliance with the French Chartered accountants’ body *Ordre des experts comptables* opinion 28 of July 1994, taking their specific characteristics into consideration.

As a result, they are classified as additional equity, since redemption is exclusively controlled by EDF.

Issuance expenses and premiums are amortised through the income statement, on a pro rata basis.

Interest paid on these bonds is recorded in the financial result.

## 1.14 SPECIAL CONCESSION LIABILITIES

These liabilities relate mostly to public electricity distribution concessions for the Island Energy Systems (SEI), and hydropower concessions.

### 1.14.1 Special public electricity distribution concession liabilities – SEI

These liabilities represent the contractual obligations specific to the concession rules for public electricity distribution concessions, recognised in the liabilities as:

- rights in existing assets: these correspond to the grantor’s right to recover all assets for nil consideration. This right comprises the value in kind of the facilities - the net book value of assets operated under concession - less any as yet unamortised financing provided by the operator;
- rights in assets to be replaced: these correspond to the operator’s obligation to contribute to the financing of assets due for replacement. These non-financial liabilities comprise:
  - depreciation recorded on the portion of assets financed by the grantor,
  - the provision for renewal, exclusively for assets due for renewal before the end of the concession. This provision is included in provisions for expenses.

When assets are replaced, the provision and amortisation of the grantor’s financing recorded in respect of the replaced item are eliminated and transferred to the rights in existing assets, since they are considered as the grantor’s financing for the new asset. Any excess provision is taken to income.

During the concession, the grantor’s rights in assets to be replaced are thus transferred upon the asset’s renewal to become the grantor’s rights in existing assets, with no outflow of cash to the benefit of the grantor.

### 1.14.2 Special hydropower concession liabilities

These liabilities comprise:

- the value of assets remitted for nil consideration and contributions received;
- differences arising from revaluations in accordance with French legislation for fixed assets commissioned before 1 January 1959 and before 1 January 1977;
- additional depreciation to industrial depreciation for facilities that are to be returned for nil consideration at the end of the concession but whose useful life extends beyond the concession term.

Following the changes made to the accounting treatment of hydropower concessions at 1 January 2009, the 1959 revaluation reserve is transferred to equity when the assets concerned are retired.

The net revaluation reserve generated by the 1976 revaluation is taken to income over the residual useful life of the assets concerned.

The value of assets remitted for nil consideration and contributions received are transferred to the income statement over their useful lives.

## 1.15 PROVISIONS OTHER THAN EMPLOYEE BENEFIT PROVISIONS

EDF recognises provisions when it has a present obligation (legal or constructive) arising from a past event, an outflow of resources will probably be required to settle the obligation, and the obligation amount can be estimated reliably.

If it is anticipated that all or part of the expenses covered by a provision will be reimbursed, the reimbursement is recognised under receivables if and only if EDF is virtually certain of receiving it.

Provisions are determined based on the company’s expectation of the cost necessary to settle the obligation. Estimates are based on management data from the information system, assumptions adopted by the Company, and if necessary experience of similar transactions, or in some cases based on independent expert reports or contractor quotes. The various assumptions are reviewed for each closing of the accounts.

The expected costs are estimated based on year-end economic conditions and spread over a forecast disbursement schedule. They are then adjusted to euros of the year of payment through application of a forecast long-term inflation rate and discounted to present value using a nominal discount rate. The provisions are based on these discounted future cash flows.

The rate of inflation and the discount rate are based on the economic and regulatory parameters of France, considering the long operating cycle of EDF's assets and the maturities of commitments.

The discount effect generated at each closing to reflect the passage of time is recorded in financial expenses.

In extremely rare situations, a provision cannot be booked due to lack of a reliable estimate. In such cases, the obligation is mentioned in the notes as a contingent liability, unless there is little likelihood of an outflow of resources.

### 1.15.1 Provisions related to nuclear generation

These provisions mainly cover the following:

- back-end nuclear cycle expenses: provisions for spent fuel management, for waste removal and conditioning and long-term radioactive waste management;
- costs for decommissioning power plants and losses relating to fuel in the reactor when the reactor is shut down (provision for last cores).

Last core expenses correspond to the loss on fuel in the reactor that is not totally spent at the time of final reactor shutdown and cannot be reused due to technical and regulatory constraints, and the cost of fuel processing, and removal and storage of the resulting waste.

Changes in provisions resulting from a change in discount rates, a change in the disbursement schedule or a change in contractor quote are recorded:

- as an increase or decrease in the corresponding assets, up to the net book value, if the provision was initially covered by balance sheet assets (decommissioning of plants still in operation, long-term management of the radioactive waste resulting from such decommissioning, and last cores);
- in the income statement in all other cases.

Detailed information on the principles for determining provisions related to nuclear generation is given in note 28.

### 1.15.2 Other provisions

These provisions mainly cover:

- losses relating to multi-year agreements for the purchase or sale of energy:
  - losses on energy purchase agreements are measured by comparing the acquisition cost under the contractual terms with the forecast market price,
  - losses on energy sale agreements are measured by comparing the estimated income under the contractual terms with the cost of the energy to be supplied;
- losses on transportation, regasification, and gas storage contracts;
- unrealised foreign exchange losses;
- risks relating to subsidiaries and affiliates;
- tax risks;
- litigation;
- costs of decommissioning of fossil-fired and hydropower plants;
- costs of renewal of facilities operated under public electricity distribution concessions;
- provisions related to environmental schemes (see note 1.19).

In extremely rare cases, description of a specific litigation covered by a provision may be omitted from the notes to the financial statements if such disclosure could cause serious prejudice to the Company.

## 1.16 EMPLOYEE BENEFITS

In accordance with the statutory regulations for companies in France's electricity and gas sector (IEG), EDF's employees are entitled to post-employment benefits (pension plans, retirement indemnities, etc) and other long-term benefits (e.g. long-service awards).

### 1.16.1 Calculation and recognition of employee benefits

EDF has recognised post-employment benefits granted to personnel since 1 January 2005, applying the standard method defined in Article 324-1 of ANC regulation 2014-03 on the national chart of accounts.

Obligations under defined-benefit plans are calculated by the projected unit credit method, which determines the present value of entitlements earned by employees at year-end to post-employment benefits and long-term benefits, taking into consideration the prospects for wage increases and the country's specific economic conditions.

Post-employment benefit obligations are valued mainly using the following methods and assumptions:

- retirement age, determined on the basis of the applicable rules, and the requirements to qualify for a full pension;
- career-end salary levels, with reference to employee seniority, projected salary levels at the time of retirement based on the expected effects of career advancement, and estimated trends in pension levels;
- forecast numbers of pensioners, determined based on employee turnover rates and mortality data;
- reversion pensions where relevant, taking into account both the life expectancy of the employee and his/her spouse and the marriage rate for IEG sector employees;
- a discount rate that depends on the duration of the obligations, determined at the year-end date by reference to the market yield on high quality corporate bonds or the rate on government bonds whose duration is coherent with EDF's commitments to employees.

The amount of the provision takes into account the present value of the fund assets that cover these benefits, which is deducted from the benefit obligations.

Any actuarial gain or loss on post-employment benefit obligations in excess of 10% (the "corridor") of the obligations or fund assets, whichever is the highest, are recognised in the income statement progressively over the average residual working life of the Company's employees.

For other long-term benefits, actuarial gains and losses and the full past service cost are directly included in the provision, without application of the "corridor" rule.

The net expense booked during the year for employee benefit obligations includes:

- the current service cost, corresponding to additional benefit entitlements earned during the year;
- the net interest expense, corresponding to interest on obligations net of the return on fund assets;
- the income or expense corresponding to the actuarial gains and losses on long-term benefits and amortisation of actuarial gains or losses on post-employment benefits;
- the past service cost, including the income or expense related to amendments or settlements of benefit plans or introduction of new plans.

### 1.16.2 Post-employment benefit obligations

Since the financing reform for the IEG sector system took effect on 1 January 2005, the CNIEG (*Caisse nationale des IEG*, the sector's specific pension body) has managed not only the special IEG pension system, but also the industrial accident, invalidity and death insurance system for the sector.

The CNIEG is a social security body governed by private law, formed by the Law of 9 August 2004. It has legal entity status and reports to the French government, operating under the joint supervision of France's Ministers for the Budget, Social Security and Energy.

Under the funding arrangements introduced by the Law, EDF establishes pension provisions to cover entitlements not funded by France's standard systems (CNAV, AGIRC-ARRCO), to which the IEG system is affiliated, or by the CTA (*Contribution tarifaire d'acheminement*) levy on gas and electricity transmission and distribution services.

As a result of this funding mechanism, any change (whether favourable or unfavourable to employees) in the standard French pension system that is not passed on to the IEG pension system is likely to cause a variation in the amount of the provisions recorded by EDF to cover its obligations.

The benefits covered by pension provisions include:

- specific benefits of employees in the deregulated or competitive activities;
- specific benefits earned by employees from 1 January 2005 for the regulated activities (island public electricity distribution) (benefits earned before that date are financed by the CTA levy).

CNIEG management expenses payable by EDF for the administration and payment of retired employees' pensions are also included.

In addition to pensions, other benefits are granted to IEG status former employees (not currently in active service), as detailed below:

- benefits in kind (energy): Article 28 of the IEG national statutes entitles such employees and current employees to benefits in kind in the form of supplies of electricity or gas at preferential prices. The obligation for supplies of energy to employees of EDF and Engie corresponds to the probable present value of kWh to be supplied to beneficiaries or their dependants during their retirement, valued on the basis of the unit cost. It also includes the payment made under the energy exchange agreement with Engie;
- retirement gratuities: these are paid upon retirement to employees due to receive the statutory old-age pension, or to their dependants if the employee dies before reaching retirement. These obligations are almost totally covered by an insurance policy;
- bereavement benefit: this is paid out upon the death of an inactive or disabled employee, in order to provide financial assistance for the expenses incurred at such a time (Article 26-§5 of the National Statutes). It is paid to the deceased's principal dependants (statutory indemnity equal to three months' pension, subject to a ceiling) or to a third party that has paid funeral costs (discretionary indemnity equal to the costs incurred);
- bonus pre-retirement paid leave: all employees eligible to benefit immediately from the statutory old-age pension and aged at least 55 at their retirement date are entitled to 18 days of bonus paid leave during the last twelve months of their employment;
- other benefits include help with the cost of studies, time banking for pre-retirement leave, and pensions for personnel sent on secondment to companies not covered by the IEG system.

### 1.16.3 Other long-term benefit obligations

These benefits concern employees currently in service, and include:

- annuities following incapacity, invalidity, industrial accident or work-related illness. Like their counterparts in the general national system, IEG employees are entitled to financial support in the event of industrial accident or work-related illness, and invalidity and incapacity annuities and benefits. The obligation is measured as the probable present value of future benefits payable to current beneficiaries, including any possible reversions;
- long-service awards;
- specific benefits for employees who have been in contact with asbestos.

## 1.17 DERIVATIVES

EDF uses derivatives in order to minimise the impact of foreign exchange risks and interest rate risks.

These derivatives comprise interest rate and currency derivatives such as futures, forwards, swaps and options traded on the over-the-counter market.

The application at 1 January 2017 of regulation 2015-05 concerning forward financial instruments and hedging operations led to recognition of unrealised gains on the foreign exchange optimisation portfolio, and the unrealised gain or loss on currency derivatives classified as hedging instruments, in the balance sheet, in the revaluation surplus accounts created by the new regulation. These accounts are netted with the unrealised foreign exchange gains or losses booked in respect of the hedged items.

Hedging derivatives correct the foreign exchange result or interest income on the corresponding asset or liability. If the foreign exchange risk is fully hedged, no provision is recorded. If it is only partly hedged, a provision is recorded for the entire unhedged portion of the unrealised loss.

For other instruments, when there is no hedging relationship, a provision is recorded for unrealised losses and unrealised gains are not recognised.

Instruments in the portfolio at the year-end are included in off-balance sheet commitments at the nominal value of the contracts.

## 1.18 COMMODITY CONTRACTS

Forward financial instruments on commodities are traded for hedging purposes. Gains and losses on these operations are included in sales or in the cost of energy purchases, symmetrically to the hedged items, in accordance with regulation 2015-05 concerning forward financial instruments and hedging operations, which has been applicable since 1 January 2017.

Instruments in the portfolio at the year-end are included in off balance sheet commitments at the quantities to be delivered or to be received under the contracts.

## 1.19 ENVIRONMENT

### 1.19.1 Greenhouse gas emission rights

The system currently in force is described in note 40.1.

EDF applies the accounting methods for greenhouse gas emission rights in accordance with ANC regulation 2012-03 of 4 October 2012, incorporated into Articles 615-1 to 615-22 of ANC regulation 2014-03.

The accounting treatment of emission rights depends on the holding intention. There are two economic models, both of which coexist at EDF.

Emission rights held under the "Trading" model are included in inventories at acquisition cost. A write-down is recorded when the present value of emission rights is lower than the book value.

Emission rights held to comply with regulatory requirements on greenhouse gas emissions (the "Generation" model) are included in inventories at acquisition cost, and the FIFO (first in first out) method is applied. A write-down is recorded when the generation cost of the electricity that includes the cost of the rights is higher than the present value of that electricity. At year-end, a "net presentation" principle is applied as follows:

- an asset is recognised (in inventories) if the quantities of greenhouse gas emissions are lower than the number of emission rights held in the portfolio. This corresponds to the rights available to cover future greenhouse gas emissions;
- a liability (provision) is recorded in the opposite situation equivalent to the rights still needed to cover emissions already produced, valued at contractualised acquisition price for forward purchases deliverable before surrender, and at market value for the balance.

The net reporting principle assumes that the emission rights held in the portfolio will be the rights used to offset emissions produced. However, there is a limit to the fungibility of rights at EDF, as there are no transfers of rights between the island and mainland activities. This can lead to concurrent recognition of an asset and a liability.

### 1.19.2 Energy savings certificates

The system currently in force is described in note 40.2.

EDF accounts for energy savings certificates in compliance with Articles 616–1 to 616-25 of ANC regulation 2014-03 on the national chart of accounts.

EDF holds energy savings certificates in order to meet the requirements of the regulations on energy savings. Consequently, EDF applies the "Energy Savings" model defined by the ANC regulation.

Certificates obtained or receivable are recorded in inventories at production or acquisition cost, and are valued under the FIFO (first in first out) method.

At the year-end, only the net position is presented in the financial statements:

- an asset is recognised (in inventories) if the energy savings achieved are greater than the energy savings obligations. This inventory corresponds to the certificates purchased, obtained or receivable that cover future energy savings obligations. It is consumed as and when energy sales are completed that generate energy savings obligations; or
- a liability (provision) is recognised if the energy savings achieved are lower than the energy savings obligations. The liability corresponds to the cost of action yet to be taken to cover the obligations associated with energy sales completed. It is subsequently extinguished by making energy savings expenditures that enable the company to obtain certificates, or by purchasing certificates.

## NOTE 2 SIGNIFICANT EVENTS AND TRANSACTIONS

### 2.1 COMPLETION OF THE SALE OF EDF'S STAKE IN DUNKERQUE LNG

Following a competitive auction process launched in early 2018, the EDF group announced on 29 June 2018 that it had entered into exclusive negotiations with two groups of investors for the disposal of its 65.01% interest in the share capital of Dunkerque LNG, owner and operator of the liquefied natural gas (LNG) terminal in Dunkirk.

The EDF group's 65.01% investment in Dunkerque LNG is held through the subsidiary EDEV which is fully-owned by EDF SA.

A consortium composed of Fluxys, AXA Investment Managers – Real Assets, on behalf of its clients, and Crédit Agricole Assurances undertook to acquire a stake of 31%, and a consortium of Korean investors, led by IPM Group (comprised of InfraPartners Management Korea Co. Ltd. in Seoul and InfraPartners Management LLP in London) in collaboration with Samsung Asset Management Co., Ltd and consisting of Samsung Securities Co. Ltd., IBK Securities Co. Ltd. and Hanwha Investment & Securities Co. Ltd., acquired a stake of 34.01%.

Based on the prices paid by the two consortia, the average enterprise value for 100% of Dunkerque LNG amounted to €2.4 billion.

This transaction allowed Fluxys, already a 25% shareholder of Dunkerque LNG, to take control of and consolidate Dunkerque LNG with the support of Axa Investment Managers – Real Assets and Crédit Agricole Assurances.

EDF, as a customer of Dunkerque LNG, is still committed in the long term to the terminal, which will continue serving the Group's gas strategy.

The EDF group signed binding agreements for this sale with the same consortia on 12 July 2018.

Once the required regulatory approvals had been given, the EDF group, via its subsidiary EDEV (which held 65.01% of Dunkerque LNG) completed the sale of its stake in the Dunkerque LNG terminal on 30 October 2018.

After completion of the operation, EDF SA received a dividend of €740 million from its subsidiary EDEV (see note 13).

Following this sale, valuation of the long-term agreement between EDF and Dunkerque LNG for reservation of LNG regasification capacities led EDF to recognise a €737 million increase in provisions for onerous contracts (see note 27).

### 2.2 SENIOR BOND ISSUES: EDF RAISES \$3.75 BILLION AND €1 BILLION

On 19 September 2018, EDF raised US\$3.75 billion through 3 senior bond issues:

- a \$1.8 billion bond, with 10-year maturity and a 4.500% fixed coupon;
- a \$650 million bond, with 20-year maturity and a 4.875% fixed coupon;
- a \$1.3 billion bond, with 30-year maturity and a 5.000% fixed coupon.

In addition, on 25 September 2018 EDF launched a €1 billion senior note offering, with 12-year maturity and a 2% fixed coupon.

These transactions enable EDF to further strengthen the structure of its balance sheet, and to refinance upcoming financial obligations.

### 2.3 ISSUANCE OF PERPETUAL SUBORDINATED BONDS

On 25 September 2018, EDF successfully launched a €1.25 billion "reset perpetual 6 year non-call hybrid note" with a 4% coupon and a first redemption at EDF's call between 4 July 2024 and 4 October 2024 inclusive. The French market regulator issued approval no. 18-466 dated 2 October 2018 for the prospectus concerning these instruments, for which settlement and delivery took place on 4 October 2018.

EDF remains committed to using hybrid bonds as a permanent part of its capital structure, to fund assets under construction.

### 2.4 REDEMPTION OF CERTAIN SERIES OF HYBRID BONDS

On 25 September 2018 EDF issued a cash tender offer for redemption of four outstanding series of hybrid bonds.

Following the end of the tender offer period on 3 October 2018, EDF proceeded to the cash redemption of bonds validly tendered from the first two hybrid issues, in order of priority, for an amount of €1.25 billion.

The total value of EDF's hybrid bonds remains unchanged as a result of the above hybrid bond issue and redemption transactions.

The results of the tender offer are summarised in the table below:

Targeted hybrid bonds	ISIN	Acceptance Priority Levels	Tendered Amounts	Tendered Amounts (as % of outstanding)	Acceptance Amounts	Pro-Rating Factors	Tender Prices
2020 bonds	FR0011401736	1	€911,800,000	73%	€911,800,000	100.00%	105.255%
2022 bonds	FR0011697010	2	€635,100,000	64%	€338,200,000	59.50%	108.185%
2026 bonds	FR0011401728	3	N/A	N/A	0	N/A	N/A
2025 bonds	FR0011401751	4	N/A	N/A	0	N/A	N/A

The settlement of the tender offer took place on 5 October 2018.

## 2.5 SYNDICATION OF AN INNOVATIVE ESG-INDEXED REVOLVING CREDIT FACILITY

On 14 December 2018 EDF completed the syndication of a €4 billion revolving credit facility, the cost of which is indexed on three of the Group's key performance indicators (KPIs) for environmental, social and governance (ESG) matters: EDF's direct CO<sub>2</sub> emissions, EDF's customers' use of its online consumption monitoring tools (as an indicator of EDF's success in getting French residential customers actively engaged with their consumption), and the electrification of EDF's vehicle fleet.

This ESG-indexed credit facility, which involves a syndicate of more than 20 banks, amends EDF's existing €4 billion revolving credit facility, extending it to a new maturity in 2023. It complements the set of sustainable financing tools that EDF has been developing over the last few years, particularly in the Green Bond market.

## 2.6 CONFIRMATION OF THE EUROPEAN COMMISSION DECISION ON THE TAX TREATMENT OF PROVISIONS ESTABLISHED BETWEEN 1987 AND 1996 FOR RENEWAL OF GENERAL NETWORK FACILITIES

On 16 January 2018, the General Court of the European Union rejected EDF's appeal against the European Commission's decision of 22 July 2015 classifying the tax treatment of provisions established between 1987 and 1996 for renewal of General Network facilities as state aid, and ordering that it be recovered by the French State. Following that decision by the Commission, on 13 October 2015 EDF had repaid €1.383 billion, corresponding to the amount of state aid including interest. Enedis and RTE contributed their respective shares.

In its ruling, the General Court upheld the European Commission's decision of 22 July 2015. In view of the repayment made on 13 October 2015, the execution of this ruling did not entail any additional payment.

On 27 March 2018, EDF submitted an appeal to the Court of Justice of the European Union against the General Court's ruling of 16 January 2018. On 13 December 2018 the Court rejected this appeal, confirming the European Commission's decision. This litigation is now definitively closed.

## 2.7 FLAMANVILLE 3 EPR PROJECT

Major milestones were reached during 2018:

- completion of cold functional testing, consisting of a large number of test operations including the leak performance test on the primary system at a pressure greater than 240 bar – higher than the pressure of this system once in operation;
- successful testing of the reactor containment building in April 2018. This is an in-air test that checks the concrete structure's mechanical behaviour and airtightness by raising pressure inside the building to six times the outside air pressure;
- integration of an instrumentation and control (I&C) configuration involving around 250 modifications, completed in early September 2018, so that hot functional testing can take place in a stable, coherent I&C configuration.

## Equipment manufacturing and quality

At 31 December 2018, almost all the equipment for the nuclear section and the conventional island, had been delivered and assembled on site. The situation as regards the quality of equipment manufactured by Framatome for the primary system is described in the following paragraphs.

### Vessel

The issue of the higher-than expected carbon content in the vessel head and bottom was examined by the French Nuclear Safety Authority ASN (*Agence de sécurité nucléaire*) during the first half of 2017 on the basis of documentation submitted by Framatome under the supervision of EDF. Based on the opinion of a group of ASN-appointed experts, the ASN issued an opinion on 11 October 2017 concluding that the mechanical properties of the vessel head and bottom headwere adequate for their uses, including in the event of an accident.

On 9 October 2018, the ASN authorised:

- the commissioning of the vessel bottom, subject to functional checks;
- the commissioning of the vessel head, for a limited operating life until 2024 unless the technical feasibility of checks comparable to the vessel bottom checks can be demonstrated.

EDF is currently working on development of in-service vessel head checks, in order to go back to the ASN later in 2019 for permission to retain the current vessel head if such checks are industrially feasible. If permission is not given, EDF could remain liable for some or all of the costs incurred to manufacture a replacement vessel head. These costs are not included in the target construction cost, since if they arise they would do so after the plant's commissioning. EDF SA has initiated arbitration proceedings against AREVA SA on this matter.

### Break preclusion and quality deviations in the welds of the main secondary system

On 30 November 2017, EDF declared a significant event to the ASN regarding the detection of a quality deviation in the welding of the secondary system that conducts the steam from the steam generators to the turbine of the Flamanville 3 EPR.

This system (main steam lines) was designed and manufactured according to the "break preclusion" concept, with stricter requirements for design, manufacture and in-service monitoring. These stricter requirements, requested by EDF, are backed up by a "high quality" requirement for the building of these systems.

Although these requirements were applied during the design phase, they were not properly incorporated into the welding work. Failure to meet these requirements does not necessarily entail non-compliance with the nuclear pressure equipment regulations.

From 21 March 2018, during an initial comprehensive inspection, EDF detected other quality deviations in welds on the pipes in the main secondary system of the Flamanville 3 EPR. The initial comprehensive inspection is a mandatory by law before commissioning plant, and mainly involves examination of the welds on the primary and secondary systems. It gives rise to an initial benchmark report on the state of plant before it begins operation.

In accordance with industrial procedures, the welds had been checked by the consortium of contractors in charge of manufacturing the system and each one had been declared compliant as the work was done.

On 10 April 2018 (see EDF's press release of the same date), EDF notified the ASN of a significant event relating to the detection of deviations in the performance checks on these welds (part of the main secondary system was already concerned by the insufficient application of the "break preclusion" requirements).



EDF therefore began a further inspection during the second quarter of 2018 of all 150 welds concerned in the main secondary system. Of these 150 welds:

- 87 welds were compliant with requirements;
- 33 welds had quality deficiencies and had to be repaired. The work on site to repair these welds began in late July 2018;
- EDF also decided to rework a further 20 welds which, although they had no defects, did not meet the break preclusion requirements defined by EDF during the EPR design phase. The files for adjustments to the first welds was sent to the ASN, and on-site welding work began in November 2018;
- for 10 other welds, EDF submitted a proposal to the ASN detailing a specific justification method to confirm the high level of safety at the plant throughout its operating life. After a final analysis this number was reduced to 8. It also became clear from checks that one of these eight welds had a small quality defect. The ASN will closely examine EDF's specific justification method in the next few months.

### Commissioning schedule and construction costs

On 25 July 2018 (see EDF's press release of the same date), the Group presented an update concerning these inspections, and adjusted the Flamanville EPR schedule and target construction costs.

- the target date for loading the nuclear fuel was scheduled for the end of the fourth quarter of 2019, with start-up and hot functional testing planned for late 2018;
- the target construction costs were revised from €10.5 billion to €10.9 billion (in 2015 euros, excluding borrowing costs).

On 21 January 2019 (see EDF's press release of the same date) EDF announced that the schedule for hot functional testing had been revised, and it is now expected to commence during the second half of February 2019.

The schedule and estimated construction costs remain tight. They include a timetable for receiving authorisations from the ASN as explained above, which among other factors is contingent on the ASN completing its examination of the methods proposed by EDF for repairing the welds in the main secondary system, as stated in the Group's press release of 31 January 2019.

On 29 January 2019 the Chairman of the ASN announced that the ASN will issue a statement in May 2019 concerning the validation programme for the welds in the main secondary system, saying "if it turns out that the eight welds in the reactor containment building structure also need reworking then it will not be possible to meet the deadline". A detailed update on progress on the Flamanville EPR, particularly the schedule and construction cost, will be issued after the ASN's statement has been published. EDF is not currently in a position to assess the impact in the event the ASN does not validate the proposed approach.

## 2.8 ACQUISITION OF 75.5% OF FRAMATOME

On 22 December 2017 AREVA SA, AREVA NP and EDF completed the sale to EDF of an interest conferring exclusive control over New NP (renamed Framatome since January 2018), a 100% subsidiary of AREVA NP.

EDF's acquisition of 75.5% of Framatome's capital was based on an adjusted valuation of €2.47 billion (for 100% of the capital), with no transfer of financial debt. This price was equivalent to a forecast 2017 EBITDA multiple of 8x<sup>(1)</sup>.

The purchase price at 31 December 2018 is set at €2.6 billion (for 100% of the capital). This is €94 million more, including EDF's acquisition expenses (for 75.5% of the capital) than the initial estimation (see note 18–1<sup>(1)</sup>), due to:

- price adjustments based on the final accounts at the completion date of the transaction (31 December 2017);
- estimated earn-out payments, some of them contingent on achievement of performance targets measured after completion of the purchase: the final amount of up to €245 million should be established during 2019;
- estimation of certain guarantees granted to EDF by AREVA NP in the sale agreement of 22 December 2017.

On 3 February 2018, Teollisuuden Voima (TVO) filed an appeal before the General Court of the European Union against the European Commission's decision of 29 May 2017 that authorised EDF's purchase of Framatome under antitrust regulations. TVO later withdrew its appeal and the Court announcement of 16 May 2018 removing the case from its register was made public at the end of May.

6.

(1) Normalised pro forma EBITDA for the activities acquired, excluding large projects.

## **NOTE 3 REGULATORY CHANGES IN FRANCE**

### **3.1 FRANCE'S MULTI-YEAR ENERGY PROGRAMME (PPE)**

On 25 January 2019, France's Ministry for the Ecological and Inclusive Transition issued the draft PPE, the oversight tool for the energy policy introduced by the French law on the energy transition for green growth adopted in 2015. In principle, the PPE covers two successive five-year periods. The first PPE published in October 2016 departed from this rule by setting out two successive periods of three and five years respectively, 2016-2018 and 2019-2023. The revised PPE, which is not yet finalised, will cover the periods 2019-2023 and 2024-2028. This draft PPE follows the Ministry's press release of 27 November 2018 presenting the government's targets for the multi-year energy programme and the national low-carbon strategy.

For nuclear electricity generation, the French government has now set the deadline of 2035 for reaching the objective of a 50% nuclear share in the national electricity mix. This objective will consequently be modified in the Energy Code. To achieve it, 14 nuclear reactors would have to be shut down by 2035, including the closure of the two reactors at Fessenheim "by spring 2020, in application of the cap on installed electronuclear power, so that the Flamanville EPR can be put into operation".

The schedule for these shutdowns would be aligned with the timing of the fifth 10-year inspections of the reactors concerned, except for 2 reactors scheduled for closure during the second period of the PPE, in 2027 and 2028, provided the criterion of secure supply is respected. If certain conditions relating to electricity prices and European electricity market trends are fulfilled, two additional reactors could also be shut down in 2025-2026 by a decision to be made in 2023.

The final version of the PPE will name the priority sites for these reactor shutdowns. All of the closures would be associated with State support for the regions concerned, mainly through an ecological transition contract to foster new local development dynamics.

The draft PPE is currently undergoing a consultation process before it can be adopted and translated into laws or regulations in 2019.

If the measures described above are confirmed in the final laws and regulations, the principal consequence of their adoption for EDF's financial statements will be recognition of the change in the expected shutdown date of two nuclear reactors to 2027 and 2028, ahead of their fifth 10-year inspection: this will have an impact on the value of nuclear provisions at the time of the change of estimate, and prospective modification of the depreciation period for the two units concerned. As this situation would bring forward the shutdown of two reactors in the fleet by a few years, the various scenarios examined indicate that the potential effect on nuclear provisions, particularly the decommissioning provision, could be an increase of some tens of millions of euros, via an adjustment to the relevant balance sheet assets.

The French government is to propose the terms of a new system of regulations for existing nuclear plants that will protect consumers against rising market prices after 2025 by allowing them to benefit from the competitive advantage of investments made in the historical nuclear power plant fleet, while giving EDF the financial capacity to ensure economic sustainability of generation facilities and meet the requirements of the PPE in low-price scenarios.

The draft PPE also states that "the Government, together with the industry, will conduct a programme of work by mid-2021 to examine the questions of the cost of new nuclear energy production and its advantages and disadvantages in relation to other low-carbon generation methods, the possible financing models, the project management modalities for new reactor projects and public consultation, and matters relating to the management of waste generated by the potential new nuclear fleet. Based on this information and depending on developments in the energy situation, the Government will make a decision regarding the suitability of launching a renewal programme for nuclear installations".

For fossil-fired electricity generation, under the draft PPE the last coal-fired plants would be closed down by 2022, and no further authorisations would be issued for new electricity plants that use fossil fuels.

If these measures are confirmed in the final laws and regulations, the principal consequence of their adoption for EDF's financial statements will be recognition of the prospective modification of the depreciation period for the coal-fired plants operated by EDF in France, at Le Havre and Cordemais (an increase of some €200 million in the annual depreciation expense over the period 2019-2022). EDF is, however, examining the possibilities of converting these plants to biomass plants. At the end of a meeting held on 24 January 2019, EDF and the Ministry for the Ecological and Inclusive Transition approved a programme of work leading up to a decision on the Ecocombust project.

As announced in EDF's press release of 29 January 2019, between now and autumn 2019, this programme of work should help validate the technical trials, environmental impact studies and economic model for this conversion project. After that period, if the technical, economic and environmental conclusions are satisfactory, once discussions have been held with the Government and local communities, EDF will embark on the industrialisation stage, aiming to start producing the fuel in 2022. The Ecocombust project concerns the production of an innovative, ecological fuel that can be used to run heating or electricity generation facilities that currently run on coal. To ensure secure electricity supplies in the north-west quarter of France, especially Brittany, some or all of the biomass produced could be used to provide 80% of the fuel for current reactors until 2026 if the studies by RTE commissioned by the government confirm the need, to ensure the electricity network in the west of France is secure at the highest peak consumption times.

The draft PPE also sets the objective of a significant step-up in the pace of development of renewable energies.

### **3.2 REGULATED ELECTRICITY SALES TARIFFS IN FRANCE – "BLUE" TARIFFS**

#### **Council of State decision of 18 May 2018**

Legal challenges against the tariff decisions of 2016 and 2017 were brought before France's Council of State by Anode (the national association of retail energy operators) and Engie, on the grounds that the "blue" regulated electricity sales tariffs for residential and non-residential customers were contrary to European Union law.

Ruling on these challenges, by decisions of 18 May and 3 October 2018 the Council of State validated the principle of regulated electricity sales tariffs, notably acknowledging that they serve the public economic interest objective of guaranteeing consumers an electricity price that is more stable than market prices. The Council of State confirmed that this objective cannot be achieved by softer State intervention and that regulation of sales tariffs, which guarantees electricity firms equal access to consumers, is not discriminatory.

However, the Council of State considered that the tariff regulation is disproportionate in its duration, which is permanent, and its scope of application, which currently covers large business sites with subscribed power levels below 36kVA. These facts were cited as justification for partial cancellation of the tariff decisions of 28 July 2016 and 27 July 2017.

Implementation of these decisions is the responsibility of the lawmaker, which is currently preparing the necessary legislative measures through France's future "Pacte Law" for business growth.

#### **Tariff changes**

Since 8 December 2015, in accordance with the NOME Law on organisation of the French electricity market (Articles L. 337-4 and L. 337-13 of the French Energy Code), the French Energy Regulatory Commission (*Commission de régulation de l'énergie* or CRE) has been responsible for sending the Ministers for the Economy and Energy its reasoned proposals for regulated sales tariffs for electricity. If no objections are made within three months, the proposals are deemed to have been approved.

For the tariff changes of 2018, the CRE, in accordance with the NOME Law, issued a decision on 11 January 2018 proposing that the Government should raise the “blue” regulated tariffs for residential customers by +0.7% and for non-residential customers by +1.6%. This proposal was confirmed by a tariff decision of 31 January 2018 published in the *Journal officiel* of 1 February 2018, and implemented at that date.

The tariff change of summer 2018 followed the same process. Considering the TURPE adjustment of 1 August 2018 and in application of the French Energy Code, in a decision of 12 July 2018 the CRE proposed a -0.5% reduction in the “blue” regulated tariffs for residential customers and a +1.1% increase in the “blue” tariffs for non-residential customers.

The same CRE decision, citing the Council of State’s decision of 18 May 2018, included the phasing out of “blue” tariffs for non-residential customers for all large business sites, suggesting a definition for determining the scope of large businesses based on “decree 2008-1354 of 18 December 2008 on the criteria that will determine the category to which a business belongs for the purposes of economic and statistical analysis”.

All items of the CRE’s proposal were approved in a tariff decision of 27 July 2018, published in the *Journal officiel* of 31 July 2018 and implemented on 1 August 2018.

In a decision of 7 February 2019 published on 12 February 2019, the CRE proposed an increase of 7.7% (excluding taxes) in the “blue” regulated tariffs for residential customers and non-residential customers. The date of application is as yet unknown. The government has three months to make an objection to this decision.

### 3.3 SUPPLIER COMMISSIONING

After Law 2017-1839 of 30 December 2017 confirmed the CRE’s competence for supplier commissioning, the CRE issued a new decision on 18 January 2018, published in the *Journal Officiel* of 25 January 2018. This decision reiterated the principles adopted in its previous decision of 26 October 2017 regarding remuneration payable by distribution network operators to suppliers for their management of customers under a single contract.

The content of these decisions upholds the principle of identical commissions for all suppliers selling single-contract market-price offers. Only regulated electricity tariffs will give rise to slightly lower commissions (€4.50 instead of €6.80 per point of delivery until 1 August 2019), and this difference will be progressively reduced to zero by 1 August 2022.

For remuneration of past customer management charges (prior to 1 January 2018), the CRE’s decision sets an amount it considers as a cap that can be passed on through the TURPE tariff.

However, Law 2017-1839 of 30 December 2017 introduced a measure intended to rule out the possibility of suppliers receiving remuneration from network operators for past customer management services.

### 3.4 ELECTRICITY EQUALISATION FUND

On 22 March 2018, the CRE published its consultation on the levels of contribution due to the Electricity Equalisation Fund for EDF SEI and Électricité de Mayotte for the years 2018 to 2021. The annual average contribution to the Electricity Equalisation Fund for EDF SEI over this period, including the planned smart metering system, is €185 million.

## 3.5 COMPENSATION FOR PUBLIC ENERGY SERVICE CHARGES (CSPE)

### Legal and regulatory framework

The compensation mechanism for public energy service charges (*compensation des charges de service public de l’énergie*) results from a reform introduced by France’s amended finance law for 2015, published in the *Journal Officiel* on 30 December 2015. Under the legislative and regulatory framework, the public energy service charges (electricity and gas) were to be compensated via two State budget items included in France’s finance laws from 2016 onwards. The initial finance law for 2019 marks a continuation from 2018, defining the following charges for 2019:

- a special “Energy Transition” budget item of €7.3 billion, principally to compensate for the additional costs associated with all contracts obliging the operators to purchase renewable energies and biogas and the annual contribution to repayment of the accumulated shortfall in compensation due to EDF;
- a “Public Energy Service” item of €3.3 billion in the general budget to cover solidarity charges borne by gas and electricity suppliers, costs associated with purchase obligations excluding renewable energies (essentially cogeneration), and the cost of applying the standard national tariffs to zones that are not connected to France’s mainland network. The interest on the accumulated shortfall to be repaid to EDF is also funded through the general budget.

Since 1 January 2018, the “basic necessity” (*Tarif de première nécessité*) rates for electricity and the “special solidarity” (*Tarifs spéciaux de solidarité*) rates for gas have been replaced by an energy voucher system. The cost of this system is not borne by EDF, but has been budgeted by the State in the “Public Energy Service” programme. However, EDF will bear solidarity charges in 2019 for the national housing solidarity fund and services for vulnerable customers.

In 2019, this mechanism of compensation for public service charges is funded as follows:

- the costs linked to the energy transition, which correspond to the subsidy mechanisms for renewable energies, and the reimbursement of the past accumulated shortfall in compensation borne by EDF as measured at 31 December 2015, are registered in a special “energy transition” budget item created by the amended finance law for 2015. Law no. 2016-1917 of 29 December 2016 (the finance law for 2017) stipulated that the two sources of additional funding for this special budget item would be a portion of the domestic tax on coal, lignite and coke (TICC), and a portion of the domestic tax on energy products (TICPE). The finance law for 2019 replaces the percentages of the TICC and TICPE by a set amount, to avoid the uncertainties of forecast income from these taxes, and broadens the sources of funding for the “Energy transition” budget item by including the proceeds of auctions of Guarantees of Origin as allowed by Article L. 314-14-1 of the Energy Code;
- other public service charges – excluding costs associated with the subsidy mechanisms for renewable energies (fuel poverty, tariff equalisation in zones that are not connected to France’s mainland network, cogeneration, the budget for the energy ombudsman, etc.) are registered directly in the general budget;
- income generated by the domestic tax on the final consumption of electricity, now renamed the Contribution to Public Electricity Service (*Contribution au service public de l’électricité* – CSPE) goes directly into the general budget. The CSPE tax is collected directly from final consumers of electricity in the form of an additional levy on the electricity sale price (and collected from electricity suppliers), or directly from electricity producers that produce electricity for their own uses;
- the level of the CSPE tax is the same in 2019 as in 2018 with the full rate set at €22.5/MWh, and eight reduced rates ranging from €12/MWh to €0.5/MWh depending on criteria of electro-intensiveness, business category and the risk of carbon leakage from installations (the risk of industries relocating to countries where greenhouse gas emissions are higher due to their electricity mix).

The costs associated with conclusion and management of purchase obligation contracts will be eligible for compensation in 2019, as they have been since 2017. This concerns an annual amount of around €45 million.

In addition to these measures, the amended French finance law for 2018 applied a downward adjustment to the amounts of compensation paid by the State for public service charges in 2018: these charges had decreased substantially due to a rise in 2018 electricity market prices between the initial forecast of July 2017 and the adjusted forecast of July 2018, and that decrease automatically narrowed the differential between the purchase obligation tariff payable to producers and the market price for electricity. For the same reason, in 2018 the State also lowered 2018 compensation for the difference between 2017 expenses as reforecast in July 2017 and actual 2017 expenses as determined in July 2018.

### Public service charges borne by EDF

The amount of expenses (excluding the annual contribution to repayment and associated interest) to be compensated to EDF for 2018 is €6,554 million.

The amounts received in the year 2018 (excluding the annual contribution to repayment and associated interest) totalled €6,919 million (including €4,610 million for the dedicated "energy transition" budget account and €2,309 million for the general budget).

A repayment schedule for EDF's receivable corresponding to the accumulated shortfall in compensation, which amounted to €5,780 million at 31 December 2015, was set out in the ministerial decision of 13 May 2016, amended on 2 December 2016. Under this schedule the receivable will be fully repaid by 2020. On 22 December 2016, EDF securitised a portion of this receivable (€1.5 billion) through a State-approved "Daily law" assignment to two groups of assignees. Consequently, since 1 January 2017, EDF has received 73.6% of payments made by the State in reimbursement of the receivable as set out in the repayment schedule. The remainder is paid directly to the assignees.

During 2018, the State paid EDF €1,217 million of the principal amount of the financial receivable, comprising €1,194 million relating to the 2018 repayment schedule and €23 million, paid on 2 January 2018, relating to the 2017 repayment schedule. The €1,194 million received corresponds to the amount due for 2018 under the repayment schedule. At 31 December 2018, EDF's share of the outstanding financial receivable amounted to €2,014 million.

Finally, in accordance with decree 2016-158 of 18 February 2016 concerning compensation for public energy service charges, on 12 July 2018 the CRE published its decision 2018-156 recording the public service charges for 2017 (€6,475 million) and providing a revised forecast of charges for 2018 (€6,940 million) and a forecast of charges for 2019 (€7,206 million).

## 3.6 CAPACITY MECHANISM

The French capacity mechanism took effect on 1 January 2017. It was introduced by France's Energy Code to ensure secure national power supplies.

On 8 November 2016, the European Commission authorised France's proposed capacity mechanism subject to the country introducing 7-year certification contracts for new capacities, admitting foreign capacities, and taking measures to prevent any market manipulation.

Several auctions of capacity for 2018 were held on the European Power Exchange EPEX SPOT in 2017 and 2018. The volumes traded amounted to 10.96GW in November 2017 for the price of €9.31/kW, 10.25GW in December 2017 for the price of €9.38/kW and 1.17GW in April 2018 for the price of €9.38/kW (the market reference price for 2018 was €9.34/kW).

Several auctions of capacity for 2019 were held on the European Power Exchange EPEX SPOT in 2017 and 2018. The volumes traded and the associated prices were as follows:

Auction date	Quantities (GW)	Price (€/kW)
December 2017	1.22	13.00
March 2018	1.24	18.50
April 2018	2.65	18.24
June 2018	4.99	18.50
September 2018	5.22	18.50
October 2018	5.48	16.77
December 2018	5.91	18.05

Following the auction of 13 December 2018, the last before the year of delivery, the reference price for 2019 is now known: it is €17.37/kW.

An over-the-counter market exists alongside these capacity auctions.

EDF has participated in these auctions since they began. All income from the auctions is recognised in full in sales of goods.

The capacity price is passed on through all EDF's customer contracts, whether the customers are on regulated sales tariff or market-price contracts, and also through other electricity suppliers' contracts.

## 3.7 ENERGY SAVINGS CERTIFICATES

Decree 2017-690 of 2 May 2017 issued by the French Ministry for the Environment, Energy and the Sea, published in the *Journal officiel* on 3 May 2017, set the obligation levels for the fourth period of energy savings obligations running from 1 January 2018 to 31 December 2020. The overall level of obligations for this three-year period was substantially increased by the decree: 1,200TWhc for the "standard" obligations and 400TWhc for the obligations that are intended to benefit households in situations of energy poverty, compared to 700TWhc and 150TWhc respectively for the previous period.

Energy sellers may fulfil their obligation in three ways: by supporting consumers in their energy efficiency operations, funding ministry-approved energy savings certificate schemes, and purchasing certificates from eligible actors. Any surplus "stock" of certificates gained in the previous period also counts towards fulfilment of the obligation. If there is a shortfall at the end of the period, obligated actors must pay the Treasury the fine of €15 per MWhc of shortfall laid down in Article L221-4 of the Energy Code, approximately twice the current cost of the standard obligation.

EDF achieved a substantially higher number of energy savings certificates in 2018 than in 2017, and will aim to increase it further in order to achieve the objective set by the State. However, given the significant increase in the level of the obligation, combined with the currently shallow market for energy savings certificates and doubts over that market's future liquidity, EDF is exposed to a risk of a shortfall in certificates for the fourth period of the scheme.

### **3.8 ARENH**

ARENH applications for 2018 deliveries totalled €96.3TWh: 87.1TWh for supplies to final customers and 9.2TWh to compensate network operators for network losses.

These applications were made at a time when the ARENH price (which includes a capacity guarantee in its €42/MWh) was competitive in comparison to forward baseload prices for 2018 (from early September 2017).

For the ARENH applications of November 2018, total demand from alternative suppliers was above the legal maximum, at 132.98TWh excluding EDF subsidiaries, and EDF will deliver the maximum ARENH volume of 100TWh for supply to competitors' final customers in 2019. Subscriptions to cover network losses amounted to 20.4TWh.

In a decision no. 2018-222 of 25 October 2018, as required by the Energy Code the CRE set out the method for allocating ARENH volumes when applications exceed the legal maximum. This decision stipulated that if the ARENH was oversubscribed in November 2018, curtailment would only apply to new ARENH applications made in that session, and that EDF-controlled subsidiaries' excess applications would be fully curtailed (this does not apply to distributors). Finally, it stated that EDF-controlled subsidiaries could enter into contracts with the parent company replicating the ARENH system and the terms of supply, particularly the curtailment rate for alternative suppliers. This curtailment mechanism, when applied, makes reference to market prices more influential in determining regulated sales tariffs, and all other things being equal, also increases the price of the energy component.

## INCOME STATEMENT

### NOTE 4 SALES

Sales are comprised of:

<i>(in millions of euros)</i>	2018	2017
Sales of energy <sup>(1)</sup>	42,630	40,131
Sales of goods and services	2,244	2,240
<b>SALES</b>	<b>44,874</b>	<b>42,371</b>

(1) Including a share of delivery costs for sales of electricity and gas.

The rise in sales in 2018 mainly reflects higher sales on the markets, resulting from a marked increase in nuclear generation in 2018 (+14.1TWh) compared to 2017, which was adversely affected by several reactor outages, and the increase in hydropower generation (+9.2TWh net). It is also explained by a positive change in

resales of purchase obligations due to a substantial volume effect, favourable price effects on market-price offers, and the higher energy savings certificate component of offers, in line with the increase in the obligation cost.

### NOTE 5 OPERATING SUBSIDIES

<i>(in millions of euros)</i>	2018	2017
<b>OPERATING SUBSIDIES</b>	<b>6,566</b>	<b>6,558</b>

Operating subsidies mainly comprise the subsidy received or receivable by EDF in respect of the Compensation for Public Energy Service Charges (CSPE). In the financial statements, this compensation is reflected in income of €6,554 million for 2018 (€6,547 million for 2017). This stability is mainly explained by the higher subsidy for purchase obligations, due to a rise in purchase volumes for photovoltaic and wind

power, counterbalanced by higher market prices for electricity. Another factor is the impact of discontinuation of the "basic necessity" (*Tarif de première nécessité*) rates for electricity and the "special solidarity" (*Tarifs spéciaux de solidarité*) rates for gas: these have been replaced by an energy voucher system whose cost is not borne by EDF.

### NOTE 6 REVERSALS OF PROVISIONS AND IMPAIRMENT

<i>(in millions of euros)</i>	2018	2017
<b>Reversals of provisions for risks</b>	<b>174</b>	<b>382</b>
Pensions and similar obligations	954	998
Spent fuel management	986	851
Long-term radioactive waste management	260	236
Decommissioning of nuclear power plants	138	131
Decommissioning of fossil-fired and hydropower plants	35	49
Other provisions for expenses	113	122
<b>Reversals of provisions for expenses</b>	<b>2,486</b>	<b>2,387</b>
<b>Reversals of depreciation</b>	<b>336</b>	<b>462</b>
<b>TOTAL REVERSALS OF PROVISIONS AND IMPAIRMENT</b>	<b>2,996</b>	<b>3,231</b>

### NOTE 7 OTHER OPERATING INCOME AND TRANSFERS OF CHARGES

<i>(in millions of euros)</i>	2018	2017
Other operating income	743	740
Transfers of charges	107	83
<b>TOTAL</b>	<b>850</b>	<b>823</b>



## NOTE 8 PURCHASES AND OTHER EXTERNAL EXPENSES

(in millions of euros)	2018	2017
Fuel purchases used <sup>(1)</sup>	3,172	3,186
Energy purchases <sup>(2)</sup>	17,057	15,870
Services and other purchases used <sup>(3)</sup>	17,181	17,667
<b>PURCHASES AND OTHER EXTERNAL EXPENSES</b>	<b>37,410</b>	<b>36,723</b>

(1) Fuel purchases used include costs relating to raw materials for energy generation (nuclear fuels, fissile materials, coal, oil, and gas), and purchases of services related to the nuclear fuel cycle. This item also includes greenhouse gas emission rights consumed (see note 1.19.1).

(2) Energy purchases include electricity purchase obligations. The increase in energy purchases is principally explained by the higher level of purchase obligations and gas purchases, which was partly offset by the lower level of purchases on the markets as nuclear power and hydropower output rose.

(3) Service purchases include distribution network access fees invoiced by the subsidiary Enedis. Excluding delivery, service purchases decreased by €126 million in 2018.

## NOTE 9 TAXES OTHER THAN INCOME TAXES

Details of taxes other than income taxes are as follows:

(in millions of euros)	2018	2017
Taxes on salaries and wages	180	174
Energy-related taxes	1,240	1,249
Local Economic Contribution	505	417
Property taxes	433	413
Other taxes	304	314
<b>TOTAL TAXES OTHER THAN INCOME TAXES</b>	<b>2,662</b>	<b>2,567</b>

## NOTE 10 PERSONNEL EXPENSES

(in millions of euros)	2018	2017
Salaries and wages	3,711	3,831
Social contributions	2,854	2,923
<b>PERSONNEL EXPENSES</b>	<b>6,565</b>	<b>6,754</b>

The decrease in personnel expenses mainly reflects the lower workforce numbers.

	2018			2017
	Executives	Non executives	Total	Total
IEG status	27,388	33,371	60,759	62,493
Other	1,879	2,289	4,168	4,084
<b>AVERAGE WORKFORCE</b>	<b>29,267</b>	<b>35,660</b>	<b>64,927</b>	<b>66,577</b>

Average workforce numbers are reported on a full-time equivalent basis.

## NOTE 11 OPERATING DEPRECIATION, AMORTISATION AND PROVISIONS

### 11.1 DEPRECIATION AND AMORTISATION

<i>(in millions of euros)</i>	2018	2017
Amortisation of intangible assets	235	216
Depreciation on property, plant and equipment:		
■ owned by EDF <sup>(1)</sup>	2,991	2,864
■ operated under concessions <sup>(2)</sup>	272	260
<b>Total depreciation and amortisation on fixed assets</b>	<b>3,498</b>	<b>3,340</b>
<b>Other depreciation and amortisation and deferred expenses</b>	<b>33</b>	<b>26</b>
<b>TOTAL DEPRECIATION AND AMORTISATION</b>	<b>3,531</b>	<b>3,366</b>

(1) Including €115 million of accelerated depreciation in 2017 due to the closure of oil-fired plants.

(2) This depreciation concerns the Island Energy Systems public electricity distribution concessions and hydropower concessions.

### 11.2 PROVISIONS AND IMPAIRMENT

<i>(in millions of euros)</i>	2018	2017
<b>Provisions for risks <sup>(1)</sup></b>	<b>1,125</b>	<b>78</b>
Pensions and similar obligations	832	889
Management of spent nuclear fuel	488	443
Long-term management of radioactive waste	48	118
Decommissioning of nuclear power plants and last cores	52	2
Decommissioning of thermal and hydropower plants	22	19
Other provisions for expenses	120	160
<b>Provisions for expenses</b>	<b>1,562</b>	<b>1,631</b>
<b>Impairment</b>	<b>253</b>	<b>366</b>
<b>TOTAL PROVISIONS AND IMPAIRMENT</b>	<b>2,940</b>	<b>2,075</b>

(1) The increase at 31 December 2018 mainly concerns supply and sale contracts, including €737 million for the long-term contract with Dunkerque LNG (see note 2.1 and note 27).

## NOTE 12 OTHER OPERATING EXPENSES

Other operating expenses amount to €1,743 million in 2018 (€1,644 million in 2017) and notably include losses on non-recoverable receivables, royalties on software, costs relating to energy savings certificates used over the year, and the net book

value of assets demolished or scrapped. The change in other operating expenses in 2018 is mainly attributable to the rise in costs associated with energy savings certificates.

## NOTE 13 FINANCIAL RESULT

(in millions of euros)	2018	2017
Income from investments <sup>(1)</sup>	2,804	1,828
Income from other securities and receivables related to fixed assets <sup>(2)</sup>	607	496
Interest and similar income and expenses <sup>(3)</sup>	(948)	(1,325)
Reversal of provisions and impairment and transfers of charges <sup>(4)</sup>	315	948
<b>Foreign exchange result</b>	<b>(330)</b>	<b>(172)</b>
■ Gains	1,239	2,256
■ Losses	(1,569)	(2,428)
<b>Result on sales of marketable securities</b>	<b>(135)</b>	<b>(140)</b>
■ Net income	7	18
■ Net charges	(142)	(158)
<b>Financial amortisation, provisions and impairment <sup>(5)</sup>, including:</b>	<b>(4,069)</b>	<b>(2,623)</b>
■ Discount expense on employee benefits	(574)	(585)
■ Discount expense on nuclear provisions	(2,365)	(1,881)
■ Provision on investment securities - dedicated assets <sup>(6)</sup>	(618)	(28)
<b>FINANCIAL RESULT</b>	<b>(1,756)</b>	<b>(988)</b>

(1) The change in dividends received principally concerns:

- Enedis (€513 million in 2018 and €659 million in 2017);
- C3 (the holding company which carries EDF Investissements Groupe) (€116 million in 2018 and €334 million in 2017);
- EDF International (€200 million in 2017, no equivalent in 2018);
- EDF Holding (the holding company which carries EDF Trading) (€581 million in 2018, no equivalent in 2017);
- PEI (€92 million in 2018 and €101 million in 2017);
- EDF Immo (€130 million in 2018 and €234 million in 2017);
- CTE (€157 million in 2018, €60 million in 2017);
- EDEV (€926 million in 2018 (including €740 million from the sale of Dunkerque LNG – see note 2.1) and €123 million in 2017);
- Dalkia (€90 million in 2018 and €13 million in 2017).

(2) In 2018, this item includes income of €46 million (€64 million in 2017) for the cost of bearing the CSPE financial receivable.

(3) The decrease essentially results from changes in the unrealised foreign exchange gain or loss on currency instruments (€456 million).

(4) This change mainly reflects a reversal from provisions for unrealised foreign exchange losses on perpetual bonds and long-term bonds issued by EDF, amounting to €524 million and recognised at 31 December 2017, with no equivalent in 2018 (see note 27).

(5) The change mainly reflects the effect of discounting provisions for the back-end of the nuclear cycle, decommissioning and last cores, amounting to €(484) million. In 2018, the discount expense on nuclear provisions increased, because the 2017/2018 decrease in the real discount rate was larger than for the comparative period 2016/2017 (the rate was 2.4% at 31 December 2018, 2.6% at 31 December 2017 and 2.7% at 31 December 2016).

(6) The change is principally due to unfavourable financial market trends in 2018.

## NOTE 14 EXCEPTIONAL RESULT

At 31 December 2018, exceptional items result in net income of €939 million. The main items are the following:

- net gains of €846 million on sales of investment securities included in dedicated assets, undertaken as part of operational portfolio management;
- net reversals of €65 million from excess tax depreciation.

At 31 December 2017, exceptional items resulted in net income of €1,232 million. The main items are the following:

- a net gain of €388 million on the sale of the CTE investment securities upon completion of the RTE operation;
- net gains of €872 million on sales of investment securities included in dedicated assets, undertaken as part of operational portfolio management;
- net reversals of €62 million from excess tax depreciation.

## NOTE 15 INCOME TAXES

### 15.1 TAX GROUP

Since 1 January 1988, EDF and certain subsidiaries have formed a group subject to the tax consolidation system existing under French tax legislation (Articles 223A to 223U of the French Tax Code). The tax consolidation group comprises 234 subsidiaries in 2018, including Enedis, EDF International, EDF Renewables and Dalkia.

### 15.2 INCOME TAX PAYABLE

Under Article 223A of the French Tax Code, EDF, as the head of the tax consolidated group, is the sole entity responsible for payment of income taxes and additional related contributions.

The tax consolidation agreement between the members of the tax group stipulates that the arrangement must be neutral in effect. In application of this principle, each subsidiary pays the consolidating company a contribution to group income tax equivalent to the tax it would have paid had it been taxed separately.

The tax consolidation agreement between EDF and the subsidiaries included in the tax group requires EDF to reimburse loss-making subsidiaries for the tax saving generated by their losses, as and when the entities concerned make taxable profits, in compliance with the standard rules for use of taxable losses.

The Company at the head of the tax group, EDF, recorded an income tax receivable of €756 million for 2018.

The breakdown is as follows:

- tax receivable of €955 million for the taxable loss of 2018;
- tax receivable of €235 million on the exceptional result;
- an expense of €36 million for adjustments resulting from the tax consolidation.

Changes in deferred taxes are as follows:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017	Variation
<b>1. Timing differences generating a deferred tax asset</b>			
■ Non-deductible provisions <sup>(1)</sup>	(15,385)	(13,925)	(1,460)
■ Financial instruments and unrealised exchange gains	(1,067)	43	(1,110)
■ Other	(404)	(312)	(92)
<b>TOTAL DEFERRED TAX ASSETS SUBJECT TO THE STANDARD RATE</b>	<b>(16,856)</b>	<b>(14,194)</b>	<b>(2,662)</b>
<b>2. Timing differences generating a deferred tax liability</b>			
■ Financial instruments and unrealised exchange losses	3,758	19	3,739
■ Other	2,149	1,926	223
<b>TOTAL DEFERRED TAX LIABILITIES SUBJECT TO THE STANDARD RATE</b>	<b>5,907</b>	<b>1,945</b>	<b>3,962</b>
■ Capital gains not yet taxed, net of capital losses	-	-	-
■ Provisions for losses taxable at 15%	-	(8)	8
<b>TOTAL DEFERRED TAX LIABILITIES SUBJECT TO REDUCED RATE</b>	<b>-</b>	<b>(8)</b>	<b>8</b>
<b>BASIS FOR DEFERRED TAXES</b>	<b>(10,949)</b>	<b>(12,257)</b>	<b>1,308</b>
Net future tax asset at standard rate <sup>(2)</sup>	3,099	3,338	(239)
Net future tax liability at reduced rate	-	1	(1)

(1) Mainly concerning post-employment benefits for personnel.

(2) Applying a corporate income tax rate of 25.82% to long-term timing differences.

### 15.3 TAX CREDIT FOR COMPETITIVITY AND EMPLOYMENT (CICE)

The amounts received in 2018 under the French CICE tax credit scheme for 2017 were to fund the Company's investment and recruitment efforts.

### 15.4 DEFERRED TAXES

Deferred taxes are not recognised in EDF's individual financial statements. Deferred taxes result from differences between the accounting bases and tax bases of items. They generally arise as a result of timing differences in the recognition of income and expenses:

- deferred tax assets reflect expenses which will be tax deductible in future years or losses carried forward which will reduce taxable income in the future;
- deferred tax liabilities reflect either advance tax deduction of future accounting expenses or accounting revenues that will be taxable in future years and will increase taxable income in the future.

## BALANCE SHEET

## NOTE 16 GROSS VALUES OF INTANGIBLE AND TANGIBLE FIXED ASSETS

<i>(in millions of euros)</i>	Gross value at 31/12/2017	Increases	Decreases	Gross value at 31/12/2018
Software	1,586	303	57	1,832
Other	247	22	10	259
<b>Intangible assets</b>	<b>1,833</b>	<b>325</b>	<b>67</b>	<b>2,091</b>
Land	119	3	11	111
Buildings	10,600	346	71	10,875
Nuclear power plants	56,106	3,322	1,050	58,378
Machinery and plant other than networks	13,091	376	231	13,236
EDF-owned networks	1,027	26	1	1,052
Other	1,590	151	67	1,674
<b>Property, plant and equipment owned by EDF</b>	<b>82,533</b>	<b>4,224</b>	<b>1,431</b>	<b>85,326</b>
Land	40	7	-	47
Buildings	10,032	139	5	10,166
Machinery and plant other than networks	1,570	57	15	1,612
Concession networks	2,753	127	14	2,866
Other	20	-	-	20
<b>Property, plant and equipment operated under concessions <sup>(1)</sup></b>	<b>14,415</b>	<b>330</b>	<b>34</b>	<b>14,711</b>
Tangible assets <sup>(2)</sup>	16,132	5,396	4,263	17,265
Intangible assets <sup>(2)</sup>	707	405	336	776
Advances and progress payments on orders	3,004	69	-	3,073
<b>Assets in progress</b>	<b>19,843</b>	<b>5,870</b>	<b>4,599</b>	<b>21,114</b>
<b>TOTAL INTANGIBLE AND TANGIBLE FIXED ASSETS <sup>(3)</sup></b>	<b>118,624</b>	<b>10,749</b>	<b>6,131</b>	<b>123,242</b>

(1) Assets operated under concessions concern the Island Energy Systems public electricity distribution concessions and hydropower concessions.

(2) Investments during the year mainly concern equipment for existing power plants and construction of the Flamanville 3 EPR plant. Intangible assets in progress include studies currently in process for the EPR 2 project, amounting to €281 million.

(3) The capitalised value of the Flamanville 3 EPR project in the financial statements at 31 December 2018 is €10,552 \* million (€10,312 million in property, plant and equipment in progress and €241 million in property, plant and equipment in operation). In addition to the construction cost, this amount includes an inventory of spare parts and capitalised amounts totalling €328 million for related projects (notably the initial comprehensive inspection and North Area development), and €520 million of pre-operating expenses and other property, plant and equipment related to the Flamanville project, giving a total construction cost at historical value of €9,704 million. Depreciation and amortisation recognised at 31 December 2018 in respect of assets in operation amounts to €50 million.

\* Interest is not capitalised in the parent company financial statements.

## NOTE 17 DEPRECIATION, AMORTISATION AND IMPAIRMENT OF INTANGIBLE AND TANGIBLE FIXED ASSETS

<i>(in millions of euros)</i>	31/12/2017	Increases	Decreases	31/12/2018
Software	772	229	51	950
Other	128	6	10	124
<b>Intangible assets</b>	<b>900</b>	<b>235</b>	<b>61</b>	<b>1,074</b>
Land and buildings	7,142	255	59	7,338
Nuclear power plants	39,414	2,303	1,338	40,379
Machinery and plant other than networks	8,448	419	226	8,641
EDF-owned networks	474	28	-	502
Other	989	136	64	1,061
<b>Property, plant and equipment owned by EDF</b>	<b>56,467</b>	<b>3,141</b>	<b>1,687</b>	<b>57,921</b>
Land and buildings	6,342	142	5	6,479
Machinery and plant other than networks	1,052	29	15	1,066
Concession networks	1,140	73	13	1,200
Other	10	-	-	10
<b>Property, plant and equipment operated under concessions</b>	<b>8,544</b>	<b>244</b>	<b>33</b>	<b>8,755</b>
<b>Tangible assets in progress</b>	<b>188</b>	<b>29</b>	<b>40</b>	<b>177</b>
<b>TOTAL DEPRECIATION, AMORTISATION AND IMPAIRMENT</b>	<b>66,099</b>	<b>3,649</b>	<b>1,821</b>	<b>67,927</b>

### 17.1 IMPAIRMENT TESTS ON ASSETS

The integrated management and interdependence of the different generation facilities that make up the French fleet (nuclear, thermal and hydropower plants), independently of their maximum technical capacities, have led EDF to consider the entire fleet as a single CGU.

Even when there is no indication of any loss of value, an impairment test is performed due to the highly significant value of this CGU in the financial statements and its substantial exposure to market prices since discontinuation of the "yellow" and "green" regulated tariffs on 1 January 2016.

The recoverable value of the generation fleet is estimated by discounting future cash flows under the usual methodology, described in note 1.6, over the assets' useful life, using an after-tax WACC of 5.2% at 31 December 2018. For nuclear assets currently in operation (except for Fessenheim), EDF's basic valuation assumes that the useful life is extended to 50 years, in line with its industrial strategy. The nuclear capacity remains subject to a ceiling of 63.2GW in the test, consistent with France's Energy Transition Law.

The assumption of stable returns on capacity of €10/KW is adopted over a long-term horizon, in line with the analysis of system fundamentals used in the benchmark scenario. The average auction price achieved in 2018 was €18/KW.

The impairment test indicated a significant positive difference between the recoverable value and the book value of the generation fleet, supported by the rise in electricity prices on the market horizon and implementation of savings plans. The margin resulting from the test is down slightly from 31 December 2017, principally due to lower long-term price scenarios, and because in the short term the ARENH system cannot capture all the value associated with higher forward prices.

The key assumptions used in the test include the useful life of nuclear assets, the long-term price scenario, the discount rate, developments in costs and investments, and the assumed capacity premium. Each of these assumptions has been subjected to a sensitivity analysis, which does not call into question the existence of a positive difference between the recoverable value and book value. The test conducted at 31 December 2018 also took into consideration the sensitivity associated with the proposals for early closures of certain nuclear plants, as set out in the proposed multi-year energy programme. This did not affect the conclusions of the test.



## NOTE 18 FINANCIAL ASSETS

## 18.1 CHANGE IN FINANCIAL ASSETS

<i>(in millions of euros)</i>	<b>Gross value at 31/12/2018</b>	<b>Gross value at 31/12/2017</b>
Investments <sup>(1)</sup>	59,207	58,594
Receivables related to investments	51	55
Investment securities <sup>(2)</sup>	20,790	17,875
Other investments	286	269
CSPE receivable <sup>(3)</sup>	2,060	3,294
Loans to subsidiaries and other financial assets <sup>(4)</sup>	10,485	9,095
<b>TOTAL FINANCIAL ASSETS, GROSS</b>	<b>92,879</b>	<b>89,182</b>
Impairment of investments and related receivables	(307)	(204)
Impairment of investment securities	(716)	(55)
<b>TOTAL IMPAIRMENT</b>	<b>(1,023)</b>	<b>(259)</b>
<b>TOTAL FINANCIAL ASSETS, NET</b>	<b>91,856</b>	<b>88,923</b>

(1) The change in investments essentially corresponds to:

- an additional €94 million in the valuation of the shares in Framatome. At 31 December 2018, the 75.5% investment in Framatome is stated at the value of €1,988 million including acquisition expenses.
- new investments by EDF Invest (see note 38.2.5):
  - subscription to the capital increase by EDF Nam Theun Holding, which owns a hydroelectric dam in Laos (€437 million);
  - subscription to the capital increase by C45, which owns wind farms in the United Kingdom (€99 million).

(2) Changes in investment securities correspond mainly to acquisitions and sales of dedicated assets over the period, which generated net gains of €846 million in 2018 (see note 14). These gains are reinvested in the dedicated asset portfolio.

(3) This receivable consists of the accumulated shortfall at 31 December 2015 in the compensation for public energy service charges (CSPE) and the associated financing costs. Reimbursements received during 2018 amount to €1,281 million including interest (€954 million in 2017) (see note 3.5), in line with the repayment schedule.

(4) Loans to subsidiaries at 31 December 2018 total €10,426 million, including €6,404 million for EDF International, €1,325 million for Dalkia, €1,063 million for EDF Renewables, €788 million for PEI and €502 million for Enedis.

## 18.2 SUBSIDIARIES AND INVESTMENTS OF AT LEAST 50% OF CAPITAL

<i>(in millions of euros)</i>	Gross book value of shares owned	Impairment recorded at 31/12/2018	% capital owned	Equity 2017	Net income 2017	Dividends received in 2018	Sales 2017
<b>I. Subsidiaries</b>							
■ <b>Holding companies</b>							
EDEV	6,891	-	100	6,431	123	926	-
EDF International	25,930	-	100	19,273	(701)	-	1
EDF Production Electrique Insulaire SAS	561	-	100	912	118	92	722
EDF Holding SAS	1,950	-	100	2,080	nm	581	-
C3	11,196	-	100	11,434	122	116	-
EDF Immo	1,361	-	100	1,530	137	130	-
EDF group Support Services	nm	-	100	nm	nm	-	143
CTE	2,705	-	50,1	5,440	203	157	-
C45	99	-	-	-	-	-	-
EDF Nam Theun Holding	437	-	-	-	-	-	-
Other companies	1,935	37	100	1,987	62	177	5
■ <b>Industrial and commercial companies</b>							
<b>France</b>							
Centrale Electrique Rhénane de Gambsheim	3	-	50	10	-	-	5
Dalkia Investissement	200	77	100	177	24	90	nm
Dalkia France	967	-	100	541	(40)	nm	2,102
Enedis	2,700	-	100	5,077	609	513	14,083
Framatome	1,988	-	75,5	2,391	1	-	-
Edvance	12	-	80	(6)	(6)	-	10
<b>Other countries</b>							
Emosson	14	14	50	120	-	-	30
Rheinkraftwerk Iffezheim (RKI)	3	-	50	105	3	-	16
Forces Motrices du Chatelôt	nm	-	50	8	nm	nm	4
■ <b>Other entities (GIE EIFER)</b>	124	121	-	-	-	-	-
<b>TOTAL I</b>	<b>59,076</b>	<b>249</b>				<b>2,782</b>	

nm: not material (less than €500,000).

CTE is the company that owns 100% of RTE.

**18.3 SUBSIDIARIES AND INVESTMENTS UNDER 50%**

<i>(in millions of euros)</i>	Gross book value of shares owned	Impairment recorded at 31/12/2018	% capital owned	Equity 2017	Net income 2017	Dividends received 2018
<b>I. Subsidiaries</b>						
<b>Total I Carried forward</b>	59,076	249				2,782
<b>II Investments</b>						
II.1 Companies in which EDF has an interest of between 10% and 50%						
■ Industrial and commercial companies						
<b>France</b>						
Trimet France	130	58	35	289	23	6
<b>Total II.1</b>	130	58				6
II.2 Companies in which EDF has an interest of less than 10%						
Other companies	-	-	-	-	-	-
<b>Other countries</b>						
Forces Motrices de Mauvoisin	1	-	10	102	5	nm
<b>Total II.2</b>	1	-				-
<b>Total II</b>	131	58				6
<b>Total investments, gross</b>	59,207	307				2,788
<b>TOTAL INVESTMENTS, NET</b>	58,900					

nm: not material (less than €500,000).

**18.4 INVESTMENT SECURITIES PORTFOLIO**

<i>(in millions of euros)</i>	At start of year			At year-end		
	Gross book value	Net book value	Fair value	Gross book value	Net book value	Fair value
<b>VALUE OF INVESTMENT SECURITIES</b>	17,875	17,825	19,717	20,790	20,136	20,830

At 31 December 2018, the investment securities portfolio comprises €20,136 million of dedicated assets.

## 18.5 VARIATION IN TREASURY SHARES

A share repurchase programme authorised by the General Shareholders' Meeting of 9 June 2006 was implemented by the Board of Directors, within the limits of 10% of the total number of shares making up the Company's capital. The initial duration of the programme was 18 months, renewed for 12 months then by tacit agreement every year.

A liquidity contract exists for this programme, as required by the French market regulator AMF.

<i>(in millions of euros)</i>	<b>Gross value at 31/12/2017</b>	<b>Increases</b>	<b>Decreases</b>	<b>Gross value at 31/12/2018</b>
<b>TREASURY SHARES</b>	<b>37</b>	<b>200</b>	<b>(184)</b>	<b>53</b>

At 31 December 2018, treasury shares included in the investment securities portfolio represent 3,677,425 shares with total value of €53 million.

## 18.6 FINANCIAL LOANS AND RECEIVABLES RELATED TO INVESTMENTS

<i>(in millions of euros)</i>	<b>Liquidity</b>			<b>Gross value at 31/12/2018</b>	<b>Gross value at 31/12/2017</b>
	<b>&lt; 1 year</b>	<b>1 - 5 years</b>	<b>&gt; 5 years</b>		
Receivables related to investments	2	-	49	51	55
CSPE receivable	1,400	660	-	2,060	3,294
Loans and other financial assets	1,143	7,657	1,685	10,485	9,095
<b>FINANCIAL LOANS AND RECEIVABLES RELATED TO INVESTMENTS</b>	<b>2,545</b>	<b>8,317</b>	<b>1,734</b>	<b>12,596</b>	<b>12,444</b>

**NOTE 19 INVENTORIES AND WORK-IN-PROGRESS**

(in millions of euros)	31/12/2018			31/12/2017		
	Gross value	Provisions	Net value	Gross value	Provisions	Net value
Nuclear fuel	8,486	(6)	8,480	8,693	(15)	8,678
Other raw materials	139	-	139	123	-	123
Other supplies	1,438	(183)	1,255	1,186	(179)	1,007
Work-in-progress and other inventories	33	-	33	161	-	161
<b>TOTAL INVENTORIES</b>	<b>10,096</b>	<b>(189)</b>	<b>9,907</b>	<b>10,163</b>	<b>(194)</b>	<b>9,969</b>

**NOTE 20 OTHER CURRENT ASSETS**

(in millions of euros)	Liquidity			Gross value at 31/12/2018	Gross value at 31/12/2017
	< 1 year	1 - 5 years	> 5 years		
<b>Advances on orders</b>	<b>350</b>	<b>93</b>	<b>247</b>	<b>690</b>	<b>786</b>
■ Trade receivables					
Amounts billed	2,064	-	-	2,064	2,524
Unbilled receivables <sup>(1)</sup>	13,354	-	-	13,354	12,972
■ Other operating receivables <sup>(2)</sup>	5,474	24	178	5,676	5,749
<b>Operating receivables</b>	<b>20,892</b>	<b>24</b>	<b>178</b>	<b>21,094</b>	<b>21,245</b>
<b>Cash instruments <sup>(3)</sup></b>	<b>773</b>	<b>603</b>	<b>1,229</b>	<b>2,605</b>	<b>2,096</b>
<b>Prepaid expenses</b>	<b>692</b>	<b>315</b>	<b>442</b>	<b>1,449</b>	<b>1,358</b>
<b>TOTAL CURRENT ASSETS</b>	<b>22,707</b>	<b>1,035</b>	<b>2,096</b>	<b>25,838</b>	<b>25,485</b>

(1) Mainly receivables for energy supplied and not billed in 2018.

(2) Including €4,192 million of receivables on the State related to taxes other than income taxes, and €783 million receivable in compensation for public energy service charges (CSPE) (€1,140 million in 2017). The rest of the CSPE receivable is recorded under "Financial assets" (see note 18.1).

(3) Unrealised gains on foreign exchange instruments.

**NOTE 21 MARKETABLE SECURITIES**

(in millions of euros)	31/12/2018	31/12/2017	Change
Treasury shares	3	3	-
Investment funds	2,868	2,650	218
Negotiable debt instruments (euros or other currencies) maturing within 3 months	175	-	175
Negotiable debt instruments (euros or other currencies) maturing after 3 months	3,468	3,093	375
Bonds	7,969	7,179	790
Accrued interest and other marketable securities	2,430	1,613	817
<b>Total gross value</b>	<b>16,913</b>	<b>14,538</b>	<b>2,375</b>
<b>Provisions</b>	<b>(52)</b>	<b>(11)</b>	<b>(41)</b>
<b>TOTAL NET VALUE</b>	<b>16,861</b>	<b>14,527</b>	<b>2,334</b>

## NOTE 22 VARIATION IN CASH AND CASH EQUIVALENTS REPORTED IN THE CASH FLOW STATEMENT

<i>(in millions of euros)</i>	31/12/2018	31/12/2017	Change
Marketable securities	16,913	14,538	2,375
Cash and cash equivalents	4,619	5,110	(491)
<b>Sub-total in balance sheet assets</b>	<b>21,532</b>	<b>19,648</b>	<b>1,884</b>
Euro investment funds	(2,868)	(2,650)	(218)
Negotiable debt instruments (euro) maturing after 3 months	(2,202)	(2,125)	(77)
Negotiable debt instruments (non euro) maturing within 3 months	(175)	-	(175)
Negotiable debt instruments (non euro) maturing after 3 months	(1,266)	(968)	(298)
Bonds	(7,969)	(7,179)	(790)
Treasury shares	(3)	(3)	-
Accrued interest and other marketable securities	(2,430)	(1,613)	(817)
<b>Marketable securities included in financial assets in the cash flow statement</b>	<b>(16,913)</b>	<b>(14,538)</b>	<b>(2,375)</b>
Cash advances to subsidiaries (cash pooling agreements) included in "other operating receivables" in the balance sheet	-	-	-
Cash advances from subsidiaries (cash pooling agreements) included in "other operating liabilities" in the balance sheet	(6,182)	(7,985)	1,803
<b>Cash and cash equivalents, closing balance in the cash flow statement*</b>	<b>(1,563)</b>	<b>(2,875)</b>	<b>1,312</b>
Elimination of the effect of currency fluctuations			13
Elimination of net financial income on cash and cash equivalents			(52)
<b>NET VARIATION IN CASH AND CASH EQUIVALENTS IN THE CASH FLOW STATEMENT *</b>			<b>1,273</b>

\* See the Cash flow statement.

In 2018, the cash positions of all subsidiaries in the cash flow statement are now classified by reference to criteria of autonomy.

An entity is considered non-autonomous when it is a holding company, generates the majority of its sales with EDF group entities, or does not have the status of employer.

The main subsidiaries classified as non-autonomous are C2, C3, EDF Holding et EDF international, and the main subsidiaries classified as autonomous are Enedis, PEI, Sofilo and GGF.

In the cash flow statement, the cash positions of autonomous subsidiaries are now presented as a deduction from "Cash and cash equivalents". The cash positions of non-autonomous subsidiaries are included in the components of the changes in working capital.

## NOTE 23 UNREALISED FOREIGN EXCHANGE LOSSES

Unrealised foreign exchange losses amount to €767 million at 31 December 2018, principally reflecting movements in the US dollar and the pound sterling (€572 million at 31 December 2017).



## NOTE 24 CHANGES IN EQUITY

<i>(in millions of euros)</i>	Capital	Reserves and premiums	Retained earnings and interim dividends	Profit or loss for the financial year	Investment subsidiaries	Tax- regulated provisions	Total equity
<b>At 31 December 2016</b>	<b>1,055</b>	<b>13,627</b>	<b>2,311</b>	<b>5,517</b>	<b>169</b>	<b>6,132</b>	<b>28,812</b>
Allocation of 2016 net income	-	4	4,412	(4,416)	-	-	-
2017 profit	-	-	-	1,924	-	-	1,924
Capital increase of 31 March 2017	316	3,689	-	-	-	-	4,005
Capital increase of 30 June 2017	73	951	-	-	-	-	1,024
Dividend distribution	-	-	1	(1,101)	-	-	(1,100)
Capital increase of 11 December 2017	20	378	-	-	-	-	398
Interim dividend	-	-	(433)	-	-	-	(433)
Other changes	-	2	84 <sup>(1)</sup>	-	(6)	(34)	46
<b>At 31 December 2017</b>	<b>1,464</b>	<b>18,651</b>	<b>6,375</b>	<b>1,924</b>	<b>163</b>	<b>6,098</b>	<b>34,676</b>
Allocation of 2017 net income	-	41	973	(1,014)	-	-	-
2018 profit	-	-	-	1,591	-	-	1,591
Capital increase of 19 June 2018	41	806	-	-	-	-	847
Dividend distribution	-	-	1	(910)	-	-	(909)
Interim dividend	-	-	(451)	-	-	-	(451)
Other changes	-	(4)	1	-	3	(42)	(42)
<b>AT 31 DECEMBER 2018</b>	<b>1,505</b>	<b>19,494</b>	<b>6,900</b>	<b>1,591</b>	<b>166</b>	<b>6,056</b>	<b>35,712</b>

(1) Impact of application of hedge accounting in compliance with regulation ANC 2015-05.

## 24.1 SHARE CAPITAL

EDF's share capital amounted to €1,505,133,838 at 31 December 2018, comprising 3,010,267,676 fully subscribed and paid-up shares with nominal value of €0.50 each, owned 83.67% by the French State, 15.06% by the public (institutional and private investors), 1.15% by current and retired Group employees, and 0.12% held by EDF as treasury shares.

In June 2018, payment of the balance of the dividend for 2017 in the form of a scrip dividend led to a €41 million increase in the share capital and an issue premium of €806 million following the issuance of 82,828,872 new shares. The formalities for this operation were completed in June 2018.

Under Article L. 111-67 of the French Energy Code, the French State must hold more than 70% of the capital of EDF at all times.

## 24.2 DIVIDENDS

The General Shareholders' Meeting of 15 May 2018 decided to distribute an ordinary dividend of €0.46 per share in respect of 2017, offering the choice of receiving this dividend in cash, or in the form of shares (scrip option).

In application of Article 24 of the Company's articles of association, shareholders who have held their shares continuously for at least 2 years at the year-end and still hold them at the dividend distribution date benefit from a 10% bonus on their dividends. The number of shares carrying an entitlement to the bonus dividend cannot exceed 0.5% of the Company's capital for a single shareholder. The bonus dividend amounts to €0.506 per share.

As interim dividends of €0.15 per share had been paid out in cash or in the form of shares (scrip option) on 11 December 2017, the balance payable for 2017 amounted to €0.31 per share benefiting from the ordinary dividend and €0.356 per share benefiting from the bonus dividend. The balance of the dividend was paid out on 19 June 2018.

The French government opted for the scrip dividend for the 2017 distribution.

The amount of the cash dividend paid to shareholders who did not opt for the scrip dividend for the 2017 distribution was €60 million.

On 6 November 2018, EDF's Board of Directors decided to distribute an interim dividend of €0.15 per share in respect of 2018. This interim dividend amounting to a total of €451 million was paid out in the form of cash only, on 10 December 2018.

## NOTE 25 ADDITIONAL EQUITY

Additional equity at 31 December 2018 consists of perpetual subordinated bonds issued by EDF in January 2013 and January 2014 at the value of €5,223 million and €3,635 million respectively (net of redemption premiums), after deduction of the redemption undertaken on 3 October 2018 and the bonds issued in 2018 totalling €1,250 million (see notes 2.3 and 2.4).

After adjustment for foreign exchange variations, amortisation of the redemption premium over the year, and the above operations, additional equity amounts to €10,620 million at 31 December 2018.

Payments to the bearers of perpetual subordinated bonds totalled €551 million in 2018 (€551 million in 2017). This expense is recorded in "interest and similar income and expenses" (see note 13).

### PERPETUAL SUBORDINATED BONDS

(in millions of currency units)

Issue date	Amount	Currency	Redemption option	Rate
01/2013	338	EUR	7 years	4.25%
01/2013	1,250	EUR	12 years	5.38%
01/2013	1,250	GBP	13 years	6.00%
01/2013	3,000	USD	10 years	5.25%
01/2014	1,500	USD	10 years	5.63%
01/2014	662	EUR	8 years	4.13%
01/2014	1,000	EUR	12 years	5.00%
01/2014	750	GBP	15 years	5.88%
10/2018	1,250	EUR	6 years	4.00%

## NOTE 26 SPECIAL CONCESSION LIABILITIES

(in millions of euros)

	31/12/2018	31/12/2017
	108	107
Revaluation difference	840	860
Additional depreciation	240	198
<b>Rights in hydropower concession assets</b>	<b>1,188</b>	<b>1,165</b>
Value in kind of assets	1,746	1,695
Unamortised financing by the operator	(1,073)	(1,026)
Amortisation of grantor financing	332	319
Contributions received for concessionary plant assets under construction	6	6
<b>Rights in public distribution concession assets <sup>(1)</sup></b>	<b>1,011</b>	<b>994</b>
<b>TOTAL SPECIAL CONCESSION LIABILITIES</b>	<b>2,199</b>	<b>2,159</b>

(1) Rights in public distribution concession assets concern the Island Energy Systems (SEI) public electricity distribution concessions.

## NOTE 27 PROVISIONS FOR RISKS

		Increases		Decreases			Other	
(in millions of euros)	31/12/2017	Operating <sup>(1)</sup>	Financial <sup>(2)</sup>	Utilisations	Reversals	Financial		31/12/2018
Provisions for unrealised exchange losses	572	-	215	-	-	(20)	-	767
Provisions for losses on contracts	510	900	14	(89)	(39)	-	150	1,446
Provisions for other risks	302	225	-	(9)	(37)	-	(150)	331
<b>PROVISIONS FOR RISKS</b>	<b>1,384</b>	<b>1,125</b>	<b>229</b>	<b>(98)</b>	<b>(76)</b>	<b>(20)</b>	<b>-</b>	<b>,544</b>

(1) The increase to provisions for losses on contracts mainly relates to the long-term contract with Dunkerque LNG (increase of €737 million, see note 2.1).

(2) The increase to provisions for unrealised exchange losses mainly concerns losses on perpetual bonds (increase of €178 million in 2018). A reversal of €524 million from these provisions concerning perpetual bonds and long-term bonds issued was recorded in 2017 (see note 13).

## NOTE 28 PROVISIONS RELATED TO NUCLEAR GENERATION - BACK-END OF THE NUCLEAR CYCLE, PLANT DECOMMISSIONING AND LAST CORES

The provisions established by EDF for the nuclear generation fleet result from the Law of 28 June 2006 on long-term management of radioactive materials and waste, and the associated implementing provisions concerning secure financing of nuclear expenses.

In compliance with the accounting principles described in note 1.15:

- EDF books provisions to cover all obligations related to the nuclear facilities it operates;
- EDF holds dedicated assets for secure financing of long-term obligations (see note 38).

The calculation of provisions incorporates a level of risks and unknowns that depend on the operations concerned. The valuation of costs also carries uncertainty factors such as:

- changes in legislation, particularly regarding safety, security and environmental protection, and financing of nuclear expenses;

- changes in the regulatory decommissioning process and the time necessary for issuance of administrative authorisations;
- future methods for storing long-lived radioactive waste and provision of storage facilities by the French agency for radioactive waste management ANDRA (*Agence nationale pour la gestion des déchets radioactifs*);
- changes in certain financial parameters such as discount rates, notably in view of the regulatory limits, inflation rates, or changes in the contractual terms of spent fuel management.

Details of changes in provisions for the back-end of the nuclear cycle, decommissioning and last cores are as follows:

		Increases		Decreases		Other changes <sup>(2)</sup>	
(in millions of euros)	31/12/2017	Operating	Financial <sup>(1)</sup>	Utilisation	Reversals		31/12/2018
Provisions for spent fuel management	10,786	488	651	(784)	(202)	(241)	10,698
Provisions for removal and conditioning of waste	726	10	43	(29)	-	1	751
Provisions for long-term radioactive waste management	8,814	38	826	(231)	-	399	9,846
<b>Provisions for the back-end of the nuclear cycle</b>	<b>20,326</b>	<b>536</b>	<b>1,520</b>	<b>(1,044)</b>	<b>(202)</b>	<b>159</b>	<b>21,295</b>
Provisions for nuclear plant decommissioning	14,920	52	752	(138)	-	399	15,985
Provisions for last cores	2,387	-	97	-	-	42	2,526
<b>Provisions for decommissioning and last cores</b>	<b>17,307</b>	<b>52</b>	<b>849</b>	<b>(138)</b>	<b>-</b>	<b>441</b>	<b>18,511</b>
<b>TOTAL PROVISIONS RELATED TO NUCLEAR GENERATION</b>	<b>37,633</b>	<b>588</b>	<b>2,369</b>	<b>(1,182)</b>	<b>(202)</b>	<b>600</b>	<b>39,806</b>

(1) The discount effect comprises the €1,534 million cost of unwinding the discount, and the effects of the change of real discount rate in 2018, recognised via the income statement for provisions with no related assets (€835 million) (cost of unwinding the discount).

(2) Other changes mainly include:

- reclassification of the provision covering interim storage of waste resulting from spent fuel processing as part of the provision for long-term radioactive waste management (€298 million);
- the effects of the change of real discount rate at 31 December 2018 for provisions with related assets (€718 million).

Concerning non-EDF installations:

- EDF, COGEMA (now Orano Cycle) and the French Atomic Energy Commission (*Commissariat à l'énergie atomique* or CEA) signed an agreement in December 2004 which transferred the management and financing of final shutdown, decommissioning and waste recovery and reconditioning for the UP1 reprocessing facility at Marcoule to the CEA. In return, EDF paid the CEA a one-time financial contribution covering its full share of the cost of outstanding operations, while remaining the owner of its final waste and bearing only the transport and storage costs;
- EDF, AREVA and AREVA NC (now Orano Cycle) signed two agreements in December 2008 and July 2010 defining the legal and financial terms for the transfer to AREVA NC of EDF's contractual obligations regarding its financial contribution to the dismantling of La Hague installations and the recovery and conditioning of waste. In application of those agreements, EDF paid AREVA NC a one-time financial contribution covering its full share of the cost of outstanding operations, while remaining the owner of its final waste and bearing only the transport and storage costs.

## 28.1 PROVISIONS FOR SPENT NUCLEAR FUEL MANAGEMENT

EDF's currently adopted strategy with regards to the fuel cycle, in agreement with the French State, is to process spent fuel and to recycle the separated plutonium in the form of MOX fuel (Mixed OXide of plutonium and uranium).

The quantities processed by Orano at the request of EDF, totalling approximately 1,100 tonnes per year, are determined based on the quantity of recyclable plutonium in the reactors that are authorised to load MOX fuel.

Consequently, provisions for spent fuel cover services associated with the following:

- removal of spent fuel from EDF's generation centres, as well as reception and interim storage;
- processing, including conditioning and storage of recyclable matter.

The processing expenses included in these provisions exclusively concern spent fuel that can be recycled in existing facilities, including the portion in reactors but not yet irradiated.

Expenses are measured based on forecast physical flows at the year-end, with reference to the contracts with Orano which define the terms for implementation of the framework agreement for the period 2008-2040. The most recent of these agreements, signed on 5 February 2016, covers the period 2016-2023.

In 2018 the Board of Directors approved resumption of recycling of uranium from reprocessing (which was suspended in 2013 pending availability of a new industrial schema), with loading of the first fuel assemblies scheduled for 2023, subject to technical adaptations and the necessary authorisations from the Nuclear Safety Authority. The corresponding contracts were signed with the respective suppliers in the second quarter of 2018.

The portion of the provision for spent fuel management relating to uranium from reprocessing will be recovered once all the industrial, regulatory and economic conditions for resumption of fuel recycling have been fulfilled, but EDF has no control over fulfilment of some of these conditions (currently, no advance timetable has been set).

These provisions also cover long-term storage of spent fuel that cannot currently be recycled in existing installations: plutonium fuel (MOX) or uranium fuel derived from enriched processing, and fuel from Creys-Malville and Brennilis until fourth-generation reactors become available.

Following publication of the ministerial order of 28 December 2018 amending the order of 21 March 2017 on secure financing of nuclear expenses, in 2018 the provision covering interim storage of waste from spent fuel processing has been reclassified as part of the provision for long-term radioactive waste management (this concerns an amount of €298 million).

The provisions for long-term radioactive waste management break down as follows:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Very low-level and low and medium-level waste	1,278	1,161
Long-lived low-level waste	292	265
Long-lived medium and high-level waste	8,276	7,388
<b>PROVISIONS FOR LONG-TERM RADIOACTIVE WASTE MANAGEMENT</b>	<b>9,846</b>	<b>8,814</b>

### Very low level and low and medium level waste

Very low-level waste mainly comes from nuclear plant decommissioning, and generally takes the form of rubble (concrete, scrap metal, insulating materials and piping). This type of waste is stored at surface level at the Morvilliers storage centre managed by ANDRA.

Low and medium-level waste comes from nuclear facilities (gloves, filters, resins). This type of waste is stored at surface level at the Soulaïnes storage centre managed by ANDRA.

The cost of removing and storing short-lived waste (very low-level and low and medium-level) is assessed on the basis of current contracts with transporters and contracts with ANDRA for operation of the existing storage centres.

## 28.2 PROVISION FOR WASTE REMOVAL AND CONDITIONING - PROVISION FOR LONG-TERM RADIOACTIVE WASTE MANAGEMENT

### Provisions for waste removal and conditioning

The provisions for waste removal and conditioning are reported separately from 1 January 2017.

They cover the following future expenses for radioactive waste resulting from operations or decommissioning (apart from spent fuel):

- characterisation and conditioning of waste;
- interim storage of waste.

Equipment assembly for the conditioning and intermediate storage facility for radioactive waste (*Installation de conditionnement et d'entreposage des déchets activés* – ICEDA) was completed in December 2018 and pre-service testing is currently in process. Information on the identification of EIP equipment (equipment that is important for protection of interests) has been added to the commissioning permit application (DAMS) which has now been sent to the ASN. The objective is to open the storage facility in September 2019.

### Provisions for long term radioactive waste management

These provisions concern future expenses for:

- removal and storage of radioactive waste resulting from decommissioning of nuclear installations operated by EDF;
- interim storage (reclassification in 2018 of €298 million from the provision for spent fuel management (see note 28.1), removal and storage of radioactive waste packages resulting from spent fuel processing;
- direct storage, where relevant, of spent fuel that cannot be recycled in existing installations: specifically plutonium fuel (MOX) or uranium fuel derived from enriched processing, and fuel from Creys-Malville and Brennilis;
- EDF's share of the costs of studies, construction, operation and maintenance, shutdown and surveillance of existing and future storage centres.

The volumes of waste concerned by provisions include existing packages of waste and all waste to be conditioned, resulting from plant decommissioning or spent fuel processing at La Hague (comprising all fuel in reactors at 31 December, irradiated or otherwise). These volumes are regularly reviewed, in keeping with the data declared for the purposes of the national waste inventory undertaken by ANDRA.

### Long lived low level waste

Long-lived low-level waste belonging to EDF essentially consists of graphite waste from the ongoing decommissioning of the former UNGG (natural uranium graphite gas-cooled) reactors.

As this waste has a long lifetime, but is lower-level than long-lived medium and high-level waste, specific subsurface storage requirements apply under the French Law of 28 June 2006.

Following the initial geological investigations, in July 2015 ANDRA remitted a report on the proposed storage centre for long-lived low-level waste on a site located in the Soulaïnes region (Aube) in France. This report was submitted to the ASN for its opinion. Uncertainties remain about the site's capacity to accommodate all of the waste included in the baseline inventory of the long-lived low-level waste storage facility. Further studies are planned under the 2016-2018 National Plan for the Management of Radioactive Materials and Waste, concerning both the

feasibility of this storage centre and the search for additional waste management solutions. A general industrial plan for management of all long-lived low-level radioactive waste is also to be remitted by the end of 2019.

### Long lived medium and high level waste

Long-lived medium and high-level waste essentially comes from processing of spent fuel, and to a lesser extent waste resulting from nuclear plant decommissioning (metallic components that have been inside the reactor).

The French Law of 28 June 2006 requires reversible storage in deep geological layers for this type of waste.

The provision established for long-lived medium and high-level waste is the largest component of provisions for long-term radioactive waste management.

Until June 2015 the gross value and disbursement schedules for forecast expenses were based on a scenario of industrial geological waste storage, following conclusions presented in the first half of 2005 by a working group formed under supervision of the State involving representatives of the administrations concerned, ANDRA and the producers of waste (EDF, Orano, CEA). EDF applied a reasonable approach to information supplied by this working group, leading to a benchmark cost, for storage of waste from all producers, of €14.1 billion under the economic conditions of 2003 (€20.8 billion under 2011 economic conditions).

In 2012 ANDRA carried out preliminary conceptional studies for the Cigéo geological storage project, after discussing the technical optimisations proposed by the producers of waste.

On this basis, ANDRA drew up figures which, in compliance with the Law of 28 June 2006, were subjected to a consultation process with waste producers started in late 2014 by the French Department for Energy and Climate (*Direction générale de l'énergie et du climat* or DGECL). In April 2015 EDF and the other producers sent the DGECL their comments on ANDRA's report and a joint estimation of the target Cigéo storage cost due to divergent approaches. All this information was included, together with the ASN's opinion, in a report submitted to the Minister for Ecology, Sustainable Development and Energy.

On 15 January 2016 the Ministry of Ecology, Sustainable Development and Energy issued a Ministerial Order setting the target cost for the Cigéo storage project at €25 billion under 2011 economic conditions. The cost as defined constitutes an objective to be met by ANDRA, in compliance with safety standards set by the ASN, working in close liaison with the operators of nuclear installations.

Publication of this Order entailed an €820 million adjustment to the provision shown in EDF's financial statements at 31 December 2015. The cost of the Cigéo project defined in the Order has replaced the estimated benchmark cost of €20.8 billion previously used by EDF for its financial statements.

In application of this Ministerial Order, the cost of the Cigéo project will be regularly updated, at least at each key milestone in the course of the project's development (authorisation to create the facility, commissioning, end of the "pilot industrial phase", safety reviews) in accordance with the opinion of the ASN.

Design studies for future facilities are currently in process with ANDRA and stakeholders. They include technical and economic optimisation and the responses to the safety option report sent by ANDRA to the ASN in April 2016. The law of 11 July 2016 also clarified the concept of reversibility. In 2017 ANDRA opted for a new configuration to provide the basis for the preliminary project.

Under the schedule prepared by ANDRA, the application to build Cigéo (classified as a basic nuclear facility) should be made during 2019 and permission is expected to be granted in 2022. After an industrial pilot phase starting in 2026, the first waste packages should be received in 2031.

On 11 January 2018, the ASN issued its opinion on the Cigéo safety option file (DOS Cigéo). It considered that the project had reached satisfactory overall technological maturity at that stage and required examination of alternatives to the proposals for storage of bituminous waste at Cigéo. In September 2018, prior to filing an application for authorisation to create Cigéo in 2019, a group of experts was appointed by the DGECL to draw up a report on current bituminous waste management practices, focusing on three themes: knowledge of bituminous waste and its behaviour, neutralisation processes, and storage arrangements.

## 28.3 DECOMMISSIONING PROVISIONS FOR NUCLEAR POWER PLANTS

EDF bears full technical and financial responsibility for decommissioning of the nuclear plants it operates. The decommissioning process is governed by French Law of 13 June 2006, Decree 2007-1557 of 2 November 2007, and the French Environment Code (Articles L593-25 and following). It involves the following operations for each site:

- a shutdown declaration, to be made at least two years prior to the planned shutdown date;
  - since the Energy Transition Law of 17 August 2015, the final shutdown, which takes place during the operating phase of the basic nuclear facility, is considered separately from dismantling, as a notable change of lesser importance (simply requiring a declaration by the operator to the Minister and the ASN);
- an application for decommissioning, which after examination by the authorities and a public inquiry, leads to a single decree authorising the decommissioning;
- key progress reviews with the ASN, included in a formal safety procedure specific to dismantling operations;
- an internal authorisation procedure for the operator, independent of operational personnel and audited by the ASN, allowing some specific work to be started ahead of the authorised safety procedure;
- finally, once these operations are complete, declassification of the facility to remove it from the legal regime governing basic nuclear facilities.

The decommissioning scenario adopted by EDF complies with France's environmental code, which requires as short a period as possible to elapse between final shutdown and dismantling in economically acceptable conditions and in compliance with the principles laid down in Article L1333-1 of the public health code (radioprotection) and section II of Article L.110-1 of the environmental code (protection of the environment). The intended end-state is industrial use: the sites will be restored to their original condition and will be reusable for industrial facilities.

The ongoing operations concern plants that were constructed and operated before the current nuclear fleet ("first-generation" plants), and the Superphenix plant and Irradiated Materials Workshop at Chinon. These operations cover four different technologies: a heavy water reactor (Brennilis), a sodium-cooled fast-neutron reactor (the Superphenix at Creys-Malville), natural uranium graphite gas-cooled (UNGG) reactors (at Chinon, Saint Laurent and Bugey) and a pressurised water reactor (PWR at Chooz). Each of them is a first for EDF, and apart from the PWR, they concern reactor technologies for which there is little or no international experience. They therefore require development of new methods and technologies that are riskier than technologies for which feedback already exists. Decommissioning of the Chooz PWR is benefiting from past experience (essentially in the US and limited), but the reactor has the specificity of being located in a cave, making this a unique operation, generating experience that is not immediately transposable and involves specific risks.

The experience gained from dismantling the Chooz PWR will make the studies and estimates of future decommissioning of the nuclear fleet currently in operation ("second-generation" plants) as robust as possible. But so far, neither EDF nor any other operator has begun a decommissioning programme on a scale comparable to the current PWR fleet, and as a result the estimates include both opportunities and risks, especially the risks associated with the scale effect.

The decommissioning provisions cover future decommissioning expenses as described above (excluding the cost of removing and storing waste, which is covered by the provisions for long-term waste management).

The preliminary dismantling plan and the priority areas for the fourth periodic review of Fessenheim (RP4) were sent to the ASN in July 2018, with the objective of filing the dismantling and RP4 documents in mid-2020.

The Consolidated Preliminary Plan (*Avant-projet consolidé* or APC) is currently being finalised, with studies expanding on the Summary Preliminary Plan (*Avant-projet sommaire* or APS), derisking, etc.

Details of changes in decommissioning provisions for nuclear power plants are as follows:

(in millions of euros)	2017	Increases		Decreases	Other changes <sup>(2)</sup>	2018
		Operating	Financial <sup>(1)</sup>	Utilisation		
Provisions for decommissioning of nuclear plants in operation	11,616	-	482	(17)	399	12,480
Provisions for decommissioning of shut-down nuclear plants	3,304	52	270	(121)	-	3,505
<b>TOTAL PROVISIONS FOR NUCLEAR PLANT DECOMMISSIONING</b>	<b>14,920</b>	<b>52</b>	<b>752</b>	<b>(138)</b>	<b>399</b>	<b>15,985</b>

(1) Cost of unwinding the discount and effects of changes in the net discount rate for provisions without related assets.

(2) These are changes of estimate with a corresponding adjustment to property, plant and equipment (see note 1.15.1) or reclassifications of provisions.

### For nuclear power plants currently in operation (PWR pressurized water reactor plants with 900MW, 1,300MW and N4 reactors)

Until 2013, provisions were estimated based on a 1991 study by the French Ministry of Trade and Industry, which set an estimated benchmark cost for decommissioning expressed in €/MW, confirming the assumptions defined in 1979 by the PEON commission. These estimates had been confirmed from 2009 by a detailed study of decommissioning costs conducted by EDF at the representative site of Dampierre (four 900MW units), and its results were corroborated by an intercomparison with the study carried out by consultants La Guardia, based mainly on the Maine Yankee reactor in the US.

In 2014 the Dampierre study was reviewed by EDF to make sure that the previous calculations were still valid in view of recent developments and experience, both internationally and internally. For this revision, the decommissioning provisions for plants in operation were based on costs resulting from the Dampierre study, in order to incorporate best estimates and feedback from inside and outside France. This change of estimate had no significant impact on the level of provisions at 31 December 2014.

Between June 2014 and July 2015, an audit of dismantling costs for EDF's nuclear fleet currently in operation was conducted by specialised consulting firms, at the request of the French Department for Energy and Climate (*Direction générale de l'énergie et du climat* or DGEC). On 15 January 2016 the DGEC published a summary of the audit report. It stated that although estimating the cost of decommissioning nuclear reactors is a demanding exercise due to relatively limited past experience, the prospects of changes in techniques, and the distant timing of the expenditure, overall, the audit confirmed EDF's estimate of decommissioning costs for its nuclear fleet currently in operation. The DGEC also made a number of recommendations to EDF following this audit.

In 2016, EDF revised the decommissioning estimate, in order to incorporate the audit recommendations and past experience gained from dismantling operations for first-generation reactors (particularly Chooz A).

A detailed analytical approach was used to revise this estimate, identifying all costs for the engineering, construction work, operation and waste processing involved in future decommissioning of reactors currently in operation. This led to figures based on detailed timetables for plant decommissioning. The approach adopted made it possible to explore more thoroughly the assessment of costs specific to the initial units of each series, estimated for each series based on transposition coefficients applied to the baseline costs for the initial 900MW unit, and the series and mutualisation effects, as these costs and effects are inherent to the fleet's size and configuration.

The natures of the principal mutualisation and series effects used to arrive at the estimate are explained below.

There are several types of mutualisation effects:

- some of them relate to the fact that several reactors may share common buildings and facilities on the same site, and these buildings and facilities will not have to be decommissioned twice. Structurally, decommissioning a pair of reactors on the same site costs less than decommissioning two standalone reactors on two different sites. In France, unlike other countries, there are no single reactors but sites with two or four, and in one case six reactors;
- certain costs are no higher when 2 or 4 reactors are decommissioned on the same site. This is usually the case for surveillance costs and cost of maintaining safe operating conditions on the site;
- waste processing in centralised facilities (for example for dismantling major components) costs less than having several waste processing facilities at the decommissioning location.

Series effects are mainly of two types:

- first, in a fleet using the same technology, many of the studies do not need to be repeated each time;
- second, in a fleet using the same technology, robots and tooling can be largely reused from one site to another.

Such series effects are comparable in nature to the effects observed during construction of the fleet, in terms of studies or component manufacturing plants.

For example, for the 900MW fleet, a series effect of approximately 20% is expected between the first-of-kind reactor with 2 units and an average 2-unit reactor.

Series and mutualisation effects in particular explain why it is not appropriate simply to compare the average decommissioning cost per reactor between the French fleet and other countries' nuclear fleets.

The figures only marginally reflect changes in productivity and the learning effect. The external audit of the decommissioning cost for the fleet currently in operation, ordered by the DGEC, considered that the learning effect incorporated into the estimate was conservative.

For reasons of prudence, the estimate also includes an assessment of risks, contingencies and uncertainties.

EDF considers that the work done to revise the estimate answers the recommendations issued after the audit. The approach adopted and its results have been presented to the administrative authority and gave rise to further questions and discussion.

EDF is also continuing to support its analyses through an international comparison, making it sure it takes into consideration a number of factors that could distort direct comparisons, for example differences in the scope concerned by costs estimate, or national and regulatory contexts.



The results of this detailed approach led to limited changes overall in the cost estimate and the associated provisions at 31 December 2016, apart from the consequences of the change in the depreciation period for 900MW series plants (excluding Fessenheim) at 1 January 2016, and the effect of changes in discount rates at 31 December 2016, i.e.:

- an increase of €321 million in the estimated decommissioning costs and an increase of €334 million in the estimated cost of long-term management of long-lived medium-level waste;
- a decrease of €(451) million in the provision for plant decommissioning, and an increase of €162 million in the provision for long-term management of long-lived medium-level waste, with corresponding changes in the underlying assets.

After its revision in 2016, it was decided that the estimate would be reviewed annually. The 2017 and 2018 reviews led to non-significant adjustments.

### For permanently shut down nuclear power plants

Unlike the PWR fleet currently in operation, the first-generation reactors now shut down used a range of different technologies: a PWR reactor at Chooz A, UNGG (natural uranium graphite gas-cooled) reactors at Bugey, St-Laurent and Chinon, a heavy water reactor at Brennilis, and a sodium-cooled fast neutron reactor at Creys-Malville.

The decommissioning costs are based on contractor quotes, which take account of accumulated industrial experience, unforeseen and regulatory developments, and the latest available figures.

In 2015 the industrial decommissioning strategy for UNGG plants was totally revised. The previously selected strategy was based on a scenario involving “underwater” dismantling of caissons (UNGG reactor buildings) for four of the reactors, with direct graphite storage in a centre currently under examination by ANDRA (see long-lived low-level waste, note 28.2). Several new technical developments showed that the alternative “in-air” dismantling solution for the caissons would improve industrial control of operations and was apparently more favourable in terms of safety, radioprotection and environmental impact. The Company therefore selected a new “in-air” dismantling scenario as the benchmark strategy for all six caissons. This scenario includes a consolidation phase, building on experience acquired from dismantling the first caisson before beginning work on the other five. The decommissioning phase will ultimately be longer than previously planned, leading to higher contractor quotes due to the induced operating costs.

Updating the industrial decommissioning scenario for first-generation power plants, particularly UNGG plants, led to a €590 million increase in the provision at 31 December 2015.

The amended industrial scenario was presented to the ASN’s commissioners on 29 March 2016.

At the request of the ASN, an independent expert review was ordered in the first quarter of 2017 to analyse EDF’s chosen solutions for decommissioning of its six UNGG reactors. The conclusions supported the main options chosen. A meeting took place with the ASN commissioners in June 2017 based on these conclusions and a justification file remitted by EDF the previous March.

The strategy file, the safety option report concerning establishment of a secure configuration, and the detailed timetable for operations over the period 2017-2032 were sent to the ASN in late December 2017. In 2018 the ASN issued its main questions and conclusions about the UNGG strategy file. “In-air” dismantling for all reactors, the usefulness of an industrial demonstrator, and the timetable for dismantling the first-of-a-kind reactor (Chinon A2) appear to be settled, but discussions are continuing regarding the dismantling timetable for the other 5 reactors. EDF’s proposed schedule allows for significant experience-based adjustments (after dismantling the first reactor) before beginning the larger-scale phases. While acknowledging the need to incorporate experience from the first-of-a-kind reactor, the ASN has so far not expressed an opinion on the timetable as a whole. At a meeting on 12 February 2019 EDF presented all the information

justifying its proposed timetable to the ASN’s panel of commissioners. The ASN is expected to issue draft decisions in 2019 that will be submitted for public consultation.

Due to uncertainties over the complex operations to be undertaken (particularly development of new methods and technologies), the provisions are very sensitive to the sequencing of operations, and the overall timetable for dismantling all six reactors. If EDF were ultimately to amend the timetable of decommissioning operations (shortening the sequence), that would entail an increase in provisions.

After the revision of the estimated cost in 2015, the decision was made that it should be reviewed annually. The 2016 review led to non-significant adjustments, apart from one increase of €125 million for a specific installation (the Irradiated Materials Workshop at Chinon). The 2017 and 2018 reviews led to non-significant adjustments.

## 28.4 PROVISIONS FOR LAST CORES

These provisions cover the future expenses resulting from scrapping fuel that will only be partially irradiated when the reactor is shut down. They are measured based on:

- the cost of the loss on fuel in the reactor that is not totally spent at the time of final reactor shutdown and cannot be reused due to technical and regulatory constraints;
- the cost of fuel processing, and waste removal and storage operations. These costs are valued in a similar way to provisions for spent fuel management and long-term radioactive waste management.

These unavoidable costs are components of the cost of nuclear reactor shutdown and decommissioning. As such, they are fully covered by provision from the commissioning date and an asset associated with the provision is recognised.

## 28.5 DISCOUNTING OF PROVISIONS RELATED TO NUCLEAR GENERATION AND SENSITIVITY ANALYSES

### 28.5.1 Discount rate

#### Calculation of the discount rate

The discount rate is determined based on long-series data for a sample of bonds with maturities as close as possible to that of the liability. However, some expenses covered by these provisions will be disbursed over periods significantly longer than the duration of instruments generally traded on the financial markets.

The benchmark used to determine the discount rate is the sliding 10-year average of the return on French OAT 2055 treasury bonds, which have a similar duration to the obligations, plus the spread of corporate bonds rated A to AA, which include EDF.

The methodology used to determine the discount rate, particularly the reference to sliding 10-year averages, is able to prioritise long-term trends in rates, in keeping with the long-term horizon for disbursements. The discount rate is therefore revised in response to structural developments in the economy leading to medium and long-term changes.

The assumed inflation rate is determined in line with the forecasts provided by consensus and expected inflation based on the returns on inflation-linked bonds.

The discount rate determined in this way is 3.9% at 31 December 2018, assuming inflation of 1.5% (4.1% and 1.5% respectively at 31 December 2017), giving a real discount rate of 2.4% at 31 December 2018 (2.6% at 31 December 2017).

### Regulatory discount rate limit

The discount rate applied must also comply with two regulatory limits. Under the amended decree of 23 February 2007 and the ministerial order of 21 March 2007, itself modified by the order of 29 December 2017, the discount rate must be lower than:

- a regulatory maximum, set until 31 December 2026 as the weighted average of two terms, the first set at 4.3%, and the second corresponding to the arithmetic average over the 48 most recent months of the TEC 30-year rate plus 100 points. The weighting given to the first constant term of 4.3% reduces on a straight-line basis from 100% at 31 December 2016 to 0% at 31 December 2026;
- and the expected rate of return on assets covering the liability (dedicated assets).

The ceiling rate based on the TEC 30-year rate is 4.0% (3.97%, rounded up to 4.0%) at 31 December 2018 (4.1% at 31 December 2017).

The discount rate used at 31 December 2018 is 3.9%.

### 28.5.2 Analyses of sensitivity to macro-economic assumptions

Sensitivity to assumptions concerning costs, inflation rate, discount rate, and disbursement schedules can be estimated through comparison of the gross amount estimated under year-end economic conditions with the present value of the amount.

	2018		2017	
	Costs based on year-end economic conditions	Amounts in provisions at present value	Costs based on year-end economic conditions	Amounts in provisions at present value
<i>(in millions of euros)</i>				
Spent fuel management	18,737	10,698	19,058	10,786
Provisions for removal and conditioning of waste	1,194	751	1,203	726
Long-term radioactive waste management	30,970	9,846	29,396	8,814
<b>BACK-END NUCLEAR CYCLE EXPENSES</b>	<b>50,901</b>	<b>21,295</b>	<b>49,657</b>	<b>20,326</b>
Decommissioning provisions for nuclear power plants in operation	20,755	12,480	20,563	11,616
Decommissioning provisions for shut-down nuclear power plants	6,576	3,505	6,472	3,304
Provisions for last cores	4,346	2,526	4,332	2,387
<b>DECOMMISSIONING AND LAST CORE EXPENSES</b>	<b>31,677</b>	<b>18,511</b>	<b>31,367</b>	<b>17,307</b>

This approach can be complemented by estimating the impact of a change in the discount rate on the discounted value.

In application of Article 11 of the decree of 23 February 2007, the following table reports these details for the main components of provisions for the back-end of the nuclear cycle, decommissioning of nuclear plants and last cores for EDF:

	Amounts in provisions at present value	Sensitivity to discount rate			
		Balance sheet provision		Pre-tax net income	
	31/12/2018	+0.20%	-0.20%	+0.20%	-0.20%
<i>(in millions of euros)</i>					
<b>BACK-END NUCLEAR CYCLE EXPENSES</b>					
■ spent fuel management	10,698	(218)	237	185	(202)
■ removal and conditioning of waste	751	(23)	25	14	(15)
■ long-term radioactive waste management	9,846	(597)	780	498	(673)
<b>DECOMMISSIONING AND LAST CORE EXPENSES</b>					
■ decommissioning of nuclear power plants in operation	12,480	(496)	520	7	(7)
■ decommissioning of shut-down nuclear power plants	3,505	(138)	149	138	(149)
■ last cores	2,526	(88)	94	-	-
<b>TOTAL</b>	<b>39,806</b>	<b>(1,560)</b>	<b>1,805</b>	<b>842</b>	<b>(1,046)</b>

## NOTE 29 OTHER PROVISIONS FOR DECOMMISSIONING

Other provisions for decommissioning principally concern fossil-fired power plants.

The costs of decommissioning fossil-fired power plants are calculated using regularly updated studies based on estimated future costs, measured by reference to the charges recorded on past operations and the most recent estimates for plants still in operation.

The provision recorded at 31 December 2018 reflects the most recent known contractor quotes and commissioning of new generation assets.

## NOTE 30 PROVISIONS FOR EMPLOYEE BENEFITS

Changes in provisions for employee benefits were as follows:

(in millions of euros)	31/12/2017	Increases		Decreases		31/12/2018
		Operating <sup>(1)</sup>	Financial	Operating <sup>(2)</sup>	Financial <sup>(3)</sup>	
Provisions for post-employment benefits	10,056	796	556	(837)	(267)	10,304
Provisions for long-term benefits	999	36	18	(117)	-	936
<b>PROVISIONS FOR EMPLOYEE BENEFITS</b>	<b>11,055</b>	<b>832</b>	<b>574</b>	<b>(954)</b>	<b>(267)</b>	<b>11,240</b>

(1) Including a past service cost of €529 million, amortisation of actuarial losses amounting to €293 million, and unvested benefits of €10 million.

(2) Including €(885) million for employers' contributions and €(68) million for actuarial gains.

(3) For the expected return on fund assets.

### DETAILS OF CHANGES IN PROVISIONS:

(in millions of euros)	Obligations	Fund assets	Obligations net of fund assets	Unrecognised past service cost	Unrecognised actuarial gains and losses	Provision in the balance sheet
<b>BALANCE AT 31/12/2017</b>	<b>30,108</b>	<b>(11,366)</b>	<b>18,742</b>	<b>(49)</b>	<b>(7,638)</b>	<b>11,055</b>
Net expense for 2018	1,104	(268)	836	10	225	1,071
Unrecognised actuarial gains and losses	(3,013)	305	(2,708)	-	2,708	-
Contributions to funds	-	(30)	(30)	-	-	(30)
Benefits paid	(1,302)	446	(856)	-	-	(856)
<b>BALANCE AT 31/12/2018</b>	<b>26,897</b>	<b>(10,913)</b>	<b>15,984</b>	<b>(39)</b>	<b>(4,705)</b>	<b>11,240</b>

Actuarial gains and losses on obligations amount to €3,013 million for 2018, reflecting the change in the discount rate (€2,036 million), the update of the mortality table (€408 million), the update of the wage increase rates (€356 million), and experience adjustments of €(13) million.

### POST EMPLOYMENT AND LONG TERM EMPLOYEE BENEFIT EXPENSES:

(in millions of euros)	31/12/2018	31/12/2017
Current service cost	529	530
Interest expenses (discount effect)	574	584
Expected return on fund assets	(267)	(266)
Amortisation of unrecognised actuarial gains and losses - post-employment benefits	241	283
Change in actuarial gains and losses - long-term benefits	(16)	42
Effect of plan curtailment or settlement	-	-
Past service cost - vested benefits	-	-
Past service cost - unvested benefits	10	10
<b>NET CHARGES RELATED TO POST-EMPLOYMENT BENEFITS AND LONG-TERM BENEFITS</b>	<b>1,071</b>	<b>1,184</b>
<b>including:</b>		
Operating expenses <sup>(1)</sup>	764	865
Financial expenses	307	318

(1) In 2018, this amount principally corresponds to operating increases of €832 million net of reversals for actuarial gains and losses (€68) million).

### 30.1 PROVISIONS FOR POST-EMPLOYMENT BENEFITS

Details of these provisions are shown below:

(in millions of euros)	31/12/2017	Increases		Decreases		31/12/2018
		Operating	Financial	Operating	Financial	
<b>Provisions for post-employment benefits</b>	<b>10,056</b>	<b>796</b>	<b>556</b>	<b>(837)</b>	<b>(267)</b>	<b>10,304</b>
<b>comprising:</b>						
Pensions	7,331	501	431	(648)	(257)	7,358
CNIEG expenses	449	8	9	(13)	-	453
Benefits in kind (energy)	1,725	198	87	(122)	-	1,888
Retirement gratuities	(15)	40	12	(32)	(10)	(5)
Other benefits	567	49	17	(22)	-	611

(in millions of euros)	Obligations	Fund assets	Unrecognised past service cost	Unrecognised actuarial gains and losses	Provision in the balance sheet
<b>Provisions for post-employment benefits at 31/12/2018</b>	<b>25,961</b>	<b>(10,913)</b>	<b>(39)</b>	<b>(4,705)</b>	<b>10,304</b>
<b>comprising:</b>					
Pensions	20,036	(10,402)	-	(2,277)	7,358
CNIEG expenses	431	-	-	22	453
Benefits in kind (energy)	4,110	-	-	(2,222)	1,888
Retirement gratuities	550	(496)	(20)	(39)	(5)
Other benefits	834	(15)	(19)	(189)	611

(in millions of euros)	Obligations	Fund assets	Unrecognised past service cost	Unrecognised actuarial gains and losses	Provision in the balance sheet
<b>Provisions for post-employment benefits at 31/12/2017</b>	<b>29,109</b>	<b>(11,366)</b>	<b>(48)</b>	<b>(7,639)</b>	<b>10,056</b>
<b>comprising:</b>					
Pensions	22,582	(10,845)	-	(4,407)	7,331
CNIEG expenses	472	-	-	(23)	449
Benefits in kind (energy)	4,572	-	-	(2,847)	1,725
Retirement gratuities	584	(506)	(28)	(65)	(15)
Other benefits	899	(15)	(20)	(297)	567

### 30.2 PROVISIONS FOR OTHER LONG-TERM BENEFITS FOR CURRENT EMPLOYEES

The amount of obligations for other long-term benefits awarded to current employees is identical to the corresponding balance sheet provisions. Details are as follows:

(in millions of euros)	31/12/2017	Increases		Decreases		31/12/2018
		Operating	Financial	Operating	Financial	
<b>Provisions for other long-term benefits for current employees</b>	<b>999</b>	<b>36</b>	<b>18</b>	<b>(117)</b>		<b>936</b>
<b>comprising:</b>						
Annuities following work-related accident and illness	854	27	16	(98)		799
Long service awards	125	8	2	(17)		118
Other	20	1	-	(2)		19

### 30.3 FUND ASSETS

Fund assets amount to €10,913 million at 31 December 2018 (€11,366 million at 31 December 2017) and are principally allocated to coverage of the past

specific benefits earned under the special pension system (€10,402 million) and retirement gratuities (€496 million).

Investments under the contracts concerned break down as follows:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
<b>TOTAL FUND ASSETS</b>	<b>10,913</b>	<b>11,366</b>
<b>Assets funding special pension benefits</b>	<b>10,402</b>	<b>10,845</b>
(%)		
Equities	27%	30%
Bonds and monetary instruments	73%	70%
<b>Assets funding retirement gratuities</b>	<b>496</b>	<b>506</b>
(%)		
Equities	27%	32%
Bonds and monetary instruments	73%	68%
<b>Assets funding other benefits</b>	<b>15</b>	<b>15</b>

### 30.4 ACTUARIAL ASSUMPTIONS

The main actuarial assumptions used for provisions for post-employment benefits and long-term employee benefits under the IEG system are summarised below:

- the discount rate is 2.30% at 31 December 2018 (1.90% at 31 December 2017);
- the inflation rate is estimated at 1.50% at 31 December 2018 (1.50% at 31 December 2017);
- the average residual period of employment is 19.75 years;
- the staff turnover rate is considered non-significant;
- the "tarif agent" (special energy price for EDF employees) includes changes in taxes based on that tariff;
- the expected return on fund assets covering past specific benefits under the special pension system is 2.37% for 2018 (2.37% for 2017);
- the expected return on fund assets covering retirement gratuities is 1.99% for 2018 (1.99% for 2017).

The discount rate used for employee benefit obligations is determined by applying the yield rate on high-quality corporate bonds based on their duration to maturities corresponding to the future disbursements resulting from these obligations. For longer durations, the calculation also takes into consideration data from a wider selection of corporate bonds adjusted for comparability with the high-quality bonds, given the smaller panel of bonds with these durations since 2017.

Changes at 31 December 2018 in the economic and market parameters used have led EDF to set the discount rate at 2.30% at 31 December 2018 (1.90% at 31 December 2017).

The inflation rate used to calculate provisions for employee benefits is derived from an internally-determined inflation curve by maturity. The inflation rate determined in this way at 31 December 2018 is an average 1.50% (identical to the rate applied at 31 December 2017).

The obligations are based on wage increase assumptions that are differentiated by age group and employee category, with an average annual rise of 2.6% including inflation for a projected full career.

The mortality table used to calculate obligations is adjusted for specificities of the IEG (gas and electricity sector) system; in 2018 it was updated by using the INSEE 2013-2070 generation table (produced by the French statistics office), instead of the INSEE 2007-2060 generation table.

## NOTE 31 PROVISIONS FOR OTHER EXPENSES

(in millions of euros)	31/12/2017	Operating increases	Decreases		Other	31/12/2018
			Utilisations	Reversals		
Provisions for:						
■ personnel expenses	69	66	(44)	(8)	-	83
■ renewal of facilities operated under concessions	264	10	-	-	(6)	268
■ other expenses	605	70	(100)	(60)	-	515
<b>PROVISIONS FOR OTHER EXPENSES</b>	<b>938</b>	<b>146</b>	<b>(144)</b>	<b>(68)</b>	<b>(6)</b>	<b>866</b>

## NOTE 32 LIABILITIES

(in millions of euros)	Maturity			Gross value at 31/12/2018	Gross value at 31/12/2017
	< 1 year	1 - 5 years	> 5 years		
<b>Liabilities</b>					
Bonds	3,319	11,930	34,819	50,068	46,552
Borrowings from financial institutions	-	-	1,154	1,154	1,200
Other borrowings	1,999	6	6	2,011	1,962
Other financial liabilities:					
■ advances on consumption	1	5	20	26	27
■ other	1,385	-	-	1,385	1,700
<b>Financial liabilities (see note 33)</b>	<b>6,704</b>	<b>11,941</b>	<b>35,999</b>	<b>54,644</b>	<b>51,441</b>
<b>Advances and progress payments received <sup>(1)</sup></b>	<b>7,134</b>	<b>-</b>	<b>-</b>	<b>7,134</b>	<b>6,861</b>
Trade payables and related accounts	7,329	84	34	7,447	7,670
Tax and social security liabilities <sup>(2)</sup>	8,157	-	-	8,157	8,011
Liabilities related to fixed assets and related accounts	2,670	-	-	2,670	2,308
Other liabilities <sup>(3)</sup>	14,955	-	-	14,955	13,922
<b>Operating, investment and other liabilities</b>	<b>33,111</b>	<b>84</b>	<b>34</b>	<b>33,229</b>	<b>31,911</b>
<b>Cash instruments <sup>(4)</sup></b>	<b>1,805</b>	<b>620</b>	<b>1,037</b>	<b>3,462</b>	<b>4,471</b>
<b>Deferred income <sup>(5)</sup></b>	<b>580</b>	<b>907</b>	<b>1,629</b>	<b>3,116</b>	<b>3,285</b>
<b>TOTAL LIABILITIES</b>	<b>49,334</b>	<b>13,552</b>	<b>38,699</b>	<b>101,585</b>	<b>97,969</b>

(1) Advances and progress payments received principally include monthly standing order payments by EDF's residential and business customers, amounting to €6,827 million at 31 December 2018 (€6,568 million at 31 December 2017).

(2) In 2018 this item includes an amount of €1,521 million for the CSPE to be collected by EDF on energy supplied but not yet billed (€1,562 million in 2017).

(3) Mainly the amount of current accounts, cash pooling and cash management agreements with subsidiaries.

(4) Essentially unrealised losses on foreign exchange instruments.

(5) Deferred income at 31 December 2018 comprises the partner advances made to EDF under nuclear plant financing plans and the associated long-term contracts, amounting to €1,663 million (€1,711 million in 2017). Deferred income on long-term contracts also includes the advance paid to EDF in 2010 under the agreement with the Exeltium consortium. This advance is transferred to the income statement progressively over the term of the contract.



## NOTE 33 FINANCIAL LIABILITIES

<i>(in millions of euros)</i>	Balance at 31/12/2017	New borrowings	Repayments	Translation adjustments	Other	Balance at 31/12/2018
Bonds in euros	1,013	-	-	-	-	1,013
Bonds in other currencies <sup>(1)</sup>	12,438	3,214	-	677	-	16,329
Euro-Medium Term Notes (EMTN) in euros <sup>(2)</sup>	20,483	1,000	(1,500)	-	-	19,983
Euro-Medium Term Notes (EMTN) in other currencies	12,618	-	-	125	-	12,743
<b>Bonds</b>	<b>46,552</b>	<b>4,214</b>	<b>(1,500)</b>	<b>802</b>	-	<b>50,068</b>
Long-term loans in euros	1,200	-	(46)	-	-	1,154
<b>Borrowings from financial institutions</b>	<b>1,200</b>	<b>-</b>	<b>(46)</b>	<b>-</b>	<b>-</b>	<b>1,154</b>
Negotiable debt instruments in euros <sup>(3)</sup>	700	255	-	-	-	955
Negotiable debt instruments (non euro) <sup>(3)</sup>	1,247	-	(329)	123	-	1,041
Contractual financial borrowings	15	-	-	-	-	15
<b>Other borrowings</b>	<b>1,962</b>	<b>255</b>	<b>(329)</b>	<b>123</b>	-	<b>2,011</b>
<b>Total borrowings</b>	<b>49,714</b>	<b>4,469</b>	<b>(1,875)</b>	<b>925</b>	-	<b>53,233</b>
<b>Advances on consumption</b>	<b>27</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>(1)</b>	<b>26</b>
Miscellaneous advances	80	41	(13)	-	-	108
Bank overdrafts	433	-	-	-	(249)	184
Deferred bank debits	39	-	-	-	(10)	29
Interest payable	1,148	-	-	-	(84)	1,064
<b>Total other financial liabilities</b>	<b>1,700</b>	<b>41</b>	<b>(13)</b>	<b>-</b>	<b>(343)</b>	<b>1,385</b>
<b>TOTAL FINANCIAL LIABILITIES</b>	<b>51,441</b>	<b>4,510</b>	<b>(1,888)</b>	<b>925</b>	<b>(344)</b>	<b>54,644</b>

(1) On 19 September 2018, EDF raised USD3.75 billion through a multi-tranche senior bond issue (see note 2.2).

(2) On 25 September 2018, EDF launched a €1 billion senior bond issue (see note 2.2).

(3) Issues net of repayments.

## 33.1 BREAKDOWN OF LOANS BY CURRENCY, BEFORE AND AFTER HEDGING INSTRUMENTS

<i>(in millions of euros)</i>	Debt structure in balance sheet				Impact of hedging instruments		Debt structure after hedging			
	Non-euro	In euros	% Non-euro	% of debt	Non-euro	In euros	Non-euro	In euros	% Non-euro	% of debt
<b>Total I - Euros</b>		<b>23,120</b>		<b>43</b>		<b>26,828</b>		<b>49,948</b>		<b>94</b>
CHF	550	488	2	1	(550)	(488)	-	-	-	-
GBP	7,385	8,256	27	16	(3,000)	(3,354)	4,385	4,902	149	9
HKD	2,416	269	1	1	(2,416)	(269)	-	-	-	-
JPY	137,000	1,089	4	2	(137,000)	(1,089)	-	-	-	-
NOK	1,000	101	-	-	(1,000)	(101)	-	-	-	-
USD	22,798	19,910	66	37	(24,648)	(21,527)	(1,850) <sup>(1)</sup>	(1,617)	(49)	(3)
<b>Total II - Non euro currencies</b>		<b>30,113</b>	<b>100</b>	<b>57</b>		<b>( 26,828)</b>		<b>3,285</b>	<b>100</b>	<b>6</b>
<b>TOTAL I + II</b>		<b>53,233</b>		<b>100</b>				<b>53,233</b>		<b>100</b>

(1) Those derivatives hedge also a proportion of others liabilities in foreign currency.

The nominal value of hedging instruments included in off-balance sheet commitments (see note 35.1) has no effect on loans in the balance sheet.

### 33.2 BREAKDOWN OF LOANS BY TYPE OF INTEREST RATE BEFORE AND AFTER HEDGING

	Debt structure in balance sheet			Impact of hedging instruments	Debt structure after hedging		
	Total	% 31/12/2018	% 31/12/2017		Total	% 31/12/2018	% 31/12/2017
<i>(in millions of euros)</i>							
Long-term borrowings and EMTN	50,573			(23,142)	27,431		
Short-term borrowings	1,997			-	1,997		
<b>Borrowings at fixed rate</b>	<b>52,570</b>	<b>99</b>	<b>99</b>	<b>(23,142)</b>	<b>29,428</b>	<b>55</b>	<b>53</b>
Long-term borrowings and EMTN	663			23,142	23,805		
Short-term borrowings	-			-	-		
<b>Borrowings at floating rate</b>	<b>663</b>	<b>1</b>	<b>1</b>	<b>23,142</b>	<b>23,805</b>	<b>45</b>	<b>47</b>
<b>TOTAL</b>	<b>53,233</b>	<b>100</b>	<b>100</b>	<b>-</b>	<b>53,233</b>	<b>100</b>	<b>100</b>

### NOTE 34 UNREALISED FOREIGN EXCHANGE GAINS

Unrealised foreign exchange gains at 31 December 2018 amount to €296 million (€485 million at 31 December 2017), of which €140 million concerned two perpetual bonds in pounds sterling and €128 million concerned a bond in pounds sterling that is totally hedged by cross-currency swaps.

## OTHER INFORMATION

### NOTE 35 FINANCIAL INSTRUMENTS

#### 35.1 OFF-BALANCE SHEET COMMITMENTS RELATED TO CURRENCY AND INTEREST RATE DERIVATIVES

EDF uses financial instruments to limit the impact of foreign exchange rate risks and interest rate risks.

	31/12/2018		31/12/2017	
	To be received (notional)	To be given (notional)	To be received (notional)	To be given (notional)
<i>(in millions of euros)</i>				
<b>1 - Interest rate transactions</b>				
<b>Short-term interest rate swaps</b>				
EUR	-	-	-	-
<b>Long-term interest rate swaps</b>				
EUR	7,140	7,140	7,184	7,184
USD	2,795	2,795	3,043	3,043
GBP	4,845	4,845	3,593	3,593
JPY	-	-	-	-
<b>Sub-total</b>	<b>14,780</b>	<b>14,780</b>	<b>13,820</b>	<b>13,820</b>
<b>2 - Exchange rate transactions</b>				
<b>Forward transactions</b>				
EUR	22,438	22,982	20,232	22,032
CAD	325	190	637	525
USD	15,431	16,868	13,634	12,941
GBP	7,534	5,290	6,848	4,521
CHF	517	196	857	557
HUF	1	1	11	11
ILS	153	153	180	180
PLN	259	305	1,171	1,255
JPY	294	955	102	1,680
CNY	13	13	15	15
MXN	84	84	62	61
Other currencies	110	110	123	123
<b>Long-term currency swaps</b>				
EUR	8,578	38,230	9,099	33,253
JPY	1,089	-	1,015	103
USD	24,284	3,995	18,515	4,385
GBP	12,001	4,358	11,337	4,126
CHF	488	444	470	427
CAD	-	-	37	37
ILS	89	89	132	132
PLN	9	5	6	3
NOK	100	-	102	-
MXN	-	11	-	11
HKD	269	-	258	-
<b>Sub-total</b>	<b>94,066</b>	<b>94,279</b>	<b>84,843</b>	<b>86,378</b>
<b>3 - Securitisation swaps</b>	<b>194</b>	<b>194</b>	<b>264</b>	<b>264</b>
<b>4- Operations on market securities</b>	<b>1,136</b>	<b>1,280</b>	<b>-</b>	<b>-</b>
<b>Purchases and sales of options</b>				
<b>TOTAL FINANCIAL OFF-BALANCE SHEET COMMITMENTS</b>	<b>110,176</b>	<b>110,533</b>	<b>98,927</b>	<b>100,462</b>
<b>5- Commodity swaps</b>				
Coal <i>(in millions of tonnes)</i>	4	4	4	4
Oil products <i>(in thousands of barrels)</i>	7,252	7,252	7,348	7,348

The amounts shown in the above table are the nominal values of contracts, translated where necessary using 2018 year-end exchange rates (regardless of whether they are classified as hedges).

## 35.2 IMPACTS OF FINANCIAL INSTRUMENT TRANSACTIONS ON NET INCOME

(in millions of euros)

	2018	2017
<b>Instruments not classified as hedges</b>		
Interest rate instruments <sup>(1)</sup>	114	104
Forex instruments	156	(202)
<b>Instruments classified as hedges</b>		
Interest rate instruments	647	600
Forex instruments	172	442

(1) Including interest on swaps.

## 35.3 FAIR VALUE OF DERIVATIVE FINANCIAL INSTRUMENTS

The fair value of currency and interest rate swaps was calculated by discounting future cash flows using year-end market exchange and interest rates, over the remaining term of the contracts (market value includes accrued interest).

The book value of off-balance sheet derivatives includes accrued interest, equalisation payments and premiums paid or received, plus translation adjustments, which are already booked in EDF's accounts. The difference between book value and market value is the unrealised gain or loss.

The fair value of derivative financial instruments reported off-balance sheet at 31 December 2018 as calculated by EDF is as follows:

(in millions of euros)

	Book value	Fair value
<b>Interest rate hedges</b>		
■ Interest rate swaps	145	1,452
<b>Exchange rate hedges</b>		
■ Forward exchange transactions and currency swaps	(77)	(93)
■ Cross-currency swaps	1	(1,040)
<b>Equity risk hedges</b>		
■ Options on shares	20	20
<b>Commodity hedges</b>		
■ Coal	-	19
■ Oil products	-	42
<b>TOTAL</b>	<b>89</b>	<b>400</b>

## NOTE 36 OTHER OFF-BALANCE SHEET COMMITMENTS AND OPERATIONS

At 31 December 2018, off-balance sheet commitments related to operations, financing and investments (other than electricity supply commitments and partnership agreements) comprise the following:

(in millions of euros)	Maturity				31/12/2018	31/12/2017
	< 1 year	1 - 5 years	5 - 10 years	> 10 years		
<b>Off-balance sheet commitments given</b>	<b>13,088</b>	<b>19,516</b>	<b>12,513</b>	<b>8,748</b>	<b>53,865</b>	<b>55,539</b>
<b>Operating commitments</b>	<b>6,910</b>	<b>13,280</b>	<b>11,170</b>	<b>8,721</b>	<b>40,081</b>	<b>41,285</b>
■ Commitments related to fuel and energy purchases	3,942	10,603	9,149	8,538	32,232	32,660
■ Other operating commitments	2,968	2,677	2,021	183	7,849	8,625
<b>Investment commitments</b>	<b>3,315</b>	<b>2,986</b>	<b>577</b>	<b>24</b>	<b>6,902</b>	<b>7,255</b>
<b>Financing commitments</b>	<b>2,863</b>	<b>3,250</b>	<b>766</b>	<b>3</b>	<b>6,882</b>	<b>6,999</b>
<b>Off-balance sheet commitments received</b>	<b>3,469</b>	<b>9,052</b>	<b>585</b>	<b>162</b>	<b>13,268</b>	<b>13,805</b>
<b>Operating commitments</b>	<b>1,294</b>	<b>900</b>	<b>585</b>	<b>162</b>	<b>2,941</b>	<b>3,485</b>
<b>Investment commitments</b>	<b>21</b>	<b>10</b>	<b>-</b>	<b>-</b>	<b>31</b>	<b>36</b>
<b>Financing commitments</b>	<b>2,154</b>	<b>8,142</b>	<b>-</b>	<b>-</b>	<b>10,296</b>	<b>10,284</b>

### 36.1 COMMITMENTS GIVEN

In almost all cases, commitments given are reciprocal, and the third parties concerned are under an obligation to supply EDF with assets or services related to operating, investing and financing transactions.

At 31 December 2018, these commitments mature as follows:

(in millions of euros)	Maturity				31/12/2018	31/12/2017
	< 1 year	1 - 5 years	5 - 10 years	> 10 years		
Electricity purchases and related services	2,340	3,650	3,599	4,903	14,492	14,360
Nuclear fuel purchases	1,602	6,953	5,550	3,635	17,740	18,300
<b>FUEL AND ENERGY PURCHASE COMMITMENTS</b>	<b>3,942</b>	<b>10,603</b>	<b>9,149</b>	<b>8,538</b>	<b>32,232</b>	<b>32,660</b>

#### Electricity purchases and related services

Electricity purchase commitments mainly concern:

- Island Energy Systems (SEI), which has given commitments to purchase electricity generated from bagasse and coal, and electricity generated by the plants of EDF's subsidiary PEI;
- hedging contracts: these are forward purchases, for which the volumes and prices are set in contracts with EDF Trading.

In addition to the obligations reported above and under Article 10 of the Law of 10 February 2000, in mainland France EDF is obliged, at the producer's request and subject to compliance with certain technical features, to purchase the power produced by co-generation plants and renewable energy generation units (wind turbines, small hydro-electric plants, photovoltaic power, etc).

The additional costs generated by this obligation are compensated, after validation by the CRE, by the CSPE. These purchase obligations total 53TWh for 2018 (47TWh for 2017), including 7TWh for co-generation (6TWh for 2017), 26TWh for wind power (23TWh for 2017), 9TWh for photovoltaic power (9TWh for 2017) and 3TWh for hydropower (3TWh for 2017).

#### Nuclear fuel purchases

Commitments for purchases of nuclear fuel arise from supply contracts for the nuclear plants intended to cover EDF's needs for uranium and fluorination, enrichment and fuel assembly production services.

The decrease in nuclear fuel purchases in 2018 is mainly explained by the execution of existing contracts.

### 36.1.1 Fuel and energy purchase commitments

In the course of its ordinary generation and supply activities, EDF has entered into long-term contracts for purchases of electricity, other energies and commodities and nuclear fuel, for periods of up to 20 years.

### 36.1.2 Other operating commitments

These are mostly commitments undertaken by EDF through signature of orders relating to operations or contracts in progress, related guarantees, and commitments as lessee under irrevocable operating lease contracts principally for premises, equipment and vehicles. The corresponding rents are subject to renegotiation at intervals defined in the contracts.

The decrease in these commitments is explained by the expiry of guarantees previously given in connection with tax disputes.

### 36.1.3 Investment commitments

Investment commitments are mostly commitments for acquisition of property, plant and equipment. The decrease in EDF's commitments for acquisition of intangible assets and property, plant and equipment is mainly explained by progress on the Flamanville 3 EPR project.

### 36.1.4 Financing commitments

These are commitments by EDF to its subsidiaries, in 2018 mainly €2,060 million to EDF Trading, €980 million to EDF Renewables, €929 million to Edison, €805 million to EDF International, €800 million to Enedis and €750 million to EDF Energy.

## 36.2 COMMITMENTS RECEIVED

### 36.2.1 Operating commitments

These commitments mainly comprise:

- operating lease commitments received as lessor;
- operating guarantees received;
- operating sale commitments, essentially concerning engineering services for HPC;
- personnel secondment commitments to Edvance.

### 36.2.2 Financing commitments

These commitments correspond to the total value of credit lines available to EDF from various banks.

## 36.3 OTHER TYPES OF COMMITMENT

### 36.3.1 Electricity supply commitments

In the course of its business, EDF has signed long-term contracts to supply electricity as follows:

- long-term contracts with a number of European electricity operators, for a specific plant or for a defined group of plants in the French nuclear generation fleet, corresponding to installed power capacity of 3.5GW;
- in execution of France's NOME Law on organisation of the French electricity market, EDF has a commitment to sell some of the energy generated by its existing nuclear power plants to other suppliers. This covers volumes of up to 100TWh each year until 31 December 2025.

### 36.3.2 Gas purchases and related services

Gas purchase commitments are given by EDF in connection with its expanding gas supply business.

Gas purchases for supply, delivery and storage are mostly undertaken through long-term contracts and forward purchases from EDF Trading.

Under the contract with the Dunkerque LNG methane terminal, EDF benefits from approximately 61% of the terminal's regasification capacities until 2037, in return for payment of an annual premium of approximately €150 million. A provision for onerous contracts has been recorded in connection with this contract – see note 2.1.

## NOTE 37 CONTINGENT LIABILITIES

### Tax inspections

For the period 2008 to 2015, EDF was notified of proposed tax adjustments, notably concerning the tax-deductibility of certain long-term liabilities. This recurrent reassessment, which is applied for each year, represents a cumulative financial risk of some €563 million in income taxes at 31 December 2018. In September 2017 the Montreuil Administrative Court issued two rulings that recognised the tax-deductibility of these liabilities and validated the position taken by the Company.

For the years 2012 to 2015, the French tax authorities notified the Company of certain recurrent tax reassessments concerning the *Contribution sur la valeur ajoutée des entreprises* (tax on corporate value added), and questioned the deductibility of long-term provisions.

### Labour litigations

EDF is party to a number of labour lawsuits, primarily regarding working hours. EDF estimates that none of these lawsuits, individually, is likely to have a significant impact on its financial results or financial position. However, because they relate to situations that could concern a large number of EDF's employees, any increase in such litigations could have a potentially negative impact on EDF's financial position (although the risk has been mitigated by the signature of the agreement on fixed numbers of working days in 2016).



## NOTE 38 DEDICATED ASSETS

### 38.1 REGULATIONS

Article L. 594 of France's Environment Code and its implementing regulations require assets (dedicated assets) to be set aside for secure financing of nuclear plant decommissioning expenses and long-term storage expenses for radioactive waste. These regulations govern the way dedicated assets are built up, and the management and governance of the funds themselves. Dedicated assets are clearly identified and managed separately from the Company's other financial assets and investments. They are also subject to specific monitoring and control by the Board of Directors and the administrative authorities.

The law requires the realisable value of dedicated assets to be higher than the value of the provisions corresponding to the present value of the long-term nuclear expenses defined above.

The Decree of 29 December 2010 made RTE shares eligible for inclusion in dedicated assets subject to certain conditions and administrative authorisation. The Decree of 24 July 2013 also revised the list of eligible assets by reference to the Insurance Code, making unlisted assets eligible subject to certain conditions.

The Decree of 24 March 2015 contains two measures concerning dedicated assets:

- the annual allocation to dedicated assets, net of any increases to provisions, must be positive or zero as long as their realisable value is below 110% of the amount of the provisions concerned;
- subject to certain conditions, real estate property owned by the operators of nuclear facilities may be allocated to coverage of these provisions.

Subject to certain conditions, the Decree of 19 December 2016 authorised allocation of the shares of CTE, which holds 100% of the capital of RTE, to the portfolio of dedicated assets at 31 December 2017 (see note 38.2.2 below).

EDF also received ministerial authorisation on 31 May 2018 to increase the portion of unlisted assets in its dedicated assets from 10% to 15% subject to conditions (this does not apply to the shares of CTE or real estate assets).

### 38.2 PORTFOLIO CONTENTS AND MEASUREMENT

Given the applicable regulations, these dedicated assets are a highly specific category of assets.

Dedicated assets are structured and managed according to a strategic allocation defined by the Board of Directors and reported to the administrative authorities. The strategic allocation is designed to meet the overall objective of long-term coverage of obligations, and determines the structure and management of the portfolio as a whole. It takes into account regulatory constraints concerning the nature and liquidity of the dedicated asset, the financial outlook for the equity and bond markets, and the diversifying contribution of unlisted assets.

As part of the strategic allocation review process and in order to pursue the diversification into unlisted assets begun in 2010 with the shares in RTE, in 2013 the Board of Directors approved the introduction of an unlisted asset portfolio alongside the diversified equity and bond investments. This portfolio is managed by the EDF Invest Division, which was formed following the Decree of 24 July 2013 on securing the funding for nuclear expenses. EDF Invest has the following target asset classes: infrastructures, real estate and debt or equity funds.

Following the French government's authorisation issued on 8 February 2013, and the approval of the Nuclear Commitments Monitoring Committee and the Board of Directors' decision of 13 February 2013, EDF allocated the entire receivable recognised by the French state, representing the accumulated shortfall in CSPE financing at 31 December 2012, to its dedicated assets.

This financial receivable was increased in the financial statements at 31 December 2015 by an additional amount estimated at €644 million that was not allocated to dedicated assets, corresponding to the shortfalls in compensation that arose between the

beginning of 2013 and the end of 2015, as acknowledged by the State in a ministerial letter of 26 January 2016. In accordance with this letter, the total financial receivable bears interest at 1.72% and will be repaid under a revised schedule ending in late 2020. This schedule was laid down in a decision of 2 December 2016, based on the CRE's confirmation of the shortfall for 2015.

On 22 December 2016, EDF assigned a 26.4% portion of this financial receivable, including the additional receivable corresponding to the shortfalls in compensation between 2013 and 2015, to a pool of investors.

Consequently, the realisable value of the non-assigned portion of the receivable, which is totally allocated to dedicated assets, is calculated based on the assignment value at that date.

The amount received for assignment of the portion of the CSPE receivable that was allocated to dedicated assets (€894 million) has been reinvested in dedicated assets, in the same way as the reimbursements received (see note 3.5).

After receiving the ministerial letter of 31 May 2018 authorising EDF, subject to conditions, to increase the portion of unlisted assets in its dedicated assets, on 29 June 2018 the Board of Directors validated the following new strategic allocation for dedicated assets:

- yield assets (target: 30% of dedicated assets), consisting of infrastructure assets, including the shares of CTE, and real estate property;
- growth assets (target: 40% of dedicated assets), consisting of equity funds investing in listed or unlisted equities;
- fixed-income assets (target: 30% of dedicated assets), consisting of listed bonds or listed bond funds, unlisted debt funds, receivables and cash.

These targets should be reached gradually, mainly by reinvesting fixed-income assets in yield assets and growth assets.

#### 38.2.1 Growth assets and fixed-income assets

Certain growth and fixed-income assets take the form of bonds held directly by EDF. Others consist of specialised collective investment funds on leading international markets, managed by independent asset management companies. They take the form of open-end funds and "reserved" funds established for the Company (which does not participate in the fund management).

The listed equity funds consist of international equities (mainly in North America but also in Europe, Asia-Pacific and emerging countries). Listed bonds and listed bond funds consist of sovereign and corporate bonds.

These investments are structured and managed in line with the strategic allocation, which takes into consideration international stock market cycles, for which the statistical inversion generally observed between equity market cycles and bond market cycles – as well as between geographical areas – has led EDF to define a long-term investment policy with appropriate allocation between growth assets and fixed-income assets.

Under the new strategic allocation, growth assets also include a small portion of funds invested in unlisted equities, and fixed-income assets also include a small portion of funds invested in unlisted debt. These funds are managed by EDF Invest (see note 38.2.2).

In the course of operational asset monitoring, EDF applies long-term, specific management rules defined and supervised by its governance bodies (maximum investment ratios, volatility analyses and assessment of individual fund manager quality).

#### 38.2.2 Yield assets

The yield assets managed by EDF Invest consist of assets related to investments in infrastructures and real estate.

Through investment funds, EDF Invest also manages growth assets and fixed-income assets (see note 38.2.1).

## 6. FINANCIAL STATEMENTS

### Other information

At 31 December 2018, the assets managed by EDF Invest represent a total realisable value of €5,680 million, including €5,356 million of yield assets. Yield assets particularly include:

- 50.1% of EDF's shares in CTE, the joint venture that owns RTE, in compliance with Decree 2016-1781 of 19 December 2016 amending the Decree of 23 February 2007. These shares amount to €2,738 million at 31 December 2018 (€2,705 million at 31 December 2017);
- EDF's investments in Terega, Porterbrook, Autostrade per l'Italia, Q-Park, Thyssengas, Aéroports de la Côte d'Azur, Madrileña Red de Gas (MRG), Géosel, Central Sicaf, Ecowest SCI A and B, Nam Theun Power Company and companies that own wind farms in the United Kingdom (Bicker Fen, Glass Moor II, Green Rigg, Rusholme, Fallago Rig and Fenland).

Details of the portfolio at 31 December 2018 are as follows:

(in millions of euros)	31/12/2018		31/12/2017	
	Net book value	Realisable value	Net book value	Realisable value
Investment in CTE (the Company that owns RTE) <sup>(1)</sup>	2,705	2,738	2,705	2,705
Investment Securities <sup>(2)</sup>	20,136	20,830	17,825	19,717
Other financial investments	2,156	2,385	2,063	2,314
<b>Dedicated assets - Investments</b>	<b>24,997</b>	<b>25,953</b>	<b>22,593</b>	<b>24,736</b>
CSPE receivable <sup>(3)</sup>	2,060	2,080	3,294	3,349
<b>Total dedicated assets before hedging</b>	<b>27,057</b>	<b>28,033</b>	<b>25,887</b>	<b>28,085</b>
Hedging instruments and other <sup>(2)</sup>	(369)	(344)	-	30
<b>TOTAL DEDICATED ASSETS AFTER HEDGING <sup>(4)</sup></b>	<b>26,688</b>	<b>27,689</b>	<b>25,887</b>	<b>28,115</b>

(1) EDF's investment of 50.1% of CTE, the company that holds 100% of the shares in RTE. The realisable value of CTE at 31 December 2018 in the above table has been determined by an independent assessor, in the same way as for EDF Invest's other assets. The realisable value of CTE at 31 December 2017 was based on the sale transaction price of 31 March 2017.

(2) Including €391 million of securities acquired in late December 2018 for which payment was made in early January 2019.

(3) The receivable consisting of accumulated shortfalls in compensation at 31 December 2015, less the portion assigned on 22 December 2016 and reimbursements received since then, in line with the repayment schedule. The realisable value of the CSPE receivable is estimated based on market rates.

(4) Limiting the value of certain investments in compliance with Article 16 of Decree 2007-243 concerning calculation of the regulatory realisable value of dedicated assets has no effect at 31 December 2017 or 2018.

Net book value and fair value include unmatured accrued interest.

### 38.2.4 Coverage of long-term nuclear obligations

At 31 December 2018, nuclear provisions are 98.3% covered by dedicated assets (108.5% at 31 December 2017).

The coverage of nuclear provisions at 31 December 2018 complies with the ministerial decision of 28 December 2018 which extended the scope of provisions to be covered by dedicated assets. Following that ministerial decision, €298 million of provisions previously considered to belong to the operating cycle as defined by the regulations were transferred to long-term provisions, with an effect of -1.05% on the coverage rate.

### 38.2.3 Valuation of EDF's dedicated assets

Dedicated assets are classified in the balance sheet according to their accounting nature: investments, investment securities, and marketable securities. They are valued under the accounting principles presented in note 1.

Withdrawals from dedicated assets in 2018 totalled €403 million, equivalent to payments made in respect of the long-term nuclear obligations to be covered during the year (€378 million in 2017).

Over a 10-year horizon, disbursements will be made to the following extent (at year-end economic conditions, i.e. in 2018 euros):

- 14% of provisions for long term radioactive waste management;
- 11% of provisions for decommissioning.

Over a 50-year horizon, disbursements will be made to the following extent (at year-end economic conditions, i.e. in 2018 euros):

- 35% of provisions for long term radioactive waste management;
- 93% of provisions for decommissioning.

The long-term nuclear obligations concerned by the regulations for dedicated assets related to nuclear generation are included in EDF's financial statements at the following values:

(in millions of euros)	31/12/2018	31/12/2017
Provisions for spent fuel management – portion unrelated to the operating cycle as defined in the regulations	1,067	983
Provisions for long-term radioactive waste management	9,846	8,814
Provision for removal and conditioning of waste	751	726
Provisions for nuclear plant decommissioning	15,985	14,920
Provisions for last cores - portion for future long-term radioactive waste management	518	467
<b>PRESENT COST OF LONG-TERM NUCLEAR OBLIGATIONS</b>	<b>28,167</b>	<b>25,910</b>

Because of changes (other than regulatory modifications) in the assumptions used to calculate long-term nuclear provisions, particularly the change in the discount rate, the required allocation to dedicated assets for 2018 amounts to €1,337 million. The administrative authorities authorised EDF to spread this allocation as follows:

€540 million in 2019 and 2020, and €257 million in 2021. Including the allocation to be made in 2019 for 2018, all other things being equal, the coverage rate at 31 December 2018 would be 100.2%.

### 38.2.5 Changes in dedicated assets in 2018

Following a ministerial letter of 31 May 2018 authorising EDF, subject to conditions, to increase the portion of unlisted assets in its dedicated assets, on 29 June 2018 the Board of Directors validated a new strategic allocation for dedicated assets (see note 38.2).

The regulatory allocation to dedicated assets for 2017 amounted to €386 million and was made during 2018.

EDF Invest continued over 2018 to build up a portfolio of infrastructures, real estate property and investment funds. Among its new investments, in November 2018 EDF

Invest completed the purchase of a minority interest in six UK companies (Bicker Fen, Fallago Rig, Fenland, Glass Moor II, Green Rigg, Rusholme) from EDF Renewables.

In December 2018, EDF Invest acquired EDF International's minority interest in Nam Theun Power Company (NTPC), a hydroelectric dam in Laos, part of which was allocated to dedicated assets at that date. The rest will be allocated in 2019.

These new investments have been added to the infrastructure assets that are part of EDF Invest's yield assets, alongside investments including CTE (the company that owns RTE), Terega (formerly TIGF), Porterbrook, Madrileña Red de Gas, Géosel, Thyssengas, Aéroports de la Côte d'Azur, Autostrade per l'Italia and Q-Park

## NOTE 39 RELATED PARTIES

### 39.1 RELATIONS WITH SUBSIDIARIES

(in millions of euros)	EDF's receivables <sup>(1)</sup>		EDF's liabilities <sup>(1)</sup>		Financial expenses	Financial income (excluding dividends)
	Loans	Trade receivables	Net liabilities included in current account	Trade liabilities		
<b>Companies</b>						
CTE (formerly C25)		313		89		0
Framatome		140		449		4
EDF Energy		128		135		2
EDF Renewables	1,063					10
EDF Energy UK LTD						2
EDF International	6,404					119
EDF Trading		1,195		1,143		5
Edison	70					2
Enedis	502	88		1,643		4
Dalkia France	1,325			143		34
Groupe PEI	788					18
Citelum						2
Current account <sup>(2)</sup>				3,213		
Investment for agreement for liquidities of subsidiaries			1,331		(10)	
Group cash management agreement with subsidiaries <sup>(3)</sup>			8,250		(5)	
Tax consolidation agreement				1,507		

(1) Receivables and payables of more than €50 million.

(2) Including €1,742 million concerning Enedis.

(3) Including €2,993 million concerning C3, €2,084 million for EDF Trading and €979 million for EDEV.

### 39.2 RELATIONS WITH THE FRENCH STATE AND STATE-OWNED ENTITIES

#### 39.2.1 Relations with the French State

The French State holds 83.67% of the capital of EDF at 31 December 2018, and is thus entitled in the same way as any majority shareholder to control decisions that require approval by the shareholders.

In accordance with the legislation applicable to all companies having the French State as their majority shareholder, EDF is subject to certain inspection procedures, in particular economic and financial inspections by the State, audits by the French Court of Auditors (*Cour des Comptes*) or Parliament, and verifications by the French General Finance Inspectorate (*Inspection générale des finances*).

The public service contract between the French State and EDF was signed on 24 October 2005. This contract is intended to form the framework for public service

missions assigned to EDF by the lawmaker for an unlimited period. The Law of 9 August 2004 does not stipulate the duration of the contract.

EDF, like other electricity producers, also participates in implementation of the multi-year energy programme established by the Decree of 27 October 2016, which defines objectives for generation and load shedding.

Finally, the French State intervenes through the regulation of electricity and gas markets, particularly for authorisation to build and operate generation facilities, establishment of sales tariffs for customers that have stayed on the regulated tariffs, transmission and distribution tariffs, and also determination of the ARENH price in accordance with France's Energy Code, and the system for compensation of public service charges.

### 39.2.2 Relations with public sector entities

EDF's relations with public sector entities mainly concern the two entities belonging to the former AREVA group (Orano and AREVA SA).

Transactions with Orano concern:

- the front-end of the nuclear fuel cycle (uranium supplies, conversion and enrichment services);
- the back-end of the nuclear fuel cycle (transportation, storage, processing and recycling services for spent fuel).

#### Front-end of the cycle:

Several important agreements were negotiated between EDF and Orano:

- for supplies of natural uranium: Orano Mining contracts covering the period 2021-2030;

- for fluorination: a contract covering the period 2019-2030;
- for enrichment of natural uranium into uranium 235: an Orano Cycle contract for the period 2019-2030.

As part of the plan to construct two EPRs in the United Kingdom at the Hinkley Point site, on 29 September 2016 EDF and Orano signed a uranium contract with Orano Mining, and a conversion contract and enrichment contract with Orano Cycle.

#### Back-end of the cycle:

Relations between EDF and Orano concerning transportation, processing and recycling of spent fuels are described in note 28.

## NOTE 40 ENVIRONMENT

### 40.1 GREENHOUSE GAS EMISSION RIGHTS

In ratifying the Kyoto Protocol, Europe made a commitment to reduce its greenhouse gas emissions. EU Directive 2003/87/EC set up a greenhouse gas emission quota system for the European Union which has been in operation since 1 January 2005.

This system was incorporated into national laws. Among other things it requires obligated actors, which is the case of EDF, to surrender to the State a number of greenhouse gas emission credits each year, corresponding to their emissions for the year. This Directive came into effect in 2005 for an initial three-year period, followed by a second period from 2008 to 2012, with progressive reduction of the emission rights allocated.

One of the main features of the third phase, running from 2013 to 2020, is the discontinuation of free allocation of emission rights in certain countries, including France.

The volume of emissions at 31 December 2018 stood at 7 million tonnes (11 million tonnes at 31 December 2017).

In 2018, EDF surrendered 11 million tonnes in respect of emissions generated in 2017. In 2017, EDF surrendered 8 million tonnes in respect of emissions generated in 2016.

### 40.2 ENERGY SAVINGS CERTIFICATES

The French Law of 13 July 2005 introduced a system of energy savings certificates. Suppliers of energy (electricity, gas, heat, cold, domestic fuel oil and fuel for vehicles) with sales above a certain level are subject to energy savings obligations for a three-year period. They fulfil these obligations by making direct or indirect energy savings rewarded by certificates, or by purchasing energy savings certificates. At the end of the set period, the entities concerned must provide evidence of compliance with obligations by surrendering the certificates, or pay a fine to the Treasury.

In application of Article 30 of the Law of 17 August 2015 on the energy transition for green growth, a new additional energy savings obligation for 2016-2017 applies from 1 January 2016, for the benefit of households in a situation of energy poverty. This new obligation is added to the energy savings obligations for the third period. The annual volume of the obligation is proportional to the annual energy savings obligation.

A fourth three-year period of energy savings obligations will begin on 1 January 2018 (see note 3.7).

## NOTE 41 MANAGEMENT COMPENSATION

The Company's key management and governance personnel are the Chairman and CEO and the directors. In application of the law, directors representing the employees receive no remuneration for their services.

The total gross compensation paid by EDF (salaries, all types of benefits and director's fees, excluding employer contributions) to the Company's key management and governance personnel was as follows:

<i>(in euros)</i>	2018	2017
Chairman and CEO <sup>(1)</sup>	452,868	452,868
Directors <sup>(2)</sup>	429,248	496,556

(1) At its meeting of 24 January 2017 the Board of Directors set the fixed annual compensation of the Chairman and Chief Executive Officer at €450,000 for 2017.

At its meeting of 15 February 2018 the Board decided to keep the fixed annual compensation of the Chairman and Chief Executive Officer at €450,000 for 2018.

(2) The General Shareholders' Meeting of 18 May 2017 approved an annual budget for directors' fees of €500,000 for 2017, including specific remuneration for the work done in 2016 and 2017 by the independent directors' working party in connection with EDF's plan to close the Fessenheim plant. The General Shareholders' Meeting of 15 May 2018 set the annual budget for directors' fees at the same level of €500,000 for 2018 and subsequent years, until a new decision is taken by the shareholders.

## NOTE 42 SUBSEQUENT EVENTS

No developments have occurred since the year-end in addition to those presented in other notes.

### 6.4 STATUTORY AUDITORS' REPORT ON THE FINANCIAL STATEMENTS

*This is a translation into English of the statutory auditors' report on the financial statements of the Company issued in French and it is provided solely for the convenience of English speaking users.*

*This statutory auditors' report includes information required by European regulation and French law, such as information about the appointment of the statutory auditors or verification of the information concerning the Group presented in the management report. This report should be read in conjunction with, and construed in accordance with, French law and professional auditing standards applicable in France.*

#### For the year ended December 31, 2018

To the Shareholders,

#### Opinion

In compliance with the engagement entrusted to us by your General Meeting, we have audited the accompanying financial statements of Electricité de France S.A. (« EDF », or « the Company ») for the year ended December 31, 2018.

In our opinion, the financial statements give a true and fair view of the assets and liabilities and of the financial position of the Company as at December 31, 2018 and of the results of its operations for the year then ended in accordance with French accounting principles.

The audit opinion expressed above is consistent with our report to the Audit Committee.

#### Basis for Opinion

##### Audit Framework

We conducted our audit in accordance with professional standards applicable in France. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Our responsibilities under those standards are further described in the Statutory Auditors' Responsibilities for the Audit of the Financial Statements section of our report.

#### VALUATION OF PROVISIONS RELATED TO NUCLEAR PRODUCTION IN FRANCE – BACK END OF THE NUCLEAR CYCLE, PLANT DECOMMISSIONING AND LAST CORES – AND DEDICATED ASSETS

Notes 1.2.2, 1.7.2, 1.15.1, 18, 28 et 38 to the financial statements

#### Independence

We conducted our audit engagement in compliance with independence rules applicable to us, for the period from January 1, 2018 to the date of our report and specifically we did not provide any prohibited non-audit services referred to in Article 5(1) of Regulation (EU) No 537/2014 or in the French Code of ethics (Code de Déontologie) for statutory auditors.

#### Justification of Assessments - Key Audit Matters

In accordance with the requirements of Articles L.823-9 and R.823-7 of the French Commercial Code (*Code de Commerce*) relating to the justification of our assessments, we inform you of the key audit matters relating to risks of material misstatement that, in our professional judgment, were of most significance in our audit of the financial statements of the current period, as well as how we addressed those risks.

These matters were addressed in the context of our audit of the financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on specific items of the financial statements.

#### Key Audit Matter

As at December 31, 2018, the provisions recorded to cover obligations relating to nuclear power plants for which EDF is the operator in France total €39,806 million, including €21,295 million with respect to the back-end of the nuclear cycle (management of spent fuel and radioactive waste) and €18,511 million with respect to the decommissioning of nuclear power plants and last cores.

The valuation of these provisions is described in Note 28. It requires defining technical and financial assumptions and using complex calculation models and falls within the scope of the regulatory context described in Note 28.

They are updated and the assumptions taken into consideration in the models are reviewed at least once a year. These assumptions reflect management's best estimate at the reporting date of the impacts of the applicable regulation, the implementation of decommissioning and storage processes or changes in the main financial parameters.

Furthermore, the Company is required to allocate so-called "dedicated" assets to secure financing of certain categories of nuclear provisions in France. The realisable value of these assets should allow the Company's commitments relating to the decommissioning of nuclear power plants and long-term storage of radioactive waste in France to be covered (Note 38). The realisable value of these dedicated assets, for an amount of €27,689 million (or a net carrying amount of €26,688 million) as of December 31, 2018, was determined based on the inventory value of diversified placements of shares and bonds, and the realisable value of non-listed assets portfolio managed by EDF Invest.

#### Responses

We have analysed the measures for recognising provisions related to nuclear generation in France and gained an understanding of the industrial scenarios for decommissioning nuclear power plants and the solutions adopted in terms of management of spent fuel and radioactive waste. We have assessed the compliance of the provisions with regard to applicable accounting, legal and regulatory measures.

We have verified the calculation models used by the Company and assessed the sensitivity of the valuations to the assumptions adopted in terms of cost, forecast cash outflows and financial parameters (discount and inflation rates).

Our work also consisted in verifying the type of costs used to determine provisions, assessing the consistency of industrial scenarios adopted by the Company and verifying the reconciliation of forecast costs and forecast cash outflows with these scenarios as well as the available studies and quotes.

We have also assessed the reasonableness of:

- margins for uncertainties and risks included in the provisions, to take into account the degree of control over decommissioning techniques and the management of spent fuel and radioactive waste;
- the series and mutualisation effects adopted in the quotes for decommissioning nuclear power plants in operation, for which the nominal cost represents €20,755 million to economic conditions at the end of the period, for a provision of €12,480 million in discounted value (Note 28).

Concerning the inflation and discount rates adopted by management, we have verified their compliance with applicable accounting standards and regulatory measures, notably the ministerial order of March 21, 2007, as amended. We have reconciled the data used for this purpose with market data and available historical information.



## VALUATION OF PROVISIONS RELATED TO NUCLEAR PRODUCTION IN FRANCE – BACK END OF THE NUCLEAR CYCLE, PLANT DECOMMISSIONING AND LAST CORES – AND DEDICATED ASSETS

Notes 1.2.2, 1.7.2, 1.15.1, 18, 28 et 38 to the financial statements

Key Audit Matter	Responses
<p>We considered the valuation of nuclear provisions and dedicated assets to be a key audit matter due to:</p> <ul style="list-style-type: none"> <li>the sensitivity of the assumptions on which the valuation of these provisions is based, notably in terms of cost, inflation and long-term discount rates, as well as the depreciation periods of nuclear power plants in operation, forecast cash outflows; the modification of these parameters can lead to a material revision in the provisioned amounts;</li> <li>the negative impacts on the financial position of the Company (cash earmarked to increase the amount of dedicated assets) in the event of an increase in nuclear provisions in France, a change in the realisable values of dedicated assets or changes in the coverage rate of nuclear provisions for dedicated assets;</li> </ul> <p>it being specified that the valuation of provisions covers and includes uncertainties related to the fact that certain scenarios and technical solutions have never been implemented.</p>	<p>Concerning the securing of financing for certain of these provisions through dedicated assets, we have verified, by sampling, the portfolio movements and reconciled the realisable value of the dedicated assets in the portfolio at the reporting date with the available certificate of depository statements and available external valuations. We have also assessed the accounting treatment and their valuation, in particular, the compliance with the accounting standard of the impairment criteria described in Note 1.7.2.</p> <p>Finally, we have verified the appropriateness of the disclosures given for the provisions related to nuclear production in France and the dedicated assets in the notes to the financial statements, notably regarding the sensitivity of the valuation of provisions to changes in macro-economic assumptions (Note 28.5.2).</p>

### Specific verifications

We have also performed, in accordance with professional standards applicable in France, the specific verifications required by French laws and regulations.

#### Information given in the management report and in the other documents with respect to the financial position and the financial statements provided to the Shareholders

We have no matters to report as to the fair presentation and the consistency with the financial statements of the information given in the management report of the Board of Directors, and in the other documents with respect to the financial position and the financial statements provided to the Shareholders.

We attest the fair presentation and the consistency with the financial statements of the information relating to payment terms, required under Article D.441-4 of the French Commercial Code (*Code de Commerce*).

#### Information relating to corporate governance

We attest that the corporate governance section of the management report sets out the information required by Articles L.225-37-3 and L.225-37-4 of the French Commercial Code

Concerning the information given in accordance with the requirements of Article L.225-37-3 of the French Commercial Code (*Code de Commerce*) relating to remunerations and benefits received by the directors and any other commitments made in their favour, we have verified its consistency with the financial statements, or with the underlying information used to prepare these financial statements and, where applicable, with the information obtained by your Company from controlling and controlled companies. Based on these procedures, we attest the accuracy and fair presentation of this information.

With respect to the information relating to items that your Company considered likely to have an impact in the event of a public purchase offer or exchange, provided pursuant to Article L.225-37-5 of the French Commercial Code, we have agreed these to the source documents communicated to us. Based on our work, we have no observations to make on this information.

### Report on Other Legal and Regulatory Requirements

#### Appointment of the Statutory Auditors

We were appointed as statutory auditors of Electricité de France S.A. by the General Meeting held on June 6, 2005 for KPMG Audit and by decision of the Board of Directors of April 25, 2002 for Deloitte & Associés.

As at December 31, 2018, KPMG Audit was in the 14<sup>th</sup> year of total uninterrupted engagement and Deloitte & Associés was in the 17<sup>th</sup> year of total uninterrupted engagement, which for both, 14 years since securities of the Company were admitted to trading on a regulated market.

### Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with French accounting principles and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Company's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless it is expected to liquidate the Company or to cease operations.

The Audit Committee is responsible for monitoring the financial reporting process and the effectiveness of internal control and risks management systems and where applicable, its internal audit, regarding the accounting and financial reporting procedures.

The financial statements were approved by the Board of Directors.

### Statutory Auditors' Responsibilities for the Audit of the Financial Statements

#### Objectives and audit approach

Our role is to issue a report on the financial statements. Our objective is to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with professional standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As specified in Article L.823-10-1 of the French Commercial Code (*Code de Commerce*), our statutory audit does not include assurance on the viability of the Company or the quality of management of the affairs of the Company.

As part of an audit conducted in accordance with professional standards applicable in France, the statutory auditor exercises professional judgment throughout the audit and furthermore:

- Identifies and assesses the risks of material misstatement of the financial statements, whether due to fraud or error, designs and performs audit procedures responsive to those risks, and obtains audit evidence considered to be sufficient and appropriate to provide a basis for his opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control;
- Obtains an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the internal control;
- Evaluates the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management in the financial statements;
- Assesses the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Company's ability to continue as a going concern. This assessment is based on the audit evidence obtained up to the date of his audit report. However, future events or conditions may cause the Company to cease to continue as a going concern. If the statutory auditor concludes that a material

uncertainty exists, there is a requirement to draw attention in the audit report to the related disclosures in the financial statements or, if such disclosures are not provided or inadequate, to modify the opinion expressed therein;

- Evaluates the overall presentation of the financial statements and assesses whether these statements represent the underlying transactions and events in a manner that achieves fair presentation.

#### Report to the Audit Committee

We submit a report to the Audit Committee which includes in particular a description of the scope of the audit and the audit program implemented, as well as the results of our audit. We also report, if any, significant deficiencies in internal control regarding the accounting and financial reporting procedures that we have identified.

Our report to the Audit Committee includes the risks of material misstatement that, in our professional judgment, were of most significance in the audit of the financial statements of the current period and which are therefore the key audit matters that we are required to describe in this report.

We also provide the Audit Committee with the declaration provided for in Article 6 of Regulation (EU) No 537/2014, confirming our independence within the meaning of the rules applicable in France such as they are set in particular by Articles L.822-10 to L.822-14 of the French Commercial Code (*Code de Commerce*) and in the French Code of Ethics (*Code de Déontologie*) for statutory auditors. Where appropriate, we discuss with the Audit Committee the risks that may reasonably be thought to bear on our independence, and the related safeguards.

Paris La Défense, February 14, 2019

#### The Statutory Auditors

**KPMG S.A.**

Jay Nirsimloo

Michel Piette

**Deloitte & Associés**

Damien Leurent

Christophe Patrier

## 6.5 TABLE OF RESULTS FOR THE LAST FIVE FISCAL YEARS

(taken from EDF's corporate financial statements):

	2018	2017	2016	2015	2014
<b>Capital at year end</b>					
Share capital (in millions of euros)	1,505	1,464	1,055	960	930
Capital contributions (in millions of euros)					
Number of common shares in existence	3,010,267,676	2,927,438,804	2,109,136,683	1,920,139,027	1,860,008,468
Number of priority dividend shares (with no voting rights) in existence					
Maximum number of future shares to be created by conversion of bonds by exercise of subscription rights					
<b>Operating results for the year (in millions of euros)</b>					
Sales excluding taxes	44,874	42,371	40,857	41,553	41,717
Income before tax, employee profit-sharing, depreciation, amortisation and provisions	7,925	5,091	9,495	7,224	8,252
Income tax	(756) <sup>(2)</sup>	(687) <sup>(2)</sup>	680	(63) <sup>(2)</sup>	577
Employee profit-sharing for the year					
Income after tax, employee profit-sharing, depreciation, amortisation and provisions	1,591	1,924	5,517	271	1,649
Dividends		1,341 <sup>(1)</sup>	2,105 <sup>(1)</sup>	2,079 <sup>(1)</sup>	2,327 <sup>(1)</sup>
Interim dividends	451	433	1,006	1,059	1,059
<b>Earnings per share (euros/share)</b>					
Income after tax and employee profit-sharing but before depreciation, amortisation and provisions	2.88	1.97	4.18	3.79	4.13
Income after tax, employee profit-sharing, depreciation, amortisation and provisions	0.53	0.66	2.62	0.14	0.89
Dividend per share		0.46 <sup>(1)</sup> (6)	0.90 <sup>(1)</sup> (5)	1.10 <sup>(1)</sup> (4)	1.25 <sup>(1)</sup> (3)
Interim dividend per share	0.15	0.15	0.50	0.57	0.57
<b>Employees</b>					
Average number of employees over the year	64,927	66,577	69,494	70,769	70,153
Total payroll expense for the year (in millions of euros)	3,711	3,831	4,001	3,964	3,905
Amounts paid for employee fringe benefits and similar (social security, Company benefit schemes, etc.) (in millions of euros)	2,854	2,923	2,873	2,848	2,699

(1) Including interim dividends paid out.

(2) Amount corresponding to a tax income.

(3) I.e. €1.375 per share bearing a loyalty dividend.

(4) I.e. €1.21 per share bearing a loyalty dividend.

(5) I.e. €0.99 per share bearing a loyalty dividend.

(6) I.e. €0.506 per share bearing a loyalty dividend.

## 6.6 DIVIDEND POLICY

### 6.6.1 DIVIDENDS AND INTERIM DIVIDENDS PAID IN THE LAST THREE FISCAL YEARS

The amount of dividends and interim dividends paid in the last three fiscal years was as follows:

Fiscal year	Number of shares	Dividend per share (in euros)	Total dividends paid <sup>(1)</sup> (in euros)	Dividend payment date
2015	1,920,139,027	1.10 <sup>(2)</sup>	2,079,072,045.71 <sup>(3)</sup>	30 June 2016
2016	2,741,877,687 <sup>(6)</sup>	0.90 <sup>(4)</sup>	2,105,349,378.42 <sup>(5)</sup>	30 June 2017
2017	2,927,438,804	0.46 <sup>(7)</sup>	1,341,187,189.41 <sup>(8)</sup>	19 June 2018

(1) After deduction of treasury shares.

(2) i.e. €1.21 for shares benefiting from the loyalty dividend.

(3) Of which €1,058,682,286.08 in interim dividends paid on 18 December 2015 for that year.

(4) i.e. €0.99 for shares benefiting from the loyalty dividend.

(5) Of which €1,005,552,797.00 in interim dividends paid on 31 October 2016 for that year comprising €922,416,509.04 in new shares, €82,548,293.00 in cash and a balancing payment of €587,994.96. The remaining €1,099,796,581.42 of the dividend for 2016, paid on 30 June 2017, comprised €1,024,155,172.48 in new shares, €74,454,959.22 in cash and a balancing payment of €1,186,449.72.

(6) When the remaining dividend was paid, i.e. after the capital increase of 30 March 2017 in which 632,741,004 new shares were issued.

(7) i.e. €0.506 for shares benefiting from the loyalty dividend.

(8) Of which €432,632,648.85 in interim dividends paid on 11 December 2017 for that year comprising €398,440,228.20 in new shares, €33,746,467.50 in cash and a balancing payment of €445,953.15. The remaining €908,554,540.56 of the dividend for 2017, paid on 19 June 2018, comprised €847,339,360.56 in new shares, €60,331,512.63 in cash and a balancing payment of €883,667.37.

On 6 November 2018, EDF's Board of Directors decided to pay in cash an interim dividend for the 2018 fiscal year of €0.15 per share.

The interim dividend for the 2018 fiscal year came to €451,000,397.55 and was paid on 10 December 2018.

At its meeting of 14 February 2019, the Board of Directors decided to propose to the Shareholders' meeting that will be summoned to approve the financial statements for the year ended 31 December 2018 and will be held on 16 May 2019, the payment of a dividend of €0.31 per share (excluding loyalty dividend) for the 2018 fiscal year. In view of the interim dividend of €0.15 per share paid on 10 December 2018, the remaining dividend payable for that year comes to €0.16 per share for shares benefiting from the ordinary dividend and €0.191 per share for shares benefiting from the loyalty dividend.

Shareholders will be offered the option of having the remaining dividend paid out in new Company shares. This option will be available between 24 May and 10 June 2019 inclusive. For shareholders who have not exercised their option by 10 June 2019 at the latest, all remaining dividend payments will be made in cash. The French State has undertaken to have its dividend paid out in the form of new shares.

New common shares issued to pay for the share capital increase will only entitle their holders to payment of the balance of the dividend for 2018.

Subject to the approval of the Shareholders' Meeting the dividend will be paid on 18 June 2019 with the ex-dividend date set at 22 May 2019.

### 6.6.2 DISTRIBUTION POLICY, INCREASED DIVIDEND

The dividend policy formulated by the Board of Directors takes the Group's investment needs, the economic context and any other relevant factor into account.

In accordance with the amendment to the articles of association passed by the Shareholders' Meeting of 24 May 2011, the first loyalty dividend was paid in 2014 for the previous year. Shareholders holding their shares in registered form for at

least two years are entitled to a loyalty dividend. The number of shares eligible for the 10% increased dividend may not exceed 0.5% of the share capital.

On 21 November 2014 the Shareholders' Meeting amended the articles of association to the effect of authorising it to approve the payment of any dividend, interim dividend, reserves or premium that is distributed or any reduction in capital, through delivery of the Company's assets, including financial securities.

### 6.6.3 UNCLAIMED DIVIDENDS

Dividends not claimed within five years of their payment date lapse in favour of the French State.

## 6.7 SIGNIFICANT CHANGE IN THE FINANCIAL OR TRADING POSITION

Significant events occurring between the last day of the 2018 fiscal year and the date of the filing of this Reference Document are mentioned in note 50 to the consolidated financial statements of the year ended 31 December 2018 for events

before 14 February 2019, when the Board of Directors approved the financial statements and, for events after 14 February 2019, in section 5.2 "Subsequent events" of this Reference Document.

## 6.8 INFORMATION RELATING TO THE ALLOCATION OF FUNDS RAISED THROUGH GREEN BONDS ISSUED BY EDF

Since 2013 the Group has conducted four Green Bond issues for a total of around €4.5 billion in order to support its development in renewable energies.

After two bond issues chiefly meant to finance the building of new wind and solar projects by its subsidiary EDF Renewables (€1.4 billion in November 2013 and \$1.25 billion in October 2015), the Group expanded its Green Bond Framework to finance investments in the renovation and modernisation of its hydropower assets in mainland France. The new Framework was first applied to a €1.75 billion issue in October 2016 and then to a 26 billion yen issue in two tranches in January 2017.

The commitments made by EDF in the context of these two bond issues follow the four Green Bond Principles<sup>(1)</sup> guiding (i) the use of proceeds, (ii) existing processes for evaluating and selecting eligible projects, (iii) the management of proceeds, and (iv) reporting procedures. A detailed description of these investments can be found in the EDF Green Bond Framework of September 2016 available on the Green Bonds page of the Company's website.

This section provides a summary of these commitments and how EDF has fulfilled them as at the end of 2018.

### USE OF PROCEEDS

EDF has committed itself to *allocate* the proceeds from its Green Bonds programme to fund new investments in renewable energy projects. Projects eligible<sup>(2)</sup> for Green Bond financing ("Eligible Projects") are:

- projects built by EDF Renewables to generate electricity from renewable sources;
- investments in existing hydropower facilities in mainland France within the following categories: renovation and heavy maintenance, modernisation and automation, and works on existing plants (including, in particular, capacity increases).

There are no plans to use the funds raised to refinance existing projects or acquire operational businesses or facilities.

### EVALUATION AND SELECTION OF ELIGIBLE PROJECTS FINANCED

Each Eligible Project to be funded is assessed against the environmental and social eligibility criteria<sup>(3)</sup> ("E&S criteria") specific to EDF Renewables' investments, on the one hand, and to hydroelectric investments, on the other, by the Financial Department of EDF Renewables and the Financial Department of EDF Hydro, respectively. Assessments are based on information provided by the teams in charge of development, purchasing and sustainable development matters.

Only projects meeting the E&S criteria qualify for Green Bond financing. Those projects over which EDF Renewables has direct control are financed as a priority.

The entire project assessment process is documented so as to be able to show an independent auditor that projects financed meet the eligibility criteria.

On this basis, the Finance Departments of EDF Renewables and EDF Hydro select which Eligible Projects are financed.

### MANAGEMENT OF PROCEEDS

Funds raised are managed according to a strict ring-fencing principle in order to ensure that their use is exclusively and effectively reserved for financing Eligible Projects.

Once received by EDF SA's Finance and Investment Department, proceeds from each bond issue are invested and tracked in a dedicated sub-portfolio of treasury assets until allocated to Eligible Projects. Proceeds are invested in priority in treasury assets identified as Socially Responsible Investments (SRI).

The finance departments of EDF Renewables and EDF Hydro notify EDF's Treasury Department, on an ongoing basis or at regular intervals, of the funds needed to cover investments related to the projects selected. Based on this information the Treasury Department adjusts the amounts available in the dedicated treasury asset sub-portfolios.

EDF aims to allocate the entirety of funds raised within 24 months of a bond issue.

### REPORTING

#### Effective use of funds

All the funds raised in November 2013 under the first Green Bond issued by EDF for €1.4 billion were allocated by June 2015. All the funds raised in October 2015 under the second Green Bond issued for \$1.25 billion were allocated by the end of 2017.

Of the €1,750 million raised in October 2016 under the third Green Bond issued by EDF, €1,188 million were allocated to Eligible Projects as at 31 December 2018. The funds raised in January 2017 in the context of the fourth Green Bond issued by EDF (JPY 26 billion in two tranches) have not yet been allocated. The balance of funds raised under the Green Bonds issued in October 2016 and January 2017 was invested in a dedicated treasury asset portfolio, as indicated above, where it will remain until allocated to Eligible Projects.

(1) The Green Bond Principles, updated in June 2018, are voluntary guidelines for issuance of green bonds. They recommend transparency and disclosure and promote integrity to support development of the green bond market. For more information, see <http://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/green-bonds/green-bond-principles>.

(2) Only projects from category (i) are eligible for financing using funds raised by the bond issues of November 2013 and October 2015.

(3) The E&S criteria for each project type are presented in the appendix to the EDF Green Bond Framework of September 2016.

## 6. FINANCIAL STATEMENTS

Information relating to the allocation of funds raised through Green Bonds issued by EDF

Allocation of proceeds at 31 December 2018:

	<b>Funds raised</b>	<b>Funds allocated to Eligible Projects</b>	<b>Number of Green Bond funded projects</b>	<b>Share of investment financed via Green Bonds funds</b>
Green Bond no. 1 – November 2013	€1.4 billion	€1.4 billion	13 <sup>(1)</sup>	59%
Green Bond no. 2 – October 2015	\$1.25 billion	\$1.25 billion	7 <sup>(1,2)</sup>	58%
Green Bond no. 3 – October 2016	€1.75 billion    €1,188 million	EDF Renewables: €764 million	6 <sup>(2)</sup>	65%
		EDF Hydro: €424 million	411 operations	100% <sup>(3)</sup>

(1) Including the Roosevelt Project, financed by Green Bonds 1 and 2.

(2) Including the Red Pine Project, financed by Green Bonds 2 and 3.

(3) Share of total investments financed by EDF, including half of the investment in the Romanche-Gavet project.

At 31 December 2018 the following Eligible Projects had been chosen by EDF Renewables for financing under the first three Green Bonds issued in November 2013 (GB1), October 2015 (GB2) and October 2016 (GB3):

<b>Project</b>	<b>Type and Capacity</b>	<b>Location</b>	<b>Year come into service</b>	<b>Financing GB1/GB2</b>
CID Solar	PV Solar, 27MWp	US (California)	In service	GB1
Cottonwood	PV Solar, 33MWp	US (California)	In service	GB1
Catalan wind farm	Onshore wind, 96MW	France (Pyrénées-Orientales)	In service	GB1
Heartland	Biogas, 20MW	US (Colorado)	In service	GB1
Hereford	Onshore wind, 200MW	US (Texas)	In service	GB1
La Mitis	Onshore wind, 25MW	Canada (Quebec)	In service	GB1
Le Granit	Onshore wind, 25MW	Canada (Quebec)	In service	GB1
Longhorn North	Onshore wind, 200MW	US (Texas)	In service	GB1
Pilot Hill	Onshore wind, 175MW	US (Illinois)	In service	GB1
Rivière du Moulin	Onshore wind, 350MW	Canada (Quebec)	In service	GB1
Spinning Spur 2	Onshore wind, 161MW	US (Texas)	In service	GB1
Spinning Spur 3	Onshore wind, 194MW	US (Texas)	In service	GB1
Roosevelt	Onshore wind, 250MW	US (New Mexico)	In service	GB1 and GB2
Great Western	Onshore wind, 225MW	US (Oklahoma)	In service	GB2
Kelly Creek	Onshore wind, 184MW	US (Illinois)	In service	GB2
Salt Fork	Onshore wind, 174MW	US (Texas)	In service	GB2
Slate Creek	Onshore wind, 150MW	US (Texas)	In service	GB2
Tyler Bluff	Onshore wind, 126MW	US (Texas)	In service	GB2
Red Pine	Onshore wind, 200MW	US (Minnesota)	In service	GB2 and GB3
Bluemex Power 1	PV Solar, 120MWp	Mexico (Sonora)	In service	GB3
Copenhagen Wind Farm	Onshore wind, 80MW	US (New York)	In service	GB3
Nicolas Riou	Onshore wind, 112MW	Canada (Quebec)	In service	GB3
Rock Falls	Onshore wind, 154MW	US (Oklahoma)	In service	GB3
Stoneray Power Partners	Onshore wind, 100MW	US (Minnesota)	In service	GB3



At 31 December 2018 the following Eligible Projects had been chosen by EDF Hydro for financing under the Green Bond issued in October 2016:

	Number of operations by type	Capacity in question (MW)	Average generation (2011-2018) (TWh)	Additional generation potential (TWh)	Amounts (in €m)
1. Renovation and heavy maintenance	184	9.6	20.6	-	177
2. Modernisation and automation	215	15.9	31.7	-	58
3. Development of existing structures	12	1.2	2.4	0.3	190
<b>TOTAL (EXCL. DUPLICATION)</b>	<b>411</b>	<b>17.1</b>	<b>34.0</b>	<b>0.3</b>	<b>424</b>

As part of managing its portfolio of renewable energy assets, the Group may sell stakes in the assets it develops. At 31 December 2016 the Group held 65%, 46% and 98% of generation capacity financed under Green Bonds no. 1, 2 and 3, respectively.

### Impact of Eligible Projects financed

The table below shows three main impacts associated with the renewable energy projects that received Green Bond financing:

- the electricity generation capacity built under each EDF Renewables project or renovated, modernised or developed as part of the hydropower investments;
- the additional electricity generation expected from each project; and
- the CO<sub>2</sub> emissions avoided as a result of injecting this additional electricity generation into the electricity grid.

These impacts are presented in aggregate: gross data correspond to the aggregate impact of projects that received funding from the Green Bond in question; while the net values correspond to the sum total of the impact of each Eligible Project weighted by the share of project investment amount financed by the Green Bond considered.

		Total capacity of projects financed at 31 December 2018 (in MW)		Expected output (in TWh/year)		Estimated CO <sub>2</sub> emissions avoided (in tonnes/year)	
		Gross <sup>(1)</sup>	Net <sup>(2)</sup>	Gross <sup>(1)</sup>	Net <sup>(2)</sup>	Gross <sup>(1)</sup>	Net <sup>(2)</sup>
Green Bond no. 1 – November 2013		1,755	976	7.0	4.1	2.94	1.64
Green Bond no. 2 – October 2015		1,306	832	5.4	3.3	3.46	1.97
Green Bond no. 3 – October 2016	EDF Renewables	878	574	3.3	2.1	1.40	0.85
	EDF Hydro	17,064	17,064	0.2 <sup>(3)</sup>	0.2 <sup>(3)</sup>	0.01 <sup>(3)</sup>	0.01 <sup>(3)</sup>

(1) Sum of the gross impacts of each project that received Green Bond financing.

(2) Sum of the impacts of each project weighted by the project investment amount financed by the Green Bond in question.

(3) Only related to the expected additional generation resulting from development investments, including half of the expected additional generation of the Romanche-Gavet project.

The above impacts are established using the methodological principles below:

- generation capacity of financed projects: installed capacity at the end of the construction of each Eligible Project as defined in the project's investment memorandum and updated as appropriate during the construction phase or at project commissioning;
- expected output: generation forecast (the "P50") taken into account when the investment decision of each Eligible Project is made;
- expected avoided CO<sub>2</sub> emissions: the average emission factor per kWh of the electric system is estimated on the basis of the energy mix of the electric system and LCA emission factors of each generation technology. The emission factor of

the project corresponds to the LCA emission factor of the project's technology. The energy mixes are those published by the Environmental Protection Agency (2016) for large power networks in the United States, Statistics Canada (2016) for the networks and provinces of Canada, and the International Energy Agency (2016) for other countries. LCA emission factors of each technology correspond to the median values established by the IPCC and published in its fifth assessment report (2014). The detailed methodology is available on request at the office of the EDF group. It is important to note that (i) there is no single standard defining a methodology for calculating avoided CO<sub>2</sub> emissions and (ii) the expected output and, therefore avoided, CO<sub>2</sub> emissions are estimated forecast data and not actual data.

## CERTIFICATE FROM ONE OF THE STATUTORY AUDITORS ON THE INFORMATION RELATED TO THE ALLOCATION, AS AT 31 DECEMBER 2018, OF FUNDS RAISED FOR THE "GREEN BOND" ISSUED BY EDF ON 25 NOVEMBER 2013, 8 OCTOBER 2015, 11 OCTOBER 2016 AND 26 JANUARY 2017

*This is a free translation into English of the attestation from one of the statutory auditors of EDF SA on the information related to the allocation, as of 31 December 2018, of funds raised for the "Green Bonds" issued by EDF on 25 November 2013, 8 October 2015, 11 October 2016 and 26 January 2017 originally issued in French and is provided solely for the convenience of English speaking readers.*

*This attestation should be read in conjunction with, and is construed in accordance with, French law and professional standards applicable in France.*

To the Chairman and Chief Executive Officer,

In our capacity as statutory auditor of Electricité de France S.A. (the "**Company**") and in accordance with your request, we have prepared this attestation on the information related to the allocation, as of 31 December 2018, of funds raised for the "Green Bonds" issued by EDF on 25 November 2013 (the "**GB 2013 Offering**"), 8 October 2015 (the "**GB 2015 Offering**"), 11 October 2016 (the "**GB 2016 Offering**") and 26 January 2017, (the "**GB 2017 Offering**"), which amounts to €1.4 billion, US\$1.25 billion, €1.75 billion and ¥26.0 billion, respectively, contained in the attached document "*Information relating to the allocation of funds raised through Green Bonds issued by EDF*", and prepared pursuant to the terms and conditions of the final terms of the Green Bond Offerings dated 25 November 2013, 8 October 2015, 11 October 2016 and 26 January 2017 (the "**Final Terms**").

This document, prepared under your responsibility for the purposes of the information of the "Green Bond" debt securities holders, presents an allocation of the funds raised from the Green Bond Offerings to eligible projects (the "**Eligible Projects**") for the period beginning as of the receipt of the funds raised from the Green Bond Offerings to 31 December 2018 (the "**Allocation of Proceeds**"):

- For an amount of €1.4 billion in relation to the GB 2013 Offering, from 27 November 2013 to 31 December 2015, noting that the allocation of proceeds has been completed in full in June 2015;
- For an amount of US\$1.25 billion in relation to the GB 2015 Offering, from 13 October 2015 to 31 December 2017, noting that the allocation of proceeds has been completed in full by the end of 2017;
- For an amount of €1.75 billion in relation to the GB 2016 Offering, from 11 October 2016 to 31 December 2018;
- For an amount of ¥26.0 billion in relation to the GB 2017 Offering, from 26 January 2017 to 31 December 2018.

This information was prepared based on the accounting records used for the preparation of the consolidated financial statements for the year ended 31 December 2018.

Our role is to report on:

- the compliance with the four components of the Green Bond Principles defined by the International Capital Market Association<sup>(1)</sup> being (i) Use of proceeds (ii) Existing processes for project evaluation and selection of the Eligible Projects (iii) Management of proceeds and (iv) Reporting;
- the compliance, in all material respects, of the Eligible Projects referred to in the attached document, with the eligibility criteria defined in the Final Terms;
- the tracking of the funds raised from the Green Bond Offerings, in a dedicated portfolio of financial assets, to the allocation of such funds to Eligible Projects and on the reconciliation of the amount of funds allocated to Eligible Projects as at 31 December 2018 as part of the Green Bond Offerings, with the accounting records and data underlying the accounting records;
- the compliance, in all material respects, of the methods used by the Company to estimate the CO<sub>2</sub> emissions avoided by the Eligible Projects financed as at 31 December 2018 with the methodology described in the section "Impact of financed Eligible Projects" of the attached document.

However, we have no responsibility:

- for challenging the eligibility criteria defined as an appendix to the Final Terms and, in particular, we give no interpretation on the terms of the Final Terms;
- for forming an opinion on the use of the allocated funds to Eligible Projects after such funds have been allocated;
- for concluding on whether the methodology used by the Company to estimate the CO<sub>2</sub> emissions avoided is appropriate.

In the context of our role as statutory auditor, we have audited, jointly with the other statutory auditor, the consolidated financial statements of the Company for the year ended 31 December 2018. Our audit was conducted in accordance with professional standards applicable in France, and was planned and performed for the purpose of forming an opinion on the consolidated financial statements taken as a whole and not on any individual component of the accounts used to determine the information. Accordingly, our audit tests and samples were not carried out with this objective and we do not express any opinion on any components of the accounts taken individually. These consolidated financial statements, which have not yet been approved by the Shareholders' meeting, have been audited and our report thereon is dated 14 February 2019.

Furthermore, we have not performed any procedures to identify events that may have occurred after the date of our report on the consolidated financial statements of the Company which was issued on 14 February 2019.

Our engagement, which constitutes neither an audit nor a review, was performed in accordance with professional standards applicable in France. For the purpose of this attestation, our work consisted, using sampling techniques or other methods of selection, in:

*For the information related to the Allocation of Proceeds and the compliance with the four components of the Green Bond Principles*

- verifying the appropriate consideration of the four components of the Green Bond Principles of the International Capital Market Association<sup>(1)</sup> being (i) the use of proceeds (ii) the existing processes for evaluation and selection of the Eligible Projects (iii) the management of proceeds and (iv) the reporting;
- understanding the procedures implemented by the Company for producing the information contained in the attached document;
- verifying the compliance, in all material respects, of the Eligible Projects referred to in the attached document, with the eligible criteria, as defined in the appendix to Final Terms;
- verifying the appropriate segregation of the funds raised from the Green Bond Offerings and their exclusive allocation to Eligible Projects;
- verifying the global allocation of the capital expenditures incurred in relation to the Eligible Projects financed by each of the Green Bond Offerings;
- performing the necessary reconciliations between this information and the accounting records from which it is derived and verifying that the information agrees with the data used to prepare the consolidated financial statements for the year ended 31 December 2018.

(1) International Capital Market Association - Green Bond Principles, 2015 - Voluntary Process Guidelines for Issuing Green Bonds, 27 March 2015.

## Information relating to the allocation of funds raised through Green Bonds issued by EDF

*For the estimation of the CO<sub>2</sub> emissions avoided*

- understanding and considering the methodology used to estimate the avoided CO<sub>2</sub> emissions;
- verifying the compliance, in all material respects, of the methods used to estimate the CO<sub>2</sub> emissions avoided by the Eligible Projects financed during the period with the methodology described in the section "Impact of Eligible Projects financed" of the attached document;
- verifying the consistency of the information related to the estimation of the electricity output as well as the choice of emission factors used (based on the calculation of the emission factors of the applicable electrical grids where the projects are located and the choice of emission factors by technology), should it be noted that there is no single framework defining a methodology for the calculation of CO<sub>2</sub> emissions avoided.

On the basis of our work, we have no matters to report on:

- the compliance with the four components of the Green Bond Principles of the International Capital Market Association <sup>(1)</sup>;
- the compliance, in all material respects, of the Eligible Projects referred to in the attached document, with the eligible criteria, as defined in the Final Terms;
- the tracking of the funds raised from the Green Bond Offerings, in a dedicated portfolio of financial assets, to the allocation of such proceeds to Eligible Projects and the consistency of the amount of allocated funds to Eligible Projects as at 31 December 2018 in the context of the Green Bond Offerings, with the accounting records and data underlying the accounting records;
- the compliance, in all material respects, of the methods used by the Company to estimate the avoided CO<sub>2</sub> emissions by the Eligible Projects financed as at 31 December 2018 with the methodology described in the section "Impact of financed Eligible Projects" of the attached document.

This attestation has been prepared solely for your attention within the context described above and may not be used, distributed or referred to for any other purpose.

Paris La Défense, 15 March 2019

**One of the statutory auditors**

**Deloitte & Associés**

Christophe Patrier  
Partner

6.

(1) International Capital Market Association - Green Bond Principles, 2015 - Voluntary Process Guidelines for Issuing Green Bonds, 27 March 2015.





## 7. GENERAL INFORMATION ABOUT THE COMPANY AND ITS CAPITAL

### 7.1 GENERAL INFORMATION ABOUT THE COMPANY 502

7.1.1 Company name, address and telephone number of the registered office	502
7.1.2 Trade and companies registry, APE code	502
7.1.3 Date of incorporation and term of the Company	502
7.1.4 Legal form and applicable legislation	502

### 7.2 INCORPORATION DOCUMENTS AND ARTICLES OF ASSOCIATION 502

7.2.1 Corporate purpose	502
7.2.2 Financial year	502
7.2.3 Statutory distribution of profits	502
7.2.4 Rights attached to shares	503
7.2.5 Assignment and transfer of shares	503
7.2.6 Changes to the articles of association, the capital and voting rights	503
7.2.7 Members and functioning of the Board of Directors	503
7.2.8 Shareholder's Meetings	503
7.2.9 Statutory or legal provisions delaying a takeover of the Company	504
7.2.10 Threshold crossings	504

### 7.3 INFORMATION REGARDING CAPITAL AND SHARE OWNERSHIP 505

7.3.1 Amount and changes in share capital	505
7.3.2 Treasury shares and share buyback programme	506
7.3.3 Authorised but non-issued capital	507
7.3.4 Other equity securities	508
7.3.5 Non-equity securities	508
7.3.6 Information on the share capital of any member of the Group subject to a conditional or unconditional agreement	508
7.3.7 Pledge of the Company's shares	508
7.3.8 Ownership of the Company's capital and voting rights	509
7.3.9 Agreements whose implementation could lead to a change of control	510

### 7.4 MARKET FOR THE COMPANY'S SHARES 511

### 7.5 RELATED-PARTY TRANSACTIONS 512

7.5.1 Relations with the French state	512
7.5.2 Relations with Engie (ex-GDF Suez)	512
7.5.3 Relations with public sector companies	512
7.5.4 Agreements with Framatome	512
7.5.5 Statutory Auditor's Special Report on regulated agreements and commitments	513

### 7.6 MATERIAL CONTRACTS 515

7.6.1 Material contracts entered into in 2018	515
7.6.2 Material contracts entered into in 2017	515
7.6.3 Material contracts entered into in 2016	515



## 7.1 GENERAL INFORMATION ABOUT THE COMPANY

### 7.1.1 COMPANY NAME, ADDRESS AND TELEPHONE NUMBER OF THE REGISTERED OFFICE

The name of the Company is: "Électricité de France". The Company may also be legally designated by the acronym "EDF".

The Company's registered office is at 22-30 Avenue de Wagram in the 8<sup>th</sup> arrondissement of Paris.

The telephone number is +33(0) 1 40 42 22 22.

### 7.1.2 TRADE AND COMPANIES REGISTRY, APE CODE

The Company is registered with the Paris Trade and Companies Registry under number 552 081 317. Its APE code is 401E.

### 7.1.3 DATE OF INCORPORATION AND TERM OF THE COMPANY

EDF was incorporated pursuant to Act no. 46-628 of 8 April 1946 as a French public industrial and commercial establishment (EPIC). It was converted into a French société anonyme (public limited company) by the Act of 9 August 2004 and the Decree of 17 November 2004.

The Company was incorporated for a term of 99 years as from 19 November 2004, unless the Company is dissolved before such date or unless its term is extended.

### 7.1.4 LEGAL FORM AND APPLICABLE LEGISLATION

Since 20 November 2004, EDF has been a French société anonyme with a Board of Directors. It is governed by the laws and regulations applicable to commercial companies, in particular the French Commercial Code, except in the event of specific exceptions stipulated in the French Energy Code or Order no. 2014-948 of 20 August 2014 on the governance and capital transactions of companies with State holdings and by its articles of association.

## 7.2 INCORPORATION DOCUMENTS AND ARTICLES OF ASSOCIATION

In this Reference Document, a reference to the articles of association means the Company's articles of association as approved by French Decree no. 2004-1224 of 17 November 2004 adopted under French Act no. 2004-803 of 9 August 2004 relating to the public electricity and gas service and electricity and gas companies (the "9 August 2004 law"), which have subsequently been amended on various occasions.

### 7.2.1 CORPORATE PURPOSE

EDF's purpose, both in France and abroad and in compliance with the laws set out in the first Article of its articles of association, is:

- to ensure the generation, transmission, distribution, supply and trading of electrical energy, and the import and export of said energy;
- to carry out the public service missions assigned to EDF by the laws and regulations, in particular by the French Energy Code, and Article L. 2 224-31 of the French Local Authorities Code (Code général des collectivités territoriales), as well as by concession agreements, and in particular the mission to develop and operate public electricity grids and the mission to supply energy at regulated rates, and to supply back-up power to electricity producers and customers with the aim of compensating for unforeseen supply failures, and electricity to eligible customers who cannot find a supplier, while contributing to the balanced development of electricity supply by reaching the goals defined by the multi-year generation investments programme defined by the Minister for Energy;
- more generally, to engage in any industrial, commercial or service activity, including research and engineering activities, in the field of energy, for all categories of customer;
- to enhance the value of all the personal and real property assets it holds or uses;
- to create, acquire, rent or lease under a business lease, all personal property, real property, businesses and clientele, to lease, install and operate all establishments, businesses and clientele, plants and workshops relating to any one of the aforementioned purposes;
- to obtain, acquire, operate or sell all processes and patents concerning the activities that are related to any of the aforementioned purposes;
- to take part, directly or indirectly, in all transactions that may be connected to any of the aforementioned purposes, by creating new companies or undertakings, by contributing, subscribing for or purchasing equity or ownership interests, stakes, or through mergers, partnerships or in any other way whatsoever; and

- more generally, to engage in all industrial, commercial, financial transactions, whether in personal or real property, that are directly or indirectly connected, in whole or in part, to any similar or related purposes or even to any purposes that may favour or develop the Company's business.

### 7.2.2 FINANCIAL YEAR

Each financial year lasts for 12 months, starting on 1 January and ending on 31 December of each year.

### 7.2.3 STATUTORY DISTRIBUTION OF PROFITS

The distributable profit consists of the net profit for the financial year, less prior losses carried forward and the various deductions provided for by the law or the articles of association, plus any retained earnings carried forward.

The Shareholders' Meeting may decide to distribute amounts deducted from the reserves that are freely available to it, but must expressly state the reserve items from which the deductions are made.

After approving the financial statements and confirming the existence of distributable amounts (which include the distributable profit and any amounts deducted from the reserves mentioned above), the Shareholders' Meeting can decide to distribute all or part of such amounts to the shareholders in the form of a dividend, allocate them to reserve items or carry them forward. The Board of Directors may also distribute interim dividends prior to the approval of the financial statements for the financial year, under the conditions laid down by law.

The Shareholders' Meeting has the option of granting the shareholders a choice, for all or part of the dividend or interim dividend paid out, between payment in cash and payment in shares. Moreover, the Shareholders' Meeting may decide to pay any dividend, interim dividend, reserve or premium that is distributed or any reduction in capital, through remittance of the Company's assets, including financial securities.



Any shareholder who can prove, at the close of a financial year, that he has held registered shares for at least two years and still holds such shares on the date of payment of the dividend declared for the said financial year, will be entitled to an increased dividend for the said registered shares, equal to 10% of the dividend paid for the other shares, including in cases where the dividend is paid in shares. The number of shares eligible for the 10% increased dividend may not exceed 0.5% of the share capital at the close of the previous financial year, for any one shareholder. The first increased dividend was paid in 2014 for the 2013 financial year (see section 6.6.2 "Distribution policy, increased dividend").

The terms governing the payment of distributions decided by the Shareholders' Meeting, and the ex-dividend date of the distributed shares are fixed by the Shareholders' Meeting or, failing this, by the Board of Directors, in accordance with the applicable statutory provisions. If the amount of the non-cash distributions to which a shareholder is entitled does not correspond to a whole number of shares, the said number will be rounded down to the next whole number and a balancing cash payment made to the shareholder or, if requested by the Shareholders' Meeting, rounded up to the next whole number, with the difference being paid in cash by the relevant shareholder.

## 7.2.4 RIGHTS ATTACHED TO SHARES

Each share entitles its holder to a portion of the Company's profit and corporate assets that is proportional to the percentage of the capital that the share represents. Moreover, each share confers a voting right and the right to be represented at Shareholders' Meetings in accordance with legislative, regulatory and bylaw restrictions.

On the filing date of this Reference Document, EDF has only issued a single class of shares.

Ownership of a share automatically entails acceptance of the articles of association and decisions adopted by Shareholders' Meetings.

Pursuant to Article L. 225-123 of the French Commercial Code, as amended by Act no. 2014-384 of 29 March 2014, all fully paid-up shares that have been registered for at least two years in the name of the same shareholder will automatically entitle their holder to voting rights that are double that of the other shares. These provisions took effect on 3 April 2016. EDF's Board of Directors had decided not to submit an amendment to the articles of association to the Shareholders' Meeting, preventing the application of the double voting right set out in Article L. 225-123 of the French Commercial Code.

Shareholders are only liable for losses within the limit of their contributions.

Whenever it is necessary to hold more than one share in order to exercise any right whatsoever, in the event of an exchange, reverse stock split or allocation of shares, or due to a capital increase or reduction, a merger or any other corporate transaction, owners of single shares or numbers of shares below that required may only exercise such right if they take personal responsibility for consolidating or, if necessary, purchasing or selling the requisite number of shares.

Shareholders can choose to hold shares in registered or bearer form, subject to compliance with the laws and regulations.

Shares may be registered with an intermediary under the conditions provided for in Articles L. 228-1 *et seq.* of the French Commercial Code. Intermediaries must declare their status as intermediaries who hold shares for a third party, under the conditions provided for by the laws and regulations. These provisions are also applicable to the other securities issued by the Company.

Under the conditions provided for by the laws and regulations in force, the Company is entitled to request from the central custodian of financial instruments, at any time and provided that it pays the required consideration, as applicable, the name or corporate name, the nationality, the year of birth or the year of incorporation, and the address of the holders of bearer shares that grant an immediate or deferred right to vote at its own Shareholders' Meetings, as well as the quantity of securities held by each of these shareholders and, where applicable, any restrictions to which the securities may be subject. The Company, in view of the list provided by the aforementioned body, has the right to ask the persons appearing on this list and whom the Company considers could be registered on behalf of third parties for the above information concerning the owners of the shares.

For registered shares that grant immediate or deferred access to the capital, intermediaries that are registered under the conditions provided for in Article L. 228-1 of the French Commercial Code mentioned above, are required,

within ten business days as from the request made by the Company or its agent, which may be made at any time, to disclose the identity of the owners of said securities.

## 7.2.5 ASSIGNMENT AND TRANSFER OF SHARES

Shares can be traded without restriction, subject to compliance with the provisions of the laws and regulations. They are registered in an account and are transmitted by transfer from one account to another.

## 7.2.6 CHANGES TO THE ARTICLES OF ASSOCIATION, THE CAPITAL AND VOTING RIGHTS

All changes to the articles of association, the capital or the voting rights attached to the securities that make up the capital are subject to the requirements of law, as the articles of association contain no specific provisions regarding such matters.

## 7.2.7 MEMBERS AND FUNCTIONING OF THE BOARD OF DIRECTORS

The Board of Directors adopted internal rules of procedure, which are regularly updated, defining the operating procedures of the Board of Directors in addition to applicable legal and regulatory requirements and the provisions of the Company's articles of association.

These procedures are described in section 4.2. "Members and functioning of the Board of Directors".

The Group's internal rules of procedure are accessible on the Group's website ([www.edf.fr](http://www.edf.fr)).

## 7.2.8 SHAREHOLDER'S MEETINGS

### 7.2.8.1 Convening notices to meetings

Shareholders' Meetings are convened by the Board of Directors or, in the last resort, by the Statutory Auditors or by any person empowered to do so. Meetings are held at the registered office or at any other place stated in the convening notice.

### 7.2.8.2 Participation in meetings and exercise of voting rights

Shareholders' Meetings may be held by video conference or telecommunication means that allow shareholders to be identified. The conditions governing the type and use of such means are specified in Articles R. 225-97 to R. 225-99 of the French Commercial Code. In such cases, shareholders who participate in the meeting by such means are deemed to be present for the calculation of the quorum and majority, under the conditions specified by law.

All shareholders can attend Shareholders' Meetings, regardless of the number of shares they own.

Shareholders can choose between one of the three following methods of participation: attend the meeting in person by requesting an admission card, grant authorisation (a proxy) to the Chairman of the Shareholders' Meeting or to any individual or legal entity of their choice (Article L. 225-106 of the French Commercial Code), or vote remotely.

In accordance with Article R. 225-85 of the French Commercial Code, proof of the right to participate in a Shareholders' Meeting is obtained by the registration of the securities in an account in the name of the shareholder or of the intermediary that is registered on the shareholder's behalf (pursuant to paragraph 7 of Article L. 228-1 of the French Commercial Code), on the second day prior to the meeting, *i.e.* at midnight, Paris time, either in the registered share accounts held by the Company (or its authorised representative), or in the bearer share accounts held by the accredited intermediary.

In accordance with Article R. 225-85 of the French Commercial Code, the registration of the securities in the bearer share accounts held by financial intermediaries is evidenced by a shareholding certificate issued by these intermediaries, where applicable by electronic means under the conditions provided for in Article R. 225-61 of the French Commercial Code, as an appendix to the postal voting form, the voting proxy or admission card request made on behalf of a shareholder or on behalf of a shareholder who is represented by the registered intermediary.

All shareholders may grant a proxy to any individual or legal entity of their choice in order to be represented at a Shareholders' Meeting. Proxies, as well as any proxy revocations, must be evidenced in writing and notified to the Company. Proxies may be revoked in the same forms as those required for the designation of the proxy holder, including by electronic means if need be. The owners of shares that are properly registered in the name of an intermediary under the conditions provided for in Article L. 228-1 of the French Commercial Code may be represented by a registered intermediary under the conditions provided for in said article.

EDF gives its shareholders the possibility of voting online, prior to the Shareholders' Meeting.

Certain shares may carry double voting rights in accordance with the conditions laid down in Act no. 2014-384 of 29 March 2014 (see section 7.2.4 "Rights attached to shares").

### 7.2.8.3 Requests for the inclusion of items or draft resolutions on the agenda and written questions to the Board of Directors

Requests for the inclusion of items or draft resolutions on the Shareholders' Meeting agenda made by shareholders who meet the conditions provided for in Article R. 225-71 of the French Commercial Code must be received by the Company by the twenty-fifth day prior to the date of the Shareholders' Meeting at the latest, but may not be sent more than 20 calendar days after the publication of the prior meeting notice, in accordance with Article R. 225-73 of the French Commercial Code.

Requests for the inclusion of items on the agenda must be substantiated. The wording of the draft resolutions must accompany requests for the inclusion of such resolutions, and a brief explanation of the reasons may also be given.

On the date of the request, the authors must provide proof of owning or representing the percentage of the capital required by Article R. 225-71 of the French Commercial Code. Requests must be accompanied by proof of entry in an account. Agenda items or draft resolutions that are proposed for inclusion are only reviewed if the authors of the request submit a new certificate proving the registration of the securities in the same accounts on the second day prior to the meeting.

Each shareholder also has the option of sending the Board of Directors written questions of his or her choice. The Board of Directors will answer the questions during the meeting, or, in accordance with Article L. 225-108 of the French Commercial Code, the answer is deemed to have been given provided that it is published on the Company's website.

Written questions must be sent to the Company by registered letter with return receipt or by electronic telecommunication at the latest on the fourth business day prior to the date of the Shareholders' Meeting. In accordance with Article R. 225-84 of the French Commercial Code, these questions must be accompanied by a shareholding certificate, in order to be taken into account.

### 7.2.8.4 Temporary disposals during meeting periods

In accordance with the provisions of Article L. 225-126 of the French Commercial Code, any person who holds, alone or together with other persons, in respect of one or more temporary disposals or any transaction that grants the right to or requires the resale or return of said shares to the assignor, a number of shares that represents more than 0.5% of the voting rights in a listed company, must inform the Company and the French Market Authority no later than midnight, Paris time, on the second business day prior to the Shareholders' Meeting, and when the contract that arranges this transaction remains in force on this date, said information must include the total number of shares held on a temporary basis. In addition to the number of shares acquired, this declaration must contain the identity of the assignor, the date and the expiration of the contract that organises the transaction and, as applicable, the voting agreement.

If no information is provided to the Company and the French Market Authority, the shares thus acquired are automatically stripped of voting rights for the Shareholders' Meeting concerned and for all Shareholder's Meetings that are held until such shares are resold or returned.

Moreover, the Company representative, a shareholder or the French Market Authority may petition the Commercial Court to order the complete or partial suspension, for a maximum of five years, of the voting rights of any shareholder who fails to provide such information, regardless of whether or not the voting borrowing shareholder has exercised his or her voting rights.

## 7.2.9 STATUTORY OR LEGAL PROVISIONS DELAYING A TAKEOVER OF THE COMPANY

Pursuant to Article L. 111-67 of the French Energy Code and the EDF articles of association, changes in share capital cannot result in the French State's shareholding falling below the statutory 70% threshold.

Certain shares may carry double voting rights in accordance with the conditions laid down in Act no. 2014-384 of 29 March 2014 (see section 7.2.4 "Rights attached to shares").

With the exception of the foregoing, no other provision specifically aims to prevent or delay the takeover of the Company by a third party.

## 7.2.10 THRESHOLD CROSSINGS

Pursuant to the provisions of the French Commercial Code, any individual or legal entity, acting alone or together with other persons or entities, that acquires a number of shares that represents more than 5%, 10%, 15%, 20%, 25%, 30%, 33.3%, 50%, 66.6%, 90% or 95% of the capital or voting rights must inform the Company, no later than prior to the close of business on the fourth trading day following the day on which the shareholding threshold is exceeded, of the total number of shares or voting rights owned (Article R. 233-1 of the French Commercial Code). Moreover, such individuals or legal entities must also inform the AMF of these acquisitions no later than prior to the close of business on the fourth trading day after exceeding the shareholding threshold (Article 223-14 of the AMF General Regulation). The AMF publishes threshold crossings that are notified to it.

Since 2012, cash payoff or physically-settled derivatives having a similar economic effect to detention of underlying shares, are taken into account for this calculation of threshold crossing (Article L. 233-9(I) 4obis of the French Commercial Code). Pursuant to AMF general regulations, holders of these financial instruments must take into account the number of shares that carry this type of agreement and financial instruments for the calculation of their participation in the framework of their reporting obligation, and must precise, when they declare threshold crossing, their intention as to the outcome of this type of agreements and financial instruments they benefit.

Within the same timeframes and under the same conditions, this information must also be disclosed when the capital or voting rights fall below the thresholds stated above.

Absent a proper declaration, the shares that exceed the fraction which should have been declared in accordance with the provisions of law mentioned above will be stripped of voting rights for all Shareholders' Meetings that are held during a two-year period following the date on which the effective disclosure is made.

Moreover, the Company articles of association provide that any individual or legal entity, acting alone or jointly, who acquires or ceases to hold, directly or indirectly, a number of shares that corresponds to 0.5% of the Company's capital or voting rights, or a multiple of said fraction, is required to inform the Company, by registered letter with return receipt requested, at the latest before the close of business on the fourth trading day following the crossing of such threshold, of the total number of shares, voting rights or equity interests held. The Company's articles of association state that the rules for the calculation and assimilation of shareholdings applicable to the statutory thresholds, as well as the obligations to provide information on financial instruments that are not assimilated to shares, apply to the disclosure requirements set out in the articles of association for bylaw thresholds.

Failure to comply with the above provisions is punishable by the loss of voting rights for the shares that exceed the fraction that should have been declared, for all Shareholders' Meetings that are held until the expiration of a two-year period following the date of the effective threshold disclosure provided for above, if the

application of this penalty is requested by one or more shareholders who hold at least 1% of the Company's capital. Such requests are recorded in the minutes of Shareholders' Meetings.

## 7.3 INFORMATION REGARDING CAPITAL AND SHARE OWNERSHIP

### 7.3.1 AMOUNT AND CHANGES IN SHARE CAPITAL

On the filing date of this Reference Document, the details of the Company's share capital are as follows:

<b>Number of shares issued</b>	<b>3,010,267,676</b>
Par value	€0.50 per share
Type of shares issued	common shares
Share capital amount	€1,505,133,838

The share capital issued by the Company has been paid up in full. The Company has not issued or authorised any preference shares.

Pursuant to the law of 9 August 2004, EDF was converted into a société anonyme (public limited company) on 20 November 2004 and its capital set at €8,129,000,000, divided into 1,625,800,000 shares with a par value of €5.

The EDF Shareholders' Meeting of 31 August 2005 granted full powers to the EDF Board of Directors with a view to reducing the capital by a maximum amount of €7,316,100,000, via a reduction in the par value of shares from €5 to a minimum of €0.5. During its meeting of 27 October 2005, the Board of Directors decided to reduce the share capital by €7,316,100,000, via a €4.50 reduction in the par value of shares, which therefore decreased from €5 to €0.50. The share capital was thus reduced to €812,900,000.

During its 18 November 2005 meeting, the Board of Directors used the authority granted to it by the Combined Shareholders' Meeting of 10 October 2005, and approved the increases in the Company's share capital in connection with the Open Price Offering and the Guaranteed Global Placement that were performed when the Group was first listed on the stock market. As a result, the Board of Directors increased the share capital to €906,834,514.

On 20 December 2005, Calyon (now Crédit Agricole-CIB) paid EDF the price that corresponded to the exercise of 8,502,062 warrants that the EDF Board issued to Calyon by decision taken on 18 November 2005. Consequently, the share capital was increased to €911,085,545 divided into 1,822,171,090 common shares.

The payment of dividends in shares on 17 December 2009 resulted in an increase in the share capital of €13,347,786 following the issue of 26,695,572 shares. On 21 January 2010, the share capital was thus increased to €924,433,331 divided into 1,848,866,662 common shares.

On 24 June 2011, the capital was increased to €930,406,055 divided into 1,860,812,110 common shares, via the issue of new shares as consideration for the EDF Énergies Nouvelles shares contributed to EDF in exchange for the EDF shares tendered as part of the alternative simplified public purchase or exchange offer involving EDF Énergies Nouvelles shares, which was initiated by EDF (see section 1.4.1.5.3 "EDF Renewables"). Then, on 28 September 2011, the capital was reduced to €924,433,331 divided into 1,848,866,662 common shares, via the cancellation of the shares purchased as part of the share buyback programme with a view to cancellation, in order to offset the dilution caused by the aforementioned offer.

On 29 July 2013, the capital was increased to €930,004,234, divided into 1,860,008,468 common shares. This increase of capital followed the decision of the EDF Shareholders' Meeting of 30 May 2013 to offer each shareholder in the Company the possibility to elect for the payment in new shares of a fraction of the

remaining dividend to be distributed for the financial year ending 31 December 2012.

The payment of interim dividends in shares on 18 December 2015 resulted in an increase in the capital of €30,065,279.50 following the issue of 60,130,559 shares. The share capital was thus increased from €930,004,234 to €960,069,513.50 divided into 1,920,139,027 common shares.

On 31 October 2016, the capital was increased to €1,054,568,341.50, divided into 2,109,136,683 common shares. This increase of capital followed the decision of the EDF Shareholders' Meeting of 12 May 2016 to offer each shareholder in the Company the possibility to elect for the payment in new shares of the remaining dividend to be distributed for the financial year ending 31 December 2016.

The payment of interim dividends in shares on 31 October 2016 resulted in an increase in the capital of €47,942,646 following the issue of 95,885,292 shares. The capital was thus increased from €1,006,625,695.50 to €1,054,568,341.50, divided into 2,109,136,683 common shares.

At its meeting of 3 March 2017, the Board of Directors, making use of the delegation of authority given by the Combined Shareholders' Meeting of 26 July 2016 in its second resolution, decided to increase the capital with maintenance of the shareholders' preferential subscription right. The capital was increased to €1,370,938,843.50, divided into 2,741,877,687 common shares. The final gross capital increase, including the issue premium, stood at €4,017,905,375.40 and resulted in the issue of 632,741,004 new shares. It was launched on 6 March 2017 and was completed on 30 March 2017.

On 12 July 2017, the capital was increased to €1,443,677,137, divided into 2,887,354,274 common shares. This increase of capital followed the decision of the EDF Shareholders' Meeting of 18 May 2017 to offer each shareholder in the Company the possibility to elect for the payment in new shares of the remaining dividend to be distributed for the financial year ending 31 December 2016.

The payment of interim dividends in shares on 14 December 2017 resulted in an increase in the share capital of €398,440,228.20 following the issue of 40,084,530 shares. The capital was thus increased from €1,443,677,137 to €1,463,719,402, divided into 2,927,438,804 common shares.

On 29 June 2018, the capital was increased to €1,505,133,838, divided into 3,010,267,676 common shares. This increase in capital followed the decision of the EDF Shareholders' Meeting of 15 May 2018 to offer each shareholder in the Company the possibility to opt for the payment in new shares of the remaining dividend to be distributed for the financial year ending 31 December 2017.

On the filing date of this Reference Document, other than the common shares of Company stock, there are no other securities that grant access to EDF's share capital, either directly or indirectly

### 7.3.2 TREASURY SHARES AND SHARE BUYBACK PROGRAMME

A share buyback programme initially authorised by the Shareholders' Meeting held on 9 June 2006, has been used by the Board of Directors within a limit of 10% of the Company's share capital and for an initial period of 15 months. This programme was continued for 15 months by the following Shareholders' Meetings held since 2006, including by the Shareholders' Meeting held on 15 May 2018.

#### 7.3.2.1 Share buyback programme in force as of the filing date of the Reference Document (programme authorised by the Shareholders' Meeting of 15 May 2018)

After consulting the Board of Directors' report, and in accordance with the provisions of Articles L. 225-209 *et seq.* of the French Commercial Code, the twelfth resolution adopted by the Shareholders' Meeting held on 15 May 2018 authorised the Board of Directors to implement a programme to buy back Company shares, capped at a maximum of 10% of the Company's capital.

This resolution immediately terminated the unused portion of the authorisation to purchase Company shares, which was granted by the seventh resolution adopted by the Shareholders' Meeting held on 18 May 2017.

The aims of the share buyback programme are as follows: to deliver shares when rights are exercised that are attached to options or securities which grant immediate or deferred access to the Company's shares by all means, as well as to perform all hedging transactions with respect to the obligations of EDF (or one of its subsidiaries) that are connected with such options or securities; to retain shares for future delivery in exchange or as payment in the context of external growth or contribution operations or mergers or demergers; to allocate shares to EDF group employees, in particular, within the framework of any share purchase or bonus share award plans under the terms stipulated by law and, in particular, by Articles

L. 225-197-1 *et seq.* of the French Commercial Code or Articles L. 3332-18 *et seq.* of the French Labour Code; to reduce the Company's capital by cancelling all or part of the shares purchased; and, finally, to ensure the liquidity of EDF shares via an investment services provider, under a liquidity agreement that is consistent with the code of ethics recognised by the Autorité des marchés financiers (French Market Authority).

Purchases of Company shares may involve any number of shares, provided that the number of shares that the Company purchases during the buyback programme does not exceed 10% of the shares that make up the Company's existing share capital on the date of the Shareholders' Meeting, and provided that the number of shares that the Company holds at any given time does not exceed 10% of the shares that make up the Company's capital.

These shares may be acquired or transferred, under the conditions and within the limits, in particular in terms of volumes and price, provided for by the laws and regulations in force on the date of the relevant transactions, by any means, such as on the market or over the counter, including via block trades (purchases or sales), by the use of derivative financial instruments or notes or securities that grant access to Company shares, or by implementing option strategies, under the conditions stipulated by the market authorities and at such times as determined by the Board of Directors or any person who is acting on the Board's behalf. This authorisation may be used during public takeover bids, within the limits permitted by the applicable regulations.

The Shareholders' Meeting set at €30 the maximum purchase price per share <sup>(1)</sup> and at €2 billion the maximum amount of funds allocated to the implementation of the programme, and granted the Board of Directors full powers, with the right of delegation, to use this authorisation.

The authorisation was granted for a maximum of 18 months as from the Shareholders' Meeting of 15 May 2018, and will therefore end on 15 November 2019, unless the Shareholders' Meeting of 16 May 2019 adopts the new programme described in section 7.3.2.3 "Description of the programme submitted for authorisation to the Shareholder's Meeting of 16 May 2019" below.

#### 7.3.2.2 Summary of the Company's trading in its own shares during the 2018 financial year

<b>Number of treasury shares held at 31 December 2018</b>	<b>3,728,019</b>
Percentage of capital held through treasury shares at 31 December 2018	0.1238%
Carrying value of the portfolio at 31 December 2018 <sup>(1)</sup> (in euros)	56,113,595.00
Market value of the portfolio at 31 December 2018 <sup>(2)</sup> (in euros)	51,446,662.20
Number of shares cancelled over the past 24 months	0

(1) Valued at the purchase price.

(2) Based on the closing price at 31 December 2018, i.e. €13.80.

#### Liquidity contract

From 25 July 2012, EDF engaged Oddo BHF to implement a new liquidity contract that complies with the Charter of Ethics of the *Association Française des Marchés Financiers* (AMAFI) as approved by the French market authority (AMF). The following assets were allocated to this liquidity contract: 1,350,000 EDF shares transferred from the former liquidity contract and €50 million in cash.

In 2018, EDF paid the following commissions on its liquidity contracts: €80,000 to Oddo BHF.

#### Number of shares purchased and sold during the 2018 financial year

During the 2018 financial year, EDF acquired 15,901,287 of its own shares and sold 15,603,284 shares under the liquidity contract. The average share purchase price was €12.59 and the average share sale price was €12.65.

#### Portfolio breakdown at 31 December 2018

At 31 December 2018, the Company held a total of 3,728,019 treasury shares. 3,677,425 of these shares (or 0.1222% of its share capital) are held under the liquidity contract, and the remaining 50,594 shares (0.0017% of its share capital), were acquired on the market with a view to being allocated to employees within the framework of the "ACT 2007" bonus share award plan, but were not actually allocated.

On this date, EDF's subsidiaries did not hold any shares, either directly or indirectly.

#### Post-closing transactions

Between 1 January 2019 and 28 February 2019, the Company acquired 1,852,803 treasury shares for an average unit value of €13.8963, and sold 1,470,088 shares for an average unit value of €14.03964.

(1) The Board of Directors may, however, adjust the aforementioned purchase price if premiums, reserves or profits are capitalised, which results either in an increase in the par value of the shares or the creation and award of bonus shares, and in the event of a stock split or reverse stock split, or any other transaction involving the shareholders' equity, in order to take into account the impact of these operations on share value.

### 7.3.3 AUTHORISED BUT NON-ISSUED CAPITAL

The following table presents a summary of the delegations of authority and authorisations to increase or reduce the share capital that were in force on the filing date of this Reference Document, which the Board of Directors was granted by the Combined Shareholders' Meeting of 15 May 2018, and the extent to which they have been used at 31 December 2018:

#### Status of the authorisations adopted by the Combined Shareholders' Meeting of 15 May 2018

Securities concerned/type of issue	Term of the authorisation and expiration	Maximum nominal increase or reduction in capital (in millions of euros)	Use of authorisations (in millions of euros)
<b>Delegation of authority to the Board to increase the capital with maintenance of the shareholders' preferential subscription right</b> Capital increase, all securities	26 months 15 July 2020	365 <sup>(1)</sup>	None
<b>Delegation of authority to the Board to increase the capital, by way of a public offering, with cancellation of the shareholders' preferential subscription right</b> Capital increase, all securities	26 months 15 July 2020	290 <sup>(1)</sup>	None
<b>Delegation of authority to the Board to make offers for private placements <sup>(2)</sup> with cancellation of the shareholders' preferential subscription right</b> Capital increase, all securities	26 months 15 July 2020	290 <sup>(1)</sup> and 20% of the share capital per year	None
<b>Authorisation for the Board, in the event of an increase of capital, via private placements, with cancellation of the shareholders' preferential subscription right, to decide the issue price at its discretion</b>	26 months 15 July 2020	10% of the capital by 12-month periods	None
<b>Authorisation for the Board to increase the number of securities to be issued in the event of a capital increase, with or without preferential subscription rights</b> Capital increase, all securities	26 months 15 July 2020	15% of the amount of the initial issue <sup>(1)</sup>	None
<b>Delegation of authority to the Board to increase the capital through the capitalisation of reserves, profits, premiums or otherwise</b>	26 months 15 July 2020	1,000	None
<b>Delegation of authority to the Board to increase the capital as consideration for a public exchange bid initiated by the Company</b>	26 months 15 July 2020	145 <sup>(1)</sup>	None
<b>Delegation of authority to the Board to increase the capital to remunerate in-kind contributions <sup>(3)</sup></b>	26 months 15 July 2020	10% of the Company's capital up to a maximum of 95 <sup>(1)</sup>	None
<b>Delegation of authority to the Board to increase the capital for the benefit of savings plan members</b> Issues reserved for the personnel	26 months 15 July 2020	15	None
<b>Delegation of authority to the Board to carry out increases of capital reserved for a category of beneficiaries, with cancellation of the shareholders' preferential subscription right</b>	18 months 15 November 2019	10	None
<b>Authorisation for the Board to reduce the capital by cancelling treasury shares</b>	26 months 15 July 2020	10% of the capital by 24-month periods	None

(1) The nominal aggregate limit on the share capital increase of €365 million provided for in the 13<sup>th</sup> resolution submitted to the Shareholders' Meeting of 15 May 2018, applies to all capital increases, with the exception of capital increases through capitalisation of reserves, premiums, profits or otherwise and capital increases that are reserved for savings plan members.

(2) Offers governed by Article L. 411-2 II of the French Monetary and Financial Code, in that they are exclusively intended for persons who provide investment portfolio management services on behalf of third parties or qualified investors or a restricted circle of investors acting on their own behalf.

(3) Article L. 225-147 of the French Commercial Code.



### 7.3.4 OTHER EQUITY SECURITIES

On the filing date of this Reference Document, other than the common shares of Company stock, there are no other securities that grant access to EDF's share capital, either directly or indirectly.

### 7.3.5 NON-EQUITY SECURITIES

On 18 April 1996, EDF set up a programme to issue debt securities in the form of Euro Medium Term Notes (the "EMTN" programme). Since this date, this programme has been regularly renewed.

On 6 October 2016, EDF successfully raised \$2.655 billion from 2 senior bonds subscribed for by twenty or so investors on the Taiwanese market ("Formosa bonds"):

- \$491 million, with a fixed coupon of 4.65%, 30-year bond;
- \$2.164 billion, with a fixed coupon of 4.99%, 40-year bond.

On 6 October 2016, EDF also successfully launched a senior multi-currency bond issue of approximately €3 billion in four tranches:

- €1.75 billion, with a fixed coupon of 1%, 10-year green bond;
- €750 million, with a fixed coupon of 1.875%, 20-year bond;
- CHF400 million, with a fixed coupon of 0.3%, 8-year bond;
- CHF150 million, with a fixed coupon of 0.65%, 12-year bond.

This third Green Bond issue, in an amount of €1.75 billion, is the largest tranche of Green Bonds issued to date and means that EDF has already issued the equivalent of more than €4 billion in Green Bonds over a three-year period to support its expansion in the renewable energies field.

On 20 January 2017, EDF successfully raised JPY137 billion, corresponding to approximately €1.1 billion<sup>(1)</sup>, through four senior bonds issued on the Japanese market ("Samurai bonds"):

- JPY107.9 billion, with a fixed coupon of 1.088%, 10-year bond;
- JPY19.6 billion, with a fixed coupon of 1.278%, 12-year green bond;
- JPY6.4 billion, with a fixed coupon of 1.569%, 15-year green bond;
- JPY3.1 billion, with a fixed coupon of 1.870%, 20-year bond, which is the longest bond maturity ever issued on the Samurai market.

With the issue of two green tranches, in a total amount of 26 billion yen to be used to finance its renewable investments, EDF opens the Samurai Green market and thus continues to actively participate in the development of Green Bonds as tools to finance the energy transition.

On 19 September 2018, EDF successfully raised US\$3.75 billion on 3 tranches of senior bonds:

- \$1.8 billion, with a fixed coupon of 4.500%, 10-year bond;
- \$650 million, with a fixed coupon of 4.875%, 20-year bond;
- \$1.3 billion, with a fixed coupon of 5.000%, 30-year bond.

In addition, on 25 September 2018, EDF successfully launched a €1 billion senior bond issue with a 12-year maturity and a fixed coupon of 2%.

On 25 September 2018, EDF launched a €1.25 billion super-subordinated bond issue with a 4% coupon and a redemption option exercisable at EDF's discretion, initially between 4 July 2024 (inclusive) and 4 October 2024 (inclusive). It also launched a contractual cash buyback offer for four existing hybrid bond issues for €1.25 billion. The total amount of EDF hybrid shares remains unchanged following these issue/redemption operations.

A description of the Group's bond debt is provided in note 38.2 to the consolidated financial statements for the fiscal year ended 31 December 2018.

### 7.3.6 INFORMATION ON THE SHARE CAPITAL OF ANY MEMBER OF THE GROUP SUBJECT TO A CONDITIONAL OR UNCONDITIONAL AGREEMENT

Acquisition and disposal commitments involving securities in subsidiaries are described in note 46 to the consolidated financial statements for the fiscal year ended 31 December 2018.

With the exception of these commitments to acquire and dispose of securities and any other commitments that are described in chapter 1 ("Presentation of the EDF group") of this Reference Document, EDF has not made any promises to purchase or sell that would make it possible to acquire or dispose of, as applicable, all or part of the capital of the Company or of any of its subsidiaries, as defined in Article L. 233-1 of the French Commercial Code.

### 7.3.7 PLEDGE OF THE COMPANY'S SHARES

To the Company's knowledge, none of the Company's common shares that make up its share capital have been pledged.

(1) According to the exchange rate on 20 January 2017.



### 7.3.8 OWNERSHIP OF THE COMPANY'S CAPITAL AND VOTING RIGHTS

For the past three financial years, EDF's share capital has been owned as follows as at 31 December of each year:

	Position as at 31/12/2018			Position as at 31/12/2017			Position as at 31/12/2016		
	Number of shares	% of capital	% of voting rights <sup>(1)</sup>	Number of shares	% of capital	% of voting rights <sup>(1)</sup>	Number of shares	% of capital	% of voting rights <sup>(1)</sup>
State*	2,518,498,450	83.67	83.77	2,444,361,086	83.50	83.60	1,805,952,345	85.62	85.73
Institutional and private investors	453,361,661	15.06	15.08	444,381,189	15.18	15.20	267,417,384	12.68	12.70
Employee shareholders	34,679,546 <sup>(2)</sup>	1.15	1.15	35,266,513 <sup>(3)</sup>	1.20	1.20	33,097,739 <sup>(4)</sup>	1.57	1.57
Treasury shares	3,728,019	0.12	-	3,430,016	0.12	-	2,669,215	0.13	-
<b>TOTAL</b>	<b>3,010,267,676</b>	<b>100.00</b>	<b>100.00</b>	<b>2,927,438,804</b>	<b>100.00</b>	<b>100.00</b>	<b>2,109,136,683</b>	<b>100.00</b>	<b>100.00</b>

(1) These percentages do not include the double voting rights that may have been acquired under Article L. 225-123 of the French Commercial Code.

(2) This number includes 30,453,101 shares (representing 1.01% of the capital) based on the definition of employee shareholdings under Article L. 225-102 of the French Commercial Code (shares held by EDF's employees and former employees through the "Actions EDF" FCPE of the EDF group's savings plan). This number also includes almost 4.3 million shares, representing 0.14% of the capital, held as directly or administered registered shares, with no lock-in periods or whose lock-in periods have expired, by employees or former employees.

(3) This number includes 30,856,184 shares (representing 1.05% of the capital) based on the definition of employee shareholdings under Article L. 225-102 of the French Commercial Code (shares held by EDF's employees and former employees through the "Actions EDF" FCPE of the EDF group's savings plan). This number also includes almost 4.4 million shares, representing 0.15% of the capital, held as directly or administered registered shares, with no lock-in periods or whose lock-in periods have expired, by employees or former employees.

(4) This number includes 28,771,251 shares (representing 1.36% of the capital) based on the definition of employee shareholdings under Article L. 225-102 of the French Commercial Code (shares held by EDF's employees and former employees through the "Actions EDF" FCPE of the EDF group's savings plan). This number also includes almost 4.3 million shares, representing 0.21% of the capital, held as directly or administered registered shares, with no lock-in periods or whose lock-in periods have expired, by employees or former employees.

\* The stake which the French State holds in the EDF share capital includes the EPIC Bpifrance allotment of 389,349,361 EDF shares held since January 2018.

## GENERAL INFORMATION ABOUT THE COMPANY AND ITS CAPITAL

### Information regarding capital and share ownership

Following a French state allotment of 389,349,361 EDF shares to EPIC Bpifrance, on 29 January 2018, BPI France and the French State combined crossed the statutory thresholds of 5%, 10%, 15%, 20%, 30%, one third, 50% and two-thirds of the Company's capital and voting rights. The French state and Bpifrance act together and have to consult each other before every Shareholders' Meeting of EDF. Bpifrance undertook to not transfer, pledge or otherwise dispose of the EDF shares.

To the Company's knowledge, no shareholder other than the French State and Bpifrance directly or indirectly holds more than 5% of the capital and voting rights.

The Company conducted a study on identifiable bearer shares as at 31 December 2018, which allowed it to examine the ownership of its capital and the geographical location of its shareholders on this date. The table set out below summarises this information as at 31 December 2018 and 31 December 2017:

	As at 31 December 2018		As at 31 December 2017	
	Number of shares held	% of capital	Number of shares held	% of capital
State*	2,518,498,450	83.67	2,444,361,086	83.50
Institutional investors in Europe (other than France)	124,602,395	4.14	111,751,510	3.81
Institutional investors in the rest of the world	201,203,349	6.68	174,348,008	5.96
Institutional investors in France	68,798,317	2.29	83,945,491	2.87
Private shareholders	58,752,599	1.95	74,336,180	2.54
Employee shareholders	34,679,546	1.15	35,266,513	1.20
Treasury shares	3,728,019	0.12	3,430,016	0.12
<b>TOTAL</b>	<b>3,010,267,676</b>	<b>100.00</b>	<b>2,927,438,804</b>	<b>100.00</b>

Following the allocation of double voting rights attached to the 1,805,952,345 registered shares held by the State for at least two years, the State indicated that it held 2,129,149,089 EDF shares and 3,935,101,434 voting rights as at 18 February 2019 (or 70.73 % of the capital and 80.84 % of the voting rights of EDF). <sup>(1)</sup>

The state has committed to choosing a payment in shares for the remaining dividend for 2018 as well as 2019 and 2020.

### 7.3.9 AGREEMENTS WHOSE IMPLEMENTATION COULD LEAD TO A CHANGE OF CONTROL

To EDF's knowledge, there are no agreements whose implementation could subsequently lead to a change in the Company's control.

Moreover, pursuant to Article L. 111-67 of the French Energy Code, the State may not hold less than 70% of EDF's capital.

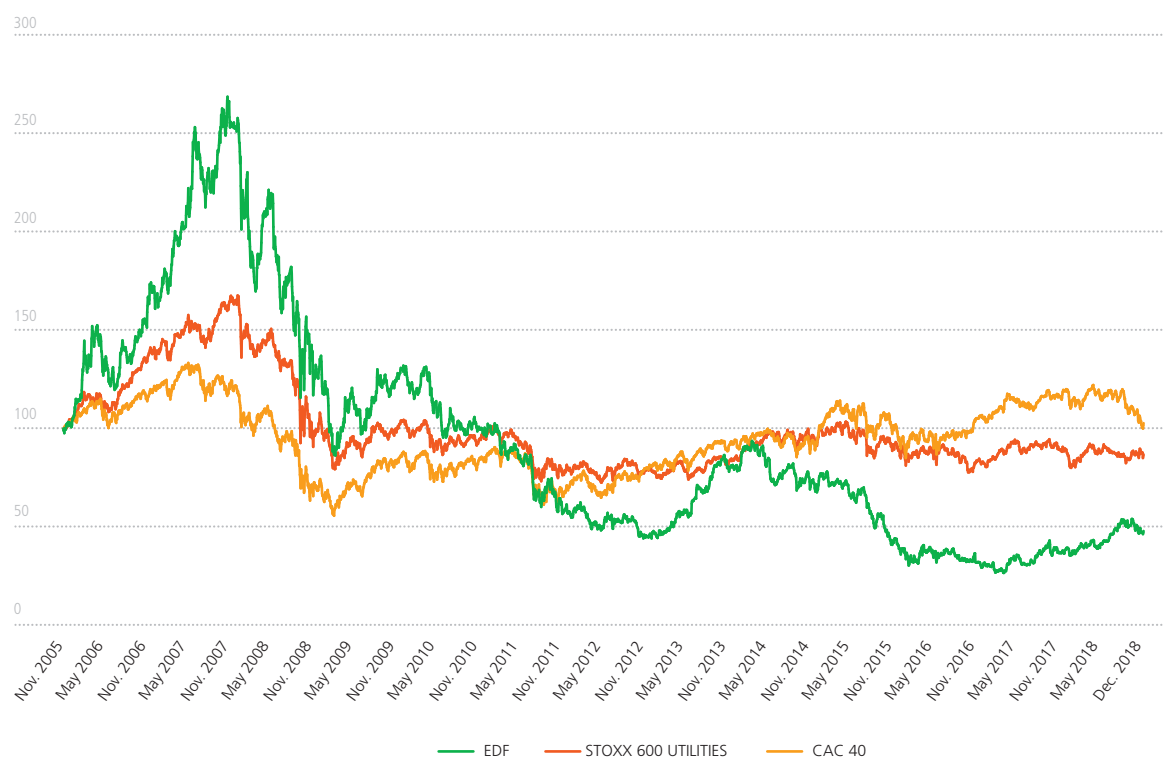
\* The stake which the French State holds in the EDF share capital includes the EPIC Bpifrance allotment of 389,349,361 EDF shares held since January 2018.

(1) This percentage was calculated based on the number of theoretical voting rights for all shares carrying voting rights, including those stripped of voting rights.

## 7.4 MARKET FOR THE COMPANY'S SHARES

The Company's shares have been listed for trading by Euronext Paris (Compartment A) since 21 November 2005, under ISIN code FR 0010242511, Reuters code (EDF.PA) and Bloomberg code (EDF: FP).

The following graph shows the changes in the Company's share price between 21 November 2005 and 31 December 2018 (base index 100 as at 21 November 2005):



(Source: Bloomberg)

The following table shows the share price and volume of EDF shares traded between 1 January 2018 and 31 January 2019 on the Euronext Paris stock market:

	Transactions		Closing price (in euros)	
	(in number of shares)	(in euros <sup>(1)</sup> )	Highest	Lowest
<b>2019</b>				
January 2019	43,514,111	607,602,873	14.430	13.570
<b>2018</b>				
December 2018	47,501,785	656,173,898	14.580	13.320
November 2018	58,212,531	855,348,002	15.645	13.860
October 2018	59,865,310	892,028,444	15.530	14.315
September 2018	59,804,549	883,291,825	15.595	13.795
August 2018	47,711,294	644,206,097	14.210	12.735
July 2018	41,948,877	515,152,853	12.800	11.805
June 2018	56,942,506	656,312,024	11.920	11.100
May 2018	57,374,599	684,865,238	12.425	11.400
April 2018	49,927,549	574,673,986	11.960	11.180
March 2018	61,529,353	682,883,438	11.920	10.285
February 2018	72,424,358	758,648,492	11.085	10.040
January 2018	56,290,039	610,527,031	11.245	10.335

(1) Transactions in euros correspond to the monthly sum of the proceeds of the daily number of shares traded by the closing price on the same day.

(Source: Euronext).

## 2018

In 2018, EDF's share price increased by 32.44%. The French CAC 40 index decreased by 10.95%, while the Euro Stoxx Utility sector index decreased by 2.08%.

At 31 December 2018, the closing price of the EDF share was €13.80 (€10.42 at 29 December 2017). Its highest closing price in 2018 was €15.64 on 8 November 2018, and its lowest closing price was €10.04 on 9 February 2018.

At 31 December 2018, EDF's market capitalisation totalled €41.54 billion (compared to €30.50 billion at 29 December 2017).

## 2019

Between the start of 2019 and 31 January 2019 inclusive, EDF's share price rose by 4.57%, the CAC 40 index increased by 5.54% and the Euro Stoxx Utility (SX6P) sector index decreased by 7.48%.

At 31 January 2019, the closing price of the EDF share was €14.430. Its lowest closing price in 2019, up to 31 January 2019 inclusive, was €13.570 on 8 January 2019, and its highest closing price was €14.430 on 31 January 2019.

At 31 January 2019, EDF's market capitalisation totalled €43.44 billion.

## 7.5 RELATED-PARTY TRANSACTIONS

In addition to the information set out below, the details of the transactions concluded by the Company with related parties, as defined by the IFRS, in respect of the 2018 financial year, are contained in note 23 and 48 to the consolidated financial statements for the financial year ended 31 December 2018.

The information on the regulated agreements and commitments referred to in Article L. 225-38 of the French Commercial Code is stated in the Statutory Auditors' special report, which is reproduced in section 7.5.5 of this Reference Document.

### 7.5.1 RELATIONS WITH THE FRENCH STATE

As of 31 December 2018, the French State held 83.67% of the share capital and 83.77% of the voting rights in EDF. Pursuant to the Article L. 111-67 of the French Energy Code, the state must remain the owner of at least 70% of its capital. The French State thus has the option, as the majority shareholder, of reviewing corporate decisions that require the approval of the shareholders and, in particular, of determining the result of the shareholders' vote for all issues over which Shareholders' Meetings have authority.

The regulations applicable to EDF, as a result of its majority ownership by the French State, are described in section 1.5 "Legislative and regulatory environment".

The relations with the French State are also described in note 48 to the consolidated financial statements for the financial year ended 31 December 2018.

### 7.5.2 RELATIONS WITH ENGIE (EX-GDF SUEZ)

The missions of the common service shared by the two network managers, Enedis and GRDF, which are respectively in charge of the distribution of electricity and gas, as defined by Article L. 111-71 of the French Energy Code, are in the electricity and gas distribution sector: construction of structures, project management work, operation and maintenance of networks, and metering operations. It does not have the status of a legal entity. The organisational and functional rules are described in

section 1.4.4.2.3 ("Service shared by Enedis and GRDF"). In March 2018, Enedis and GRDF decided to create two joint entities: UONRH-MS, which groups together employment contract activities, studies and medico-social services, and the OIT, the IT & Telecoms operator, which groups together all telephony and office automation activities. The establishment of these two joint entities took effect on 01/01/2019.

### 7.5.3 RELATIONS WITH PUBLIC SECTOR COMPANIES

Relations with public sector companies mainly concern the Orano group. Transactions with Orano relate to the upstream and downstream nuclear fuel cycles. These relations are described in particular in sections 2.3 ("Dependency factors"), 1.4.1.1.4 ("Nuclear fuel cycle and related issues"), and 1.4.1.1.6 ("Decommissioning of nuclear power plants"), and in note 48 of the appendices to the consolidated financial statements for the year ended 31 December 2018.

### 7.5.4 AGREEMENTS WITH FRAMATOME

The statutory auditors' special report on regulated agreements and commitments of 9 March 2018 mention the following contracts previously approved by EDF's Shareholders' Meeting and which are still in effect:

- agreement relating to the supply of the Flamanville 3 EPR nuclear boilers (authorised by the EDF Board of Directors at its 23 January 2007 meeting);
- agreement relating to the maintenance and upkeep of the boilers to be carried out during the three ten-year inspections of the 900MW series nuclear reactors in France (authorised by the EDF Board of Directors at its 14 June 2007 meeting).

During the review of agreements made prior to 2018, the Board of Directors at its 14 February 2019 meeting noted that these agreements could be deemed to be part of EDF and Framatome's regular business transactions and were concluded under normal conditions. As such, they do not fall within the scope of regulated agreements as stipulated by the French Code of Commerce and were declassified.

## 7.5.5 STATUTORY AUDITOR'S SPECIAL REPORT ON REGULATED AGREEMENTS AND COMMITMENTS

### Shareholders' Meeting held to approve the financial statements for the year ended December 31, 2018

*This is a free translation into English of the Statutory Auditors' special report on regulated agreements and commitments with third parties that is issued in the French language and is provided solely for the convenience of English speaking readers. This report on regulated agreements and commitments should be read in conjunction with, and construed in accordance with, French law and professional auditing standards applicable in France. It should be understood that the agreements reported on are only those provided by the French Commercial Code and that the report does not apply to those related party transactions described in IAS 24 or other equivalent accounting standards.*

To the Shareholders' Meeting of Electricité de France SA,

In our capacity as Statutory Auditors of Electricité de France SA (the "**Company**"), we hereby report to you on regulated agreements and commitments.

The terms of our engagement require us to communicate to you, based on information provided to us, the principal terms and conditions of those agreements and commitments brought to our attention or which we may have discovered during the course of our audit, without expressing an opinion on their usefulness and appropriateness or identifying such other agreements and commitments, if any. It is your responsibility, pursuant to Article R. 225-31 of the French Commercial Code (*Code de Commerce*), to assess the interest involved in respect of the conclusion of these agreements and commitments for the purpose of approving them.

Our role is also to provide you with the information stipulated in Article R. 225-31 of the French Commercial Code relating to the implementation during the past year of agreements and commitments previously approved by the Shareholders' Meeting, if any.

We conducted the procedures we deemed necessary in accordance with the professional guidelines of the French National Institute of Statutory Auditors (*Compagnie Nationale des Commissaires aux Comptes*) relating to this engagement. These procedures consisted in agreeing the information provided to us with the relevant source documents.

### Agreements and commitments submitted to the approval of the shareholders' meeting

#### Agreements and commitments authorized and concluded during the year

We hereby inform you that we have not been advised of any agreement or commitment authorized and concluded during the year to be submitted to the approval of the Shareholders' Meeting pursuant to Article L.225-38 of the French Commercial Code.

### Agreements and commitments previously approved by the Shareholders' Meeting

#### Previously approved agreements and commitments which have remained in force during the year

#### 1. Agreements signed by EDF as part of the sale by AREVA SA of its entire interest in the capital of NEW NP (henceforth Framatome)

**Persons concerned:** the French State, represented by Mr. Martin Vial on the Board of Directors, a shareholder owning more than 10% of the voting rights of EDF and AREVA SA, and Mr. Maurice Gourdault-Montagne, director of EDF and AREVA SA.

The Board of Directors had previously authorized the conclusion of these agreements successively during its meetings of June 23, 2017 and December 14, 2017, which were approved by the Combined Shareholders' Meeting of May 15, 2018 held to approve the financial statements for the year ended December 31, 2017.

##### a. Agreement between EDF, AREVA SA and AREVA NP to acquire 75.5% of the capital of Framatome

**Nature, purpose, and terms & conditions:** Following the memorandum of understanding signed on July 28, 2016, the Board of Directors which met on November 15, 2016 had previously authorized the agreement, signed the same day, setting the terms of the sale of the interest conferring to EDF exclusive control of an entity ("NEW NP" which has become "Framatome"), 100%-held by AREVA NP, a subsidiary of AREVA SA, regrouping the activities relating to the design and manufacturing of nuclear reactors and equipment, fuel assemblies and services to the nuclear installed base within the Group.

The final acquisition agreement covering 75.5% of the capital of Framatome was authorized by your Board of Directors on December 14, 2017 and signed on December 22, 2017. The acquisition was carried out on December 31, 2017 for €1,868 million, excluding acquisition costs.

This agreement had no financial impact during fiscal year 2018, since the negotiations were still ongoing between the parties regarding (i) the setting of earn-outs, including certain related to performance objectives measured subsequent to the completion date and for which the final valuation, of a maximum amount of €245 million, should be known during 2019 and (ii) the valuation of certain items of the vendor warranties granted by Areva NP and exercised by EDF.

##### b. Signature by EDF of the agreement relating to the acquisition of 19.5% of the Framatome shares by Mitsubishi Heavy Industries (MHI)

**Nature, purpose and terms & conditions:** the final acquisition agreement was signed on December 14, 2017, concomitantly with the acquisition by EDF of 75.5% of the Framatome shares. It allows MHI to acquire 19.5% of Framatome from AREVA SA and AREVA NP, and under financial conditions similar to those of EDF.

This agreement had no financial impact during fiscal year 2018, since the negotiations led by EDF on behalf of MHI were still ongoing between the parties regarding the setting of earn-outs and the valuation of certain items of the vendor warranties granted by Areva NP and exercised by EDF and MHI.

##### c. Signature by EDF of the agreement relating to the acquisition of 5% of the Framatome shares by Assystem

**Nature, purpose and terms & conditions:** the final acquisition agreement was signed on December 14, 2017, concomitantly with the acquisition by EDF of 75.5% of the Framatome shares. It allows Assystem to acquire 5% of Framatome from AREVA SA and AREVA NP, in the presence of EDF and under financial conditions similar to those of EDF.

This agreement had no financial impact during fiscal year 2018, since the negotiations led by EDF on behalf of Assystem were still ongoing between the parties regarding the setting of earn-outs and the valuation of certain items of the vendor warranties granted by Areva NP and exercised by EDF and Assystem.

## Agreements and commitments authorized during prior years but not approved by the Shareholders' Meeting

In accordance with the terms of Article R.225-30 of the French Commercial Code, we have been informed of the following agreements and commitments, which were described in our special report on regulated agreements and commitments for fiscal years 2016 and 2017, and which were not approved by the Combined Shareholders' Meeting of May 18, 2017 held to approve the financial statements for the year ended December 31, 2016, which were continued during the period.

### 1. Shareholders' agreement between EDF on the one hand, and Caisse des Dépôts, Consignation and CNP Assurances on the other hand, regarding Coentreprise de Transport d'Electricité CTE, parent company of RTE

**Person concerned:** the French State, represented by Mr. Martin Vial on the Board of Directors, a shareholder owning more than 10% of the voting rights of EDF, and having a representative on the Board of Directors of CNP Assurances.

**Nature, purpose, terms & conditions:** this agreement, signed on December 14, 2016 and implemented on March 31, 2017 between EDF Caisse des Dépôts et Consignation and CNP Assurances, enabled Caisse des Dépôts et Consignation and CNP Assurances to acquire an indirect interest of 49.9% in the capital of RTE, via CTE, and the set-up of the terms and conditions of a long-term partnership to encourage the development of RTE, notably by the conclusion of a shareholders' agreement.

### 2. Agreement entered into between the French State, EDF, the Caisse des Dépôts, CNP Assurances and CTE relating to the governance of CTE and RTE

**Person concerned:** the French State, represented by Mr. Martin Vial on the Board of Directors, a shareholder owning more than 10% of the voting rights of EDF, a party to the agreement and having a representative on the Board of Directors of CNP Assurances.

**Nature, purpose, terms & conditions:** the purpose of this agreement, entered into between EDF, Caisse des Dépôts and CNP Assurances, CTE and the French State, is to set forth the commitment of the French State and to limit its representatives to two on the Supervisory Board of RTE.

Paris La Défense, 15 March 2019

The Statutory Auditors

KPMG S.A.

Deloitte & Associés

Jay Nirsimloo

Michel Piette

Damien Leurent

Christophe Patrier



## 7.6 MATERIAL CONTRACTS

The information on the regulated agreements and commitments referred to in Article L. 225-38 of the French Commercial Code is contained in the Statutory Auditors' special report, which is reproduced in section 7.5.5 "Statutory Auditor's Special Report on regulated agreements and commitments" of this Reference Document, section 7.5.4 of the 2017 Reference Document and section 7.5.4 of the 2016 Reference Document.

Except for the contracts which may be described in chapters 1 and 5 of this Reference Document or in the notes to the consolidated statements for the financial year ended 31 December 2018, in chapters 1 and 5 of the 2016 and 2017 Reference Document or in the notes to the consolidated statements for the financial years ended 31 December 2016 and 2017, including the contracts described hereunder, EDF signed no material contracts other than those concluded in the normal course of business over the last two years preceding the filing of this Reference Document, the 2017 Reference Document and the 2016 Reference Document.

### 7.6.1 MATERIAL CONTRACTS ENTERED INTO IN 2018

Material contracts entered into in 2018, other than those conducted in the normal course of business, by the Group, are the followings:

- Concession agreement for the stake in Dunkerque LNG - 30 October 2018;
- Concession agreement for the 49% minority share in 24 wind power farms in the UK, representing 550MW in Dalmore Capital Limited and Pensions Infrastructure Platform - June 2018;
- Sale contract for a 450MW offshore Scottish wind farm project named "Neart na Gaoithe" - May 2018.

### 7.6.2 MATERIAL CONTRACTS ENTERED INTO IN 2017

Material contracts entered into in 2017, other than those conducted in the normal course of business, by the Group, are the followings:

- On 19 May 2017, EDF signed an agreement with PGE for the disposal of the assets of EDF Polska;
- EDF signed an agreement on 31 March 2017 for the transfer of a 49.9% indirect equity interest in RTE to Caisse des Dépôts and CNP Assurances;
- In accordance with the non-binding memorandum of understanding signed between EDF and AREVA on 30 July 2015 and updated on 28 July 2016, on 31 December 2017 EDF acquired 75.5% of the capital and voting rights of New NP (Now Framatome), an entity spun out of the AREVA group combining industrial activities relating to nuclear reactor and equipment design and manufacturing, fuel assemblies and installed base services, authorised by the Board of Directors on 14 December 2017.

### 7.6.3 MATERIAL CONTRACTS ENTERED INTO IN 2016

Material contracts entered into in 2016, other than those conducted in the normal course of business, by the Group, are the followings:

- final agreements relating to the Hinkley Point C project, entered into on 29 September 2016, with the British Government and CGN following the authorisation of the final investment decision by EDF's Board of Directors on 28 July 2016;
- a share transfer agreement relating to the acquisition of AREVA NP's activities through the acquisition of an interest between 51 and 75% of the capital and voting rights in New NP, (a fully owned subsidiary of AREVA NP) entered into between EDF, AREVA and AREVA NP on 15 November 2016, to which is appended the draft shareholders' agreement relating to the governance of New NP, authorised by the Board of Directors on 15 November 2016;
- an investment agreement (and its appendices) entered into between EDF SA, Caisse des dépôts and CNP Assurances on 14 December 2016 providing for the indirect partial sale of the shares in Réseau de Transport d'Electricité - RTE authorised by the Board of Directors on 14 December 2016.





## 8. ADDITIONAL INFORMATION

<b>8.1 PERSON RESPONSIBLE FOR THE REFERENCE DOCUMENT AND THE CERTIFICATION</b>	<b>518</b>
8.1.1 Person responsible for the Reference Document	518
8.1.2 Certification from the person responsible for the 2018 Reference Document containing the annual financial report	518
<b>8.2 AUDITORS – STATUTORY AUDITORS</b>	<b>519</b>
Deloitte et Associés	519
KPMG SA	519
<b>8.3 DOCUMENTS AVAILABLE TO THE PUBLIC - LEI</b>	<b>519</b>
<b>8.4 FINANCIAL COMMUNICATION CALENDAR</b>	<b>519</b>
<b>8.5 CONCORDANCE TABLES</b>	<b>520</b>
8.5.1 Concordance table with Appendix I of (EC) regulation no. 809/2004	520
8.5.2 Concordance table with the management report	522
8.5.3 Concordance table with the elements of the EDF Board of Directors' report on corporate governance	525
8.5.4 Concordance table with the non-financial performance statement	526
8.5.5 Concordance table with the annual financial report	527
<b>GLOSSARY</b>	<b>528</b>

## 8.1 PERSON RESPONSIBLE FOR THE REFERENCE DOCUMENT AND THE CERTIFICATION

### 8.1.1 PERSON RESPONSIBLE FOR THE REFERENCE DOCUMENT

Jean-Bernard Lévy, Chairman and Chief Executive Officer of EDF.

### 8.1.2 CERTIFICATION FROM THE PERSON RESPONSIBLE FOR THE 2018 REFERENCE DOCUMENT CONTAINING THE ANNUAL FINANCIAL REPORT

Having taken all reasonable care to ensure that such is the case, I certify that, to the best of my knowledge, the information contained in this Reference Document accurately reflects the facts and contains no omission likely to affect its meaning.

I certify that, to the best of my knowledge, the financial statements are prepared in accordance with accounting standards and that they give a true and fair view of the assets and liabilities, financial position and the income of the Company and of all the companies included in the consolidation, and that the management report (Rapport de gestion) presents a true and fair view of the business trends, income and financial position of the Company and of all the companies included in the consolidation and a description of the main risks and uncertainties they face.

I have obtained a letter from the Statutory Auditors certifying that they have verified the financial and accounting information provided in this Reference Document and that they have read the document in entirety. This letter contains no observation.

Jean-Bernard Lévy,

Chairman and Chief Executive Officer of EDF

## 8.2 AUDITORS – STATUTORY AUDITORS

### DELOITTE ET ASSOCIÉS

6, Place de la Pyramide, 92908 Paris – La Défense Cedex, represented by Mr Damien Leurent and Mr Christophe Patrier.

### KPMG SA

Tour EQHO, 2, avenue Gambetta, CS 60055, 92066 Paris – La Défense cedex, represented by Mr Jay Nirsimloo and Mr Michel Piette.

The Statutory Auditors were initially appointed by decision of the Shareholders' Meeting of 6 June 2005 for a period of six fiscal years expiring at the end of the Shareholders' Meeting ruling on the financial statements covering the fiscal year closing 31 December 2010.

Their terms of office were renewed by a decision of the Combined Shareholders' Meeting of 24 May 2011 until the Shareholders' Meeting ruling on the financial statements for the fiscal year ended 31 December 2016 then again by the Combined Shareholders' Meeting of 18 May 2017 for a further period of six fiscal years expiring at the end of the Shareholders' Meeting ruling on the financial statements covering the fiscal year ending 31 December 2022.

The aforementioned Statutory Auditors consequently certified the financial statements reproduced in this Reference Document.

## 8.3 DOCUMENTS AVAILABLE TO THE PUBLIC - LEI

The Company's press releases, annual reports, including historical financial information relating to the Company and any related updates filed with the AMF, are available on the Company's website:

<https://www.edf.fr/en/the-edf-group/dedicated-sections/investors-shareholders>

and a copy may also be obtained at the Company's registered office at 22-30, avenue de Wagram, 75382 Paris Cedex 08 (France).

EDF's LEI number is 549300X3UK4GG3FNM006

All of the regulated information published by the Company, pursuant to Article 221–1 *et seq.*, in the AMF's General Regulation, is available at the following address:

<https://www.edf.fr/en/the-edf-group/dedicated-sections/investors-shareholders/regulated-information>

Finally, the documents and information referred to in Article R. 225-73-1 of the French Commercial Code, are available on EDF web site in the section dedicated to Shareholders' Meetings.

8.

## 8.4 FINANCIAL COMMUNICATION CALENDAR

2018 Annual Results	15 February 2019
First quarter 2019 revenue	14 May 2019
Shareholders' Meeting	16 May 2019
Half year 2019 Results	26 July 2019

The Company has imposed a 15 days embargo period prior to the announcement of the annual and half-year results and before the quarterly results ("quiet period") during which no new information regarding the business development and EDF's

results have to be issued to financial analysts and investors so as to avoid the release of incomplete financial information enabling the recipients to anticipate EDF's results prior to their official publication.

## 8.5 CONCORDANCE TABLES

### 8.5.1 CONCORDANCE TABLE WITH APPENDIX I OF (EC) REGULATION NO. 809/2004

Concordance table with the information required by Appendix I of EC Regulation no. 809/2004 of 29 April 2004:

<b>Appendix I of EC Regulation no. 809/2004 of 29 April 2004</b>	<b>Reference Document sections</b>
<b>1. Persons responsible</b>	<b>Section 8.1</b>
1.1. Name and address of the persons responsible	Section 8.1.1
1.2. Declaration by the persons responsible	Section 8.1.2
<b>2. Statutory Auditors</b>	<b>Section 8.2</b>
2.1. Name and address of the Statutory Auditors	Section 8.2
2.2. Change in auditors, where applicable	n/a
<b>3. Selected financial information</b>	<b>Introduction: Key figures</b>
3.1. Historical financial information	Chapter 6
3.2. Interim financial information	n/a
<b>4. Risk factors</b>	<b>Section 2.1</b>
<b>5. Information about the issuer</b>	<b>Chapters 1 and 7</b>
5.1. History and Development of the Company	Section 1.1
5.1.1. Legal and commercial name of the issuer	Section 7.1.1
5.1.2. Place of registration of the issuer and its registration number	Section 7.1.2
5.1.3. Date of incorporation and the length of life of the issue	Section 7.1.3
5.1.4. Domicile and legal form of the issuer, legislation under which the issuer operates, its country of incorporation, and the address and telephone number of its registered office	Section 7.1.4
5.1.5. Important events in the development of the issuer's business	Sections 5.1.2 and 5.1.3
5.2. Investments	Section 1.3.3
5.2.1. Past principal investments	Section 1.3.3.1
5.2.2. Principal investments in progress	Section 1.3.3.2
5.2.3. Future principal investments for which commitments have been taken by governing bodies	Sections 1.3.3.2 and 5.1.3.5
<b>6. Business overview</b>	<b>Section 1.4</b>
6.1. Principal activities	Section 1.4
6.2. Principal markets	Section 1.4
6.3. Exceptional factors	n/a
6.4. Extent to which the issuer is dependent	Section 2.3
6.5. Competitive position	Sections 1.4.2.1.2 and 1.4.5.1.2.3
<b>7. Organisational structure</b>	<b>Section 1.2.1</b>
7.1. Brief description of the Group	Section 1.2.1
7.2. List of significant subsidiaries	Section 1.2.1
<b>8. Property, plant and equipment</b>	<b>Section 1.7</b>
8.1. Material property, plant and equipment	Section 1.7
8.2. Environmental issues	Sections 1.7.3.2 and 3.4.2
<b>9. Operating and financial review</b>	<b>Chapter 6</b>
9.1. Financial position	Chapter 6
9.2. Operating income	Chapter 6.1
9.2.1. Significant factors materially affecting the issuer's income from operations	Section 5.1.2 and 5.1.3
9.2.2. Explanation of material changes in net sales or revenue	Section 6.7
9.2.3. Strategy or factor of governmental, economical, budgetary, monetary or political nature, that has influenced or which may significantly influence, directly or indirectly, the issuer's operations	Sections 1.3.1 and 1.3.2



**Appendix I of EC Regulation  
no. 809/2004 of 29 April 2004**

**Reference Document  
sections**

<b>10. Cash and capital resources</b>	<b>Chapters 6 and 7</b>
10.1. Issuer's capital resources	Sections 7.2 and 7.3
10.2. Cash flows	Chapter 6.1 – Note 43
10.3. Borrowing requirements and the funding structure of the issuer	Chapter 6.1 – Note 38
10.4. Restrictions on the use of capital resources	n/a
10.5. Expected sources of financing	n/a
<b>11. Research and development, patents and licences</b>	<b>Section 1.6</b>
<b>12. Trend information</b>	<b>Sections 5.2, 5.3 and 5.4</b>
12.1. Most significant trends since the end of the last fiscal year	Section 5.2
12.2. Information on events that are reasonably likely to have a material effect on the issuer's prospects	Section 5.4
<b>13. Profit forecasts or estimates</b>	<b>Section 5.4</b>
<b>14. Administrative, management, and supervisory bodies and Executive Management</b>	<b>Chapter 4</b>
14.1. Members of the administrative and management bodies	Sections 4.2.1 and 4.3.1
Name, professional address and functions	Sections 4.2.1 and 4.3.1
Nature of any family relationship	Section 4.4
Expertise and experience	Sections 4.2.1 and 4.3.1
Absence of conviction	Section 4.4.2
14.2. Conflict of interest	Section 4.4.3
<b>15. Compensation and benefits</b>	<b>Section 4.6</b>
15.1. Compensation paid and benefits in kind	Sections 4.6.1 and 4.6.2
15.2. Amounts set aside or accrued to provide pension, retirement	Section 4.6.1.1.3
<b>16. Board practices</b>	<b>Section 4.2.2</b>
16.1. Date of expiration of the current terms of office	Section 4.2.2.1
16.2. Members of the administrative or management bodies' services contracts	Section 4.4.3
16.3. Information about Audit and Remuneration Committees	Section 4.2.3
16.4. Statement of compliance with the corporate governance regime in force	Section 4.1
<b>17. Employees</b>	<b>Section 3.4.1</b>
17.1. Number of employees	Section 3.4.1.1
17.2. Shareholdings and stock options	n/a
17.3. Arrangements for involving the employees in the capital of the issuer	n/a
<b>18. Major shareholders</b>	<b>Section 7.3</b>
18.1. Major shareholders holding more than 5% of the share capital	Section 7.3.8
18.2. Breakdown of voting rights	Section 7.2.4
18.3. Controlling shareholder	Section 7.3
18.4. Agreement whose implementation could lead to a change of control	Section 7.3.9
<b>19. Related-party transactions</b>	<b>Section 7.5</b>
<b>20. Financial information concerning the issuer's assets and liabilities, financial position and profits and losses</b>	<b>Chapters 5 and 6</b>
20.1. Historical financial information	Chapter 6
20.2. Pro forma financial information	n/a
20.3. Financial statements	Chapter 6
20.4. Auditing of historical annual financial information	Chapter 6
20.5. Date of the latest financial information	n/a
20.6. Interim and other financial information	Chapter 6
20.7. Dividend policy	Section 6.6
20.8. Disputes and litigation	Section 2.4
20.9. Significant change in the issuer's financial or trading position	Section 6.7
<b>21. Additional information</b>	<b>Chapters 6 and 7</b>
21.1. Share capital	Section 6.1 and 7.3 - Note 27
Amount of subscribed share capital, number of fully paid issued shares and par value per share	Section 7.3.1
Number of shares authorised	Section 7.3.3

Appendix I of EC Regulation no. 809/2004 of 29 April 2004	Reference Document sections
Information on shares not representing the share capital	Section 7.3.5
Number, book value and nominal value of the shares held by the issuer	Section 7.3.2
Information on convertible or exchangeable securities or securities with subscription warrants,	n/a
Information on conditions governing any right of acquisition and/or obligation right attached to authorised but unissued share capital or any endeavour to increase the share capital	Sections 7.2.4, 7.2.5 and 7.3.3
Information about the share capital owned by any member of the Group which is under option or subject to a conditional or unconditional agreement to be put under option and characteristics of such options	Section 7.3.6
History of the Company's share capital	Section 7.3.1
21.2. Incorporation documents and articles of association	Section 7.2
<b>22. Material contracts</b>	<b>Section 7.6</b>
<b>23. Third party information, statements by experts and declarations of interest</b>	<b>n/a</b>
23.1. Identity	n/a
23.2. Certificate	n/a
<b>24. Documents on display</b>	<b>Section 8.3</b>
<b>25. Information on investments</b>	<b>Section 4.5.1</b>

## 8.5.2 CONCORDANCE TABLE WITH THE MANAGEMENT REPORT

This Reference Document includes the elements of the Board of Directors' management report relating to the 2018 fiscal year as provided for in Articles L. 225-100 *et seq.* of the French Commercial Code. The management report is composed of the sections of the Reference Document referred to in the following table:

Required topics	Reference texts	Reference Document sections
<b>Situation and activity of the Group</b>		
Objective and exhaustive analysis of the Company's and Group's business, results and financial situation	L. 225-100-1, L. 232-1 L. 233-6 and L. 233-26 of the French Commercial Code	Chapter 5
Key events arising between the end of the fiscal year and the date the management report was written	L. 232-1 and L. 233-26 of the French Commercial Code	Section 5.2
Foreseeable development and future prospects of the situation of the Company and the Group	L. 232-1 and L. 233-26 of the French Commercial Code	Sections 5.4 and 2.4.3
Key indicators of financial and non-financial performance relevant to the particular business of the Company and the Group	L. 225-100-1 of the French Commercial Code	Chapter 3 and section 8.5.4
Description of the major risks and uncertainties and indication on the use of financial instruments for the Company and the Group	L. 225-100-1 of the French Commercial Code	Section 2.1
Acquisition of significant equity holdings during the reporting period in Companies having their registered office on the French territory	L. 233-6 al.1 of the French Commercial Code	Section 5.1.3 and Note 5 to the consolidated statements
Internal control and risk management procedures implemented by the Group relating to the preparation and processing of accounting and financial information	L. 225-100-1 of the French Commercial Code	Section 2.2
Financial risks associated with the effects of climate change and the Group's low-carbon strategy.	L. 225-100-1 of the French Commercial Code	Section 2.1.4
Research and development activities	L. 232-1 and L. 233-26 of the French Commercial Code	Section 3.3.1
<b>Corporate governance/Corporate Officers</b>		
<b>Section including elements contained in the report on corporate governance</b>		
Reference to the Corporate Governance Code	L. 225-37-4 of the French Commercial Code	Section 1.6
List of all mandates and positions held in all Group's companies by each executive officer during financial year	L. 225-37-4 of the French Commercial Code	Section 4.1
Conditions for the preparation and organisation of the Board's work	L. 225-37-4 of the French Commercial Code	Sections 4.2 and 4.3
Members of the Board of Directors and description of the diversity policy applied to members of the Board of Directors, description of its objectives, its implementation procedures and the results obtained	L. 225-37-4 of the French Commercial Code	Section 4.2
Information on the balanced representation of women and men in the Executive Committee and gender balance index in the 10% of functions with highest responsibility	L. 225-37-4 of the French Commercial Code	Section 3.2.2.2

Required topics	Reference texts	Reference Document sections
Remuneration and benefits of all kinds paid by the Company during the financial year to each executive officer	L. 225-37-3 of the French Commercial Code	Section 4.6
Guidelines and rules approved by the Board of Directors for the determination of the executives officers' compensation and benefits	L. 225-37-4 of the French Commercial Code	Section 4.6
Agreements concluded between a manager or a major shareholder and a subsidiary	L. 225-37-4 of the French Commercial Code	Sections 7.5 and 7.6 Notes 23 and 48 to the consolidated statements
Limitation of powers of the Chairman and Chief Executive Officer	L. 225-37-4 of the French Commercial Code	Sections 4.2.2 and 7.2.9
Information likely to impact a public offer	L. 225-37-5 of the French Commercial Code	Sections 7.2 and 7.3
Specific procedures relating to the participation of shareholders in General Meeting	L. 225-37-4 of the French Commercial Code	Section 7.2.8
Summary table of the outstanding delegations given by the Annual General Meeting to perform capital increases	L. 225-37-4 of the French Commercial Code	Section 7.3.3

Required topics	Reference texts	Reference Document sections
<b>Share ownership and capital stock</b>		
Structure and change of the Company's share capital	L. 233-13 of the French Commercial Code	Section 7.3
Acquisition and disposal by the Company of its own shares	L. 225-211 of the French Commercial Code	Section 7.3.2
Status of employees participation in the share capital	L. 225-102 al 1 of the French Commercial Code	Section 3.4.3.1 Section 7.3.8
Shares acquired by employees in the context of employees buyout	L. 225-102 al 2 of the French Commercial Code	n/a
References to potential adjustments for the securities giving access to the share capital in the case of share repurchases or financial operations	R. 228-90 and R. 228-91 of the French Commercial Code	n/a
Amount of dividend paid out over the past three fiscal years	243 bis of the French General Tax Code	Section 6.6.1
<b>Environmental, labour and social information</b>		
Declaration of non-financial performance	L. 225-102-1 al 5 et 6 and R. 225-105 of the French Commercial Code	Chapter 3 and Section 8.5.4
Specifics Information concerning companies using at least one site filed as Seveso "high threshold"	L. 225-102-2 of the French Commercial Code	Section 1.5.6.2
Vigilance plan	Article L. 225-102-4 I al 1 of the French Commercial Code	Section 3.8.1
<b>Other information</b>		
Additional tax information	223 quater and 223 quinquies of the French General Tax Code	n/a
Injunctions or fines as a result of anti-competitive practices	L. 464-2 of the French Commercial Code	n/a
Information concerning supplier and customer payment periods	L. 441-6-1 of the French Commercial Code	Section 5.1.7
Table showing the Company's results over each of the last five financial periods	R. 225-102 of the French Commercial Code	Section 6.5
List of the existing subsidiaries	L. 232-1 of the French Commercial Code	Section 5.1.8
Amount of intercompany loans granted	L. 511-6 of the French Monetary and Financial Code	Section 1.2.2
Information on operations made on the Company's shares by managers' transactions and related persons	L. 621-18-2 of the French Monetary and Financial Code	Section 4.5.2
Attribution and conservation of stock-options by the executive officers	L. 225-185 of the French Commercial Code	n/a
Attribution and conservation of free shares to executive officers	L. 225-197-1 of the French Commercial Code	Section 4.6.2

## 8.5.3 CONCORDANCE TABLE WITH THE ELEMENTS OF THE EDF BOARD OF DIRECTORS' REPORT ON CORPORATE GOVERNANCE

This Reference Document includes all the elements of the Company's Board of Directors' report pursuant to Article L. 225-37 of the French Commercial Code. The Board's report on corporate governance is composed of the sections of the Reference Document referred to in the following table and is included in the management report in a section on corporate governance:

Required topics	Reference texts	Chapter
Reference to the Corporate Governance Code	L. 225-37-4 of the French Commercial Code	Section 4.1
List of all mandates and positions held in all Group's companies by each executive officer during financial year	L. 225-37-4 of the French Commercial Code	Sections 4.2 and 4.3
Conditions for the preparation and organisation of the Board's work	L. 225-37-4 of the French Commercial Code	Section 4.2
Members of the Board of Directors and description of the diversity policy applied to members of the Board of Directors, description of its objectives, its implementation procedures and the results obtained	L. 225-37-4 of the French Commercial Code	Section 4.2
Information on the balanced representation of women and men in the Executive Committee and gender balance index in the 10% of functions with highest responsibility.	L. 225-37-4 of the French Commercial Code	Section 3.2.2.2
Remuneration and benefits of all kinds paid by the Company during the financial year to each executive officer	L. 225-37-3 of the French Commercial Code	Section 4.6
Guidelines and rules approved by the Board of Directors for the determination of the executives officers' compensation and benefits	L. 225-37-4 of the French Commercial Code	Section 4.6
Agreements concluded between a manager or a major shareholder and a subsidiary	L. 225-37-4 of the French Commercial Code	Sections 7.5 and 7.6 - Note 48 to the consolidated statements
Limitation of powers of the Chairman and Chief Executive Officer	L. 225-37-4 of the French Commercial Code	Sections 4.2.2 and 7.2.9
Information likely to impact a public offer	L. 225-37-5 of the French Commercial Code	Sections 7.2.8 and 7.3.2.
Specific procedures relating to the participation of shareholders in General Meeting	L. 225-37-4 of the French Commercial Code	Section 7.2
Summary table of the outstanding delegations given by the Annual General Meeting to perform capital increases	L. 225-37-4 of the French Commercial Code	Section 7.3.3

### 8.5.4 CONCORDANCE TABLE WITH THE NON-FINANCIAL PERFORMANCE STATEMENT

This Reference Document includes the non-financial performance statement for the 2018 financial year prepared in accordance with Articles L. 225-102-1 and R. 225-105 of the French Commercial Code.

Thus, to the extent necessary to understand the Company's position, the evolution of its business, its economic and financial results and the impact of its activity, the Extra-financial Performance Statement (EPSD) presents information on how the

Company and the Group take into account the social and environmental consequences of their activities, as well as the effects of these activities on respect for human rights and the fight against corruption and tax evasion.

The EPSD is hence made up of the sections of the Reference Document identified in the table below:

Topics	Reference Document sections	Topics	Reference Document sections
<b>Business models</b>			<b>Sections 1.3 and 1.4</b>
<b>Risk factors</b>			<b>Chapter 3 and Section 2.1</b>
<b>Challenges/Risks of non-financial performance of the Group</b>		<b>Key policy performance indicators of the Group</b>	
Adaptation of skills	Sections 3.2.2.3 and 3.4.1.3	% of employees who attended a training during the year	Section 3.4.1.3
The issue of consultation with stakeholders	Section 3.2.5	% of the number of projects included in the criteria - i.e. any new project of more than €50 million, for which an investment decision is taken as from 1 January 2017 and having a significant impact on the territories or the environment.	Section 3.2.5.1
Energy efficiency	Sections 1.4.6, 1.4.2 and 3.2.4	Number of customer visits on digital consumption monitoring platforms	Section 3.2.4.1
Climate Change Issue - Reduction of direct greenhouse gas emissions	Section 3.2.1	CO <sub>2</sub> emissions due to heat and electricity generation (gCO <sub>2</sub> /kWh)	Section 3.2.1.2.4
The issue of biodiversity and environmental heritage	Section 3.2.6	Level of awareness of the ecological value of the land	Section 3.2.6.3.1
Energy mix issue	Section 1.6.2.	Net installed capacity of renewable energy in MWe	Section 1.4.1.5
Management of radioactive waste and spent fuel	Sections 1.4.1.1.4, 1.4.5.1.2.1 and 3.3.2	France: m <sup>3</sup> of long-lived high and intermediate level solid radioactive waste UK: m <sup>3</sup> of low level radioactive waste generated	Section 3.9.3.2.1 Section 3.9.3.2.1
Energy poverty of private individual customers	Section 3.2.3	Number of "energy supports" initiatives in France	Section 3.2.3.1
Promotion of diversity	Sections 3.2.2 and 3.4.4.3	% of women in the Management Committees of the Group's entities.	Sections 3.2.2.2 and 4.2.1
Health & Safety	Section 3.2.2	Overall LTIR - group and service providers (from 2019) - Overall TF in 2018	Section 3.2.2.1
Safety of the nuclear fleet	Sections 1.4.1 and 1.4.5	Number of significant level 2 events on the INES scale	Section 3.9.3.2.2



Specific information	Reference Document sections
<b>Corporate information: information on subcontracting, suppliers and fair practices</b>	<b>Sections 3.3.3 and 3.4.4</b>
Respect for human rights	Sections 3.2.2, 3.2.3 and 3.3.3
Fight against corruption	Section 3.5.1
Fight against tax evasion	Section 3.5.2
<b>Consequences for climate change of the Group's activity and of the use of the goods and services it produces</b>	<b>Sections 3.1.3, 3.2.1 and 3.3.1</b>
Commitments to sustainable development and the circular economy	Sections 3.1.3 and 3.3.2
Commitments to fight food waste and food insecurity, respect for animal welfare and responsible, equitable and sustainable food	Section 3.3.2
<b>Social consequences: information on employment, work organisation, social relations, training and equal treatment</b>	<b>Section 3.4</b>
Collective agreements concluded within the Group and their impact on the economic performance and working conditions of employees	Sections 3.2 and 3.4
Actions to combat discrimination and promote diversity	Sections 3.2.2, 3.3, 3.4 and 3.5
Measures taken in favour of people with disabilities	Sections 3.2, 3.3 and 3.4

## 8.5.5 CONCORDANCE TABLE WITH THE ANNUAL FINANCIAL REPORT

This Reference Document includes the annual financial report for the 2018 financial year. It has been prepared in application of Articles L. 451-1-2 of the French Monetary and Financial Code and Article 222-3 of the AMF General Regulation. The annual financial report consists of the sections of the Reference Document listed in the table below:

Topics	Reference Document sections
Certification from the person responsible of the annual financial report	Section 8.1.2
EDF annual financial statements	Section 6.3
Statutory Auditors' report on the EDF annual financial statements	Section 6.4
EDF group consolidated financial statements	Section 6.1
Statutory Auditors' report on the EDF group's consolidated financial statements	Section 6.2
Management report	Section 8.5.2
Fees paid to Statutory Auditors	note 52 to the consolidated statements

## Glossary

<b>ANDRA</b> (National Agency for Radioactive Waste)	In France, radioactive waste is managed by the National Agency for Radioactive Waste Management (ANDRA), a public industrial and commercial institution created under the French law of 30 December 1991.
<b>ASN</b> (Nuclear Safety Authority)	On behalf of the Government, the Nuclear Safety Authority (ASN) supervises nuclear safety and radiation protection in France to protect workers, patients, the public and the environment from the risks related to the use of nuclear power. It is responsible in particular for the external oversight of nuclear facilities in France. The ASN is an independent administrative authority comprised of over 300 people. At the national level, the ASN is represented by the Directorate-General for Nuclear Safety and Radiation Protection (DGSNR).
<b>Assembly/Fuel</b>	Nuclear fuel is in the form of an assembly made up of an array of 264 fuel rods, bound together by a rigid structure made of tubes and grids. Each fuel rod consists of a water-tight zirconium tube into which uranium oxide pellets are piled, constituting the fuel. The assemblies are loaded side by side into the reactor vessel – 205 assemblies are required for a 1,500MW reactor – to make up the core of the reactor. During operation, these assemblies are crossed by bottom to top with primary water which heats on contact and carries this energy to the steam generators.
<b>Balancing Mechanism</b>	Created by RTE on 1 April 2003, the balancing mechanism allows it to use power reserves that can be mobilised in the event of an imbalance between supply and demand.
<b>Becquerel (Bq)</b>	International legal unit for measuring radioactivity. The Becquerel (Bq) is equal to one disintegration per second. The activity represented by this unit is so low that multiples of it are used: the MBq (megabecquerel or million Becquerels) and the GBq (gigabecquerel or billion Becquerels).
<b>Cogeneration</b>	Generation technique for combined electricity and heat production. The advantage of cogeneration is the ability to capture the heat produced by the fuel whereas in traditional electricity generation this heat is lost. This process also allows the same facility to meet the heating (hot water or steam) and electricity needs of both industrial and local authority customers. This system improves the energy efficiency of the generation process and reduces fuel use by an average of 20%.
<b>Combined-Cycle Gas</b>	The most recent technology for generating electricity in a natural gas-fired plant. A combined cycle is made up of one or more combustion turbines and a steam turbine allowing for an improved yield. The syngas is routed to the combustion turbine, which generates electricity and very hot exhaust gases (effluents). The heat from the exhaust gases is recovered by a boiler, thus producing steam. Part of the steam is then recovered by the steam turbine to generate electricity.
<b>Congestion</b>	Situation in which an interconnection linking the national transmission grids cannot absorb all of the physical flows resulting from international exchanges required by market operators due to a shortage of capacity in the interconnection and/or the national transmission grids involved.
<b>CRE</b> (French Energy Regulatory Commission)	CRE was created on 30 March 2000 to ensure the proper functioning of the electricity and gas market. The CRE, an independent body, regulates the opening of the French energy market. It ensures that all of the generators and eligible customers have non-discriminatory access to the network. Within its jurisdiction, this body supervises and authorises, settles any disputes and, if required, imposes sanctions. For a detailed description of its powers, see section 1.5.3.2 ("French legislation: Energy Code").
<b>Distribution network</b>	Downstream of the transmission network, medium- and low-voltage distribution networks serve end-users (residential, local authorities, SMEs, SMIs, etc.).
<b>Disruption</b>	Voluntary reduction of electrical power by a customer, in exchange for compensation. It is called "diffused" when it is due to the aggregation of small consumption sites.
<b>Electricity supply</b>	Electricity demand can be broken down into four types of consumption: <ul style="list-style-type: none"> <li>■ the "basic" (or "ribbon") supply of electricity, which is generated and consumed throughout the year;</li> <li>■ "semi-basic" supply is the electricity generated and consumed over the winter period;</li> <li>■ "peak" supply corresponds to periods of the year when electricity generation or supply is in heavy demand;</li> <li>■ "lace" supply is a complement to "ribbon" supply.</li> </ul>
<b>Enriched uranium</b>	Uranium, whose isotope 235 content, the only fissile material, has been increased from its low natural level (0.7%) to approximately 4% for pressurised water reactor fuel.
<b>Enrichment</b>	Process to increase the fissile content of an element. In its natural state uranium is 0.7% uranium 235 (fissile) and 99.3% uranium 238 (non fissile). To enable its efficient use in a pressurised water reactor, it is enriched with uranium 235 whose proportion is increased to around 4%.
<b>Entity Responsible for Balance</b>	Entities with which RTE signs a contract for the financing of shortfalls between forecast and actual consumption and the production of a portfolio of users brought together by the balance responsible entity which plays a role of insurer covering the potential losses arising from the many differences between over- and under-supply.
<b>EPR</b>	European Pressurised Reactor. The latest generation of reactors currently under construction (known as generation 3), it is the result of Franco-German cooperation, and offers advanced safety, environmental and technical performance.
<b>ERU</b> (enriched reprocessed uranium)	To be used in a reactor, reprocessed uranium (RepU), even if containing more fissile uranium than in its natural state, must be further enriched. It is therefore called re-enriched uranium (ERU).
<b>Fluorination (conversion)</b>	Also called "conversion", fluorination allows for the purification of uranium compounds and their transformation into uranium hexafluoride (UF <sub>6</sub> ), allowing their enrichment using current techniques.

<b>Fuel Cycle</b>	<p>The nuclear fuel cycle encompasses all industrial operations in France and abroad which enable the supply of the fuel to generate energy in a reactor, then to unload and process it. The cycle can be broken down into three stages:</p> <ul style="list-style-type: none"> <li>■ upstream: the processing of concentrates from uranium ore, the conversion, enrichment and production of fuel (which takes more than two years);</li> <li>■ the core of the cycle corresponding to the use of fuel in the reactor: receipt, loading, operation and discharging (which takes three to five years);</li> <li>■ downstream: pool storage, reprocessing of spent fuel in reactors of recoverable material, vitrification of highly radioactive waste, then temporary storage of the waste before storage.</li> </ul>
<b>Greenhouse gases</b>	Gas that retains a portion of the solar radiation in the atmosphere and for which an increase in emissions due to human activity (man-made emissions) causes an increase in the earth's average temperature and plays an important role in climate change. The Kyoto Protocol covers the seven following principal greenhouse gases: carbon dioxide (CO <sub>2</sub> ), methane (CH <sub>4</sub> ), nitrogen protoxide (N <sub>2</sub> O), hydrofluorocarbons (HFC), perfluorated hydrocarbons (PFC), sulfurhexafluoride (SF <sub>6</sub> ) and, since 2013, nitrogen trifluoride (NF <sub>3</sub> ).
<b>IAEA</b>	International Atomic Energy Agency based in Vienna (Austria).
<b>Interconnection</b>	Electricity transmission infrastructure that allows for exchanges of energy between different countries, by connecting the transmission network of one country to that of a neighbouring country.
<b>Intermediate Storage</b>	Intermediate stage in the process of managing nuclear waste. It involves placing waste packages in a facility to ensure, for a given period of time, their isolation from contact with man and the environment with the intention of retrieving them for a further stage in the waste management process. Intermediate storage facilities are designed, built and managed by the producers of such waste (EDF, AREVA NC (ex-COGEAMA) and CEA) and are close to areas where waste is conditioned.
<b>LDC (French Local Distribution Companies)</b>	French Local Distribution Companies. Local Distribution Companies sell and deliver electrical energy to end users located in their exclusive service area.
<b>LNG (Liquefied Natural Gas)</b>	Natural gas turned into liquid form by reducing its temperature to -162°C allowing for a reduction by 600 in its volume.
<b>Man-sievert</b>	Unit expressing the collective equivalent dose. A man-sievert is the collective dose from exposure of 1,000 men to 1mSv (millisievert).
<b>Metering</b>	A system allowing for the recording, at a given network connection point, of the volumes of electricity transmitted or distributed (power, frequency, active and reactive energy).
<b>Multi-year energy programme (PPE or Programmation pluriannuelle de l'énergie)</b>	In France, the public authorities express their priorities for action in the energy sector in the form of an operational project called "PPE" in order to achieve the objectives set by law (including carbon neutrality in 2050). The PPE for the French mainland is developed by the Government. The PPE sets the course for all energy sectors that may complement each other to provide the French energy mix in the future.
<b>MW/MWh</b>	<p>The MWh is the energy unit generated by a facility and is equal to the facilities' power, expressed in MW, multiplied by the duration of operations in hours.</p> <p>1MW = 1,000 kilowatts = 1 million watts</p> <p>1MWh = 1MW produced for 1 hour = 1 megawatt hour</p> <p>1GW = 1,000MW = 1 billion watts</p> <p>1TW = 1,000GW</p>
<b>MWh cumac</b>	The MWh cumac is the certificate energy unit of counting which corresponds to the cumulative energy savings aggregated on the operations' lifetime.
<b>Non-interconnected zones</b>	Zones in France which are not connected to metropolitan France (Corsica and overseas departments).
<b>Nuclear safety</b>	Nuclear safety includes all of the technical, organisational and human measures which are intended to prevent accident risks and to limit the effects of an accident, and which are taken at every stage of the life of a nuclear power plant (from design to operation and finally to decommissioning).
<b>Nuclear tranche</b>	Electrical production unit consisting of a nuclear boiler and a turbo-alternator generator. A nuclear tranche essentially consists of its reactor type and the power of its turbo-alternator generator. EDF nuclear plants include two or four tranches, and occasionally six.
<b>Plant availability</b>	Fraction of power available, out of theoretical maximum energy, counting only technical non-availability. The availability coefficient (Kd) is defined as the ratio between annual actual generation capacity (or amount producible annually) and maximum theoretical generation capacity, where maximum theoretical generation capacity = installed capacity × 8,760h. The Kd, which counts only technical non-availability, i.e., scheduled shutdowns, unplanned outages and testing periods, characterises a plant's industrial performance.
<b>Plutonium (Pu)</b>	Element with the atomic number of 94 (number of neutrons) and no naturally occurring isotopes (elements whose atoms possess the same number of electrons and protons – thus the same chemical properties – but a different number of neutrons). Plutonium 239, a fissile isotope, is produced in nuclear reactors from uranium 238.
<b>Producible hydropower generation</b>	Maximum energy that hydropower facilities may produce using contributions under normal hydraulicity conditions. However, generation from hydroelectric facilities does vary, sometimes markedly, from one year to the next depending on hydraulicity (rainfall and snowfall). In dry years, the generation index may vary by 20% or more from the standard level.

<b>Radiation protection</b>	At a power plant, ionising radiation sources are numerous: the fuel itself, equipment activated by neutron flux (particularly that which is close to the core, such as tanks or lids) and particles from corrosion of the primary circuit of reactors and carried by the primary fluid. The level of exposure of a person is quantified by the dose equivalent in Sieverts (Sv). The total dose equivalents, called dosimetry and expressed in man-sieverts, is used as an indicator of dose received by all participating persons. The mobilisation of ground players has allowed a continuous improvement of performance on the protection of employees against the effects of ionising radiation.
<b>Renewable energies</b>	Energies for which production does not require extinction of the initial resource. They include hydro, wind, solar, marine (the energy produced by marine waves and currents), geothermal (energy derived from the heat below the earth's magma) energies, and bio-mass (energy derived from living matter, particularly wood and organic waste). They often include energy from the incineration of household or industrial waste.
<b>Reprocessing</b>	Reactor burnt fuel reprocessing aimed at separating materials that can be recycled (uranium and plutonium) from final waste.
<b>RepU (reprocessed uranium)</b>	Reprocessed uranium ("RepU"), uranium derived from spent fuel reprocessing, differs from natural uranium as it contains slightly more uranium 235 and more uranium isotopes. It is recyclable and RepU fuel assembly refuelling is used in reactors.
<b>Series</b>	In the nuclear field, a series of plants means a set of nuclear plants with identical generation capacity. EDF's PWR model is divided into three series of available electrical power: the 900-MW series (34 tranches of approximately 900MW each), the 1,300-MW series (20 tranches) and the 1,450-MW series (4 tranches).
<b>STEP</b>	Pumped-storage hydropower plant. Power plant with two tanks, an upper and a lower one, connected by pumps that allow the water to be pumped up once turbined and located in the lower tank, towards the upper tank.
<b>Storage</b>	Storage consists in placing packages of radioactive waste in a facility, ensuring their long-term management, i.e., under safe conditions allowing for long-term risk control.
<b>Systems services</b>	Systems Services are services provided to users (consumers or electricity producers) through the joint action of the electricity transmission network operator RTE and the producers. They are intended to regulate frequency and voltage in order to maintain the balance between electric consumption and production at all times. They are created by RTE from elementary contributions from producers, i.e. primary and secondary reserves provided to RTE. RTE remunerates the producers for these auxiliary services before re-invoicing these services via the tariff to use the network under the rules defined by the Union for the Coordination of Transmission of Electricity (UCTE).
<b>Therms (th)</b>	One therm is equivalent to 1,163kWh or 4,186 million joules.
<b>Transmission network</b>	Network providing for the transmission of electrical power at high and very high voltages from the generating sites to the distribution networks or industrial sites directly connected to it; this includes the major interconnection transmission network (400,000 volts and 225,000 volts) and the regional distribution networks (225,000 volts, 150,000 volts, 90,000 volts and 63,000 volts).
<b>Uranium</b>	<p>In its natural state, uranium is a mix containing three main isotopes (elements whose atoms have the same number of electrons and protons, thus the same chemical properties, but a different number of neutrons):</p> <ul style="list-style-type: none"> <li>■ uranium 238, 99.3% fertile;</li> <li>■ uranium 235, 0.7% fissile;</li> <li>■ uranium 234.</li> </ul> <p>Uranium 235 is the only natural fissile isotope, a quality which justifies its use as an energy source.</p>
<b>Vitrification</b>	Process of immobilisation in a glass structure concentrated solutions of high-level waste by mixing at high temperature with glass paste.
<b>Waste management</b>	<p>The nuclear generation of 1MWh of electricity (equivalent to the monthly consumption of two households) produces around 11g of total waste across all categories.</p> <p>Short-lived waste represents more than 90% of the total, but contains only 0.1% of the radioactivity of waste. Accordingly, based on their level of radioactivity, they are separated into two sub-categories: low-level waste and very-low-level waste.</p> <p>Long-lived medium and high-level waste are produced in low quantity (less than 10% of the total quantity), but they contain almost all of the radioactivity of the waste (99.9%).</p>

Photo credits: ©EDF, all rights reserved

This document was printed under an ISO 14001:2004 certified Environmental Management System.

The images in the 2018 Reference Document are from EDF's new advertising campaign, "Be the energy for change", showing that, in today's world of taking action to combat climate change, EDF group is accelerating its transformation by calling on one and all to join the movement.

### **Investors Relations**

Aymeric DUCROCQ  
Director of Investors and Markets  
Email: [edf-irteam@edf.fr](mailto:edf-irteam@edf.fr)

### **Websites**

[edf.fr](http://edf.fr)  
[edf.fr/finance](http://edf.fr/finance)



EDF  
22-30 avenue de Wagram  
75382 Paris Cedex 08 - France  
SA share capital €1,505,133,838  
552 081 317 R.C.S. Paris  
[edf.fr](http://edf.fr)