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## EDF invests in the energies of the future



EDF Group, the world leader in carbon-free energy, continues to invest in renewable energy and to strengthen its positions both in Europe and throughout the world. The Group contributes to the rise of competitive industrial sectors in renewable energy, in particular in wind and solar power. It relies mainly on its specialised subsidiary EDF Energies Nouvelles, an integrated global player, active in all areas and throughout the value chain of renewable energy.

To support the technological breakthrough and the emergence of innovative solutions, EDF is pursuing an ambitious R&D policy to which it is allocating more than 50 million Euros each year.

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## 1. EDF, EUROPEAN LEADER IN RENEWABLE ENERGY

### A managed carbon footprint

The EDF Group occupies a unique position among the large global energy providers with a **production mix of 85% CO<sub>2</sub> free, rising to 96% in France**. EDF emits 10 times less CO<sub>2</sub> per kWh produced than the European average for the sector. Throughout the world, the Group favours the most efficient solutions, in line with local climate policies.

**Among energy providers, EDF is the main contributor for reducing CO<sub>2</sub> emissions in Europe :**

- 350 g CO<sub>2</sub>/kWh all energy providers combined
- 450 g CO<sub>2</sub>/kWh excluding EDF

In order to manage its carbon footprint, EDF applies a voluntary industrial policy:

- **the integration of the carbon criterion** in the Group's industrial trade-off between the various means of production, both for their operation and long-term investment.
- **the operation of nuclear power plants**, free of greenhouse gas emissions. It is the challenge posed by the maintenance program and the major works undertaken by EDF, a ten year industrial plan, which aims at improving the safety and performance of the French nuclear fleet.
- **the updating of fossil-fired power plants**. By 2016, EDF will have replaced less performing coal plants with combined cycle gas and latest generation combustion turbines, with considerably enhanced performance and improved environmental impact.
- **the optimization of hydroelectricity production**, the leading renewable energy source, by modernizing production facilities.
- **the development of other renewable energy**, in particular wind and solar power.



The EDF Group ranks among the lowest CO<sub>2</sub>/MWh emitting European electricity companies, behind the Norwegian company Statkraft, which produces 10 times less electricity, PVO and Verbund.

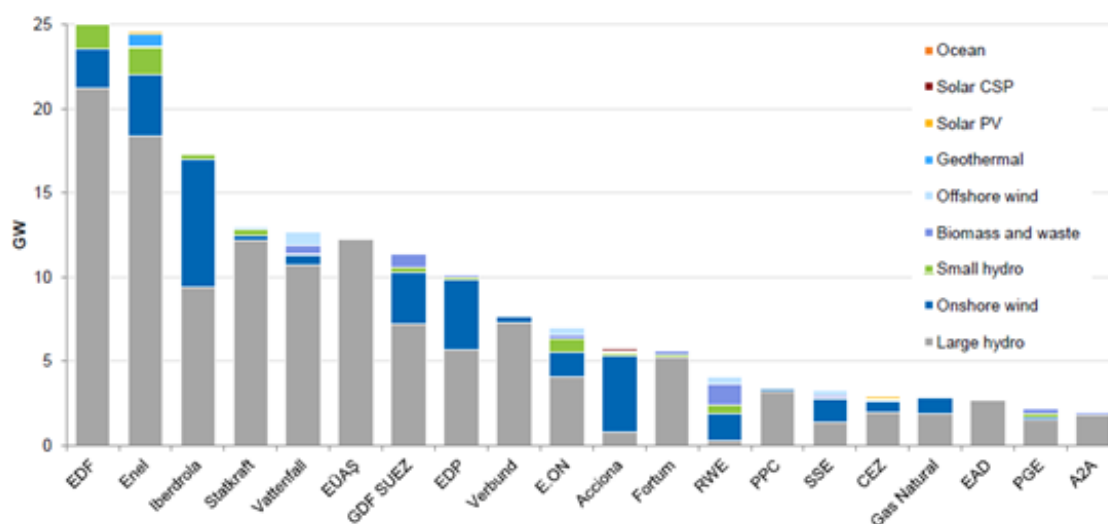
Source: PWC PWC Climate Change and Electricity, 12th edition, November 2013.

**Carbon factors of the leading European electricity producers from 2009 to 2013, in Kg/MWh**

## EDF, Number 1 European producer of renewable energy

The EDF Group is the **European leader in renewable energy**, thanks to an installed capacity of 25.2 GW, combining hydro, wind, solar power and other Renewables including biomass. EDF's 20 GW installed in France makes it the number 1 European hydroelectricity producer.

In 2013, Renewables, including hydro power, accounted for 20% of the installed capacity and 11% of the Group's production. With 63.6 TWh of production, EDF was the **leading producer of electricity and heat from renewable sources in Europe**.



Renewables installed capacity at the end of 2012 in Europe (Source IHS)

The Group also relies on several specialized subsidiaries, including EDF Energies Nouvelles and Dalkia, who are developing other Renewables and which enhance its energy mix.

	France	Europe	World
Hydro	20,481	21,976	21 976
Wind	613	2,663	5,094
Solar	150	299	504
Other Renewables (including biomass)	85	265	350
<b>TOTAL</b>	<b>21,329</b>	<b>25,203</b>	<b>27,924</b>

EDF Group net installed capacity, figures in MW (June 2014)



At the end of June 2014, renewable production reaches almost 33 TWh in Europe.

	France	Europe	World
Hydro	26,369	28,903	28,903
Wind	630	2,491	5,297
Solar	58	170	357
Other renewables (including biomass)	109	624	931
Renewable heat production	561	561	561
<b>TOTAL</b>	<b>27,726</b>	<b>32,750</b>	<b>36,049</b>

*Production of the EDF Group in GWh at the end of June 2014*

## Innovation to prepare for technological breakthroughs

EDF's R&D department mobilizes its human and financial resources in order to support the emergence of new technologies and to respond to the challenges of integrating renewable energies and the intermittent supply of their production. **Altogether more than 50 million Euros are specifically allocated each year to medium and long term programmes and to groundbreaking innovations.** Since 2011 EDF Energies Nouvelles has invested 27 million Euros in R&D.

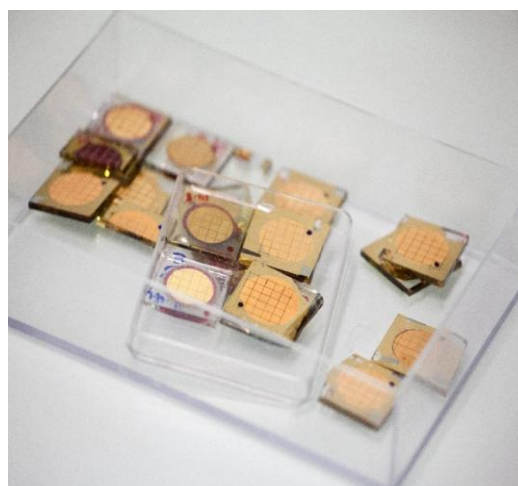
EDF has developed **partnerships with the academic and industrial world**, by relying on about fifteen shared laboratories and technical centres in France. Throughout the world, EDF has 5 R&D centres, in particular in China and the United Kingdom. Nearly 150 researchers work there exclusively on Renewables, which makes EDF the leading utility company in terms of resources dedicated to this sector.

4 objectives for the renewable energy programmes:

- **to optimise** existing technologies,
- **to identify the technological breakthroughs** posing major challenges,
- **to develop and manufacture** the most promising technologies,
- **to contribute to the integration of renewable energy** in the electric systems.

### NEXCIS, designer and manufacturer of photovoltaic technology

- EDF is the main shareholder of this start-up, a spin off of IRDEP, the laboratory created by EDF R&D, the CNRS and the ENSCP.
- Design of second generation thin film solar power modules
- Reduction in manufacturing cost, whilst maintaining the same output
- Industrial production by 2015

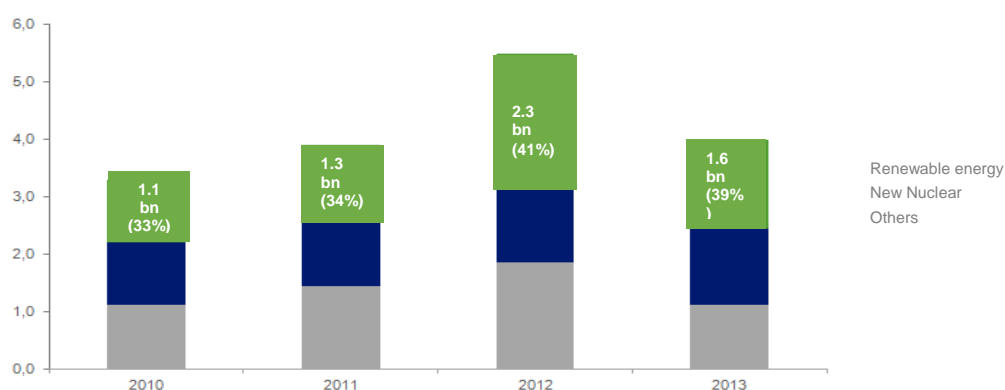


## Major investments in new Renewables

The EDF Group has invested **6.4 billion Euros in new renewable energy since 2010**, in particular in wind and solar power. Each year, a **third of our gross investments in development are dedicated to Renewables**, that is to say more than for new nuclear power.

### INVESTMENT IN RENEWABLE ENERGY

#### Gross operating investment (Gross CAPEX) for development



**6.4 billion Euros invested since 2010:**  
A strong commitment by EDF towards development of renewable energy sources.

#### PEGASE, to handle intermittent supply

- Experimental project at La Réunion enabling management of the intermittent supply of solar power and wind energy
- Detailed forecasting of renewables production in the very short term
- Coupling with a 1 MW battery allowing the smooth injection of Renewables into the network





## 2. A STRATEGY FOCUSED ON SUSTAINABILITY

### Sustainability through dialogue, support for the local economy and the relationship with the environment

Wherever present, the EDF Group places great importance with regards to the impact of its installations on the social, societal and environmental levels. The development of renewable energy is part of this sustainability approach, with the involvement of the full range of stakeholders and by taking into account the safeguarding of the environment and of biodiversity.

#### As an example, the consultation for the offshore wind farm project at Fécamp:

- Since 2007 the setting-up of a consultation Committee to take into account issues affecting the local area
- Allied with fishing professionals to define the positioning of wind farms
- Optimisation of landscape integration in order to limit the visual impact

### Innovative and responsible financing: the Green Bond

In November 2013 EDF launched **the first corporate issue exclusively intended for the financing of new renewable projects, in the amount of 1.4 billion Euros**. 721 million Euros have already been invested in projects in France and internationally. At this stage, 13 projects for a total combined capacity of 1.8 GW were financed in France, in the United States and in Canada:

- 10 wind farms
- 2 solar power parks
- 1 biomethane plant

The projects adopted must respect the very strict environmental, social and societal criteria. From the time the funds are received up to their allocation to the companies of the projects selected, all of the funds are segregated and traced, which prohibits their use for any other purposes and guarantees their exclusive allocation to renewable projects.



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## The EDF-Amundi partnership: asset management dedicated to energy transition

EDF and Amundi concluded a partnership for the creation of a joint management company which will take-up the role of **raising funds from institutional investors and private individuals, and managing funds intended to finance projects, on behalf of third parties, which fall within the field of energy transition.**

EDF identifies the best investment opportunities in the sector, whilst Amundi brings its know-how as an investor with regards to structuring and also its ability to mobilise savings. The challenge is to offer the market new families of funds dedicated to the production of renewable energy (wind, solar power, small-scale hydro installations...) and energy savings for industry. **EDF and Amundi have set themselves a fund-raising objective of €1.5 billion.**





### 3. EDF EN, A LEADING GLOBAL OPERATOR

#### An integrated industrialist present throughout the value chain of Renewables

100% subsidiary of the EDF Group, EDF Energies Nouvelles is currently among the top **6 global operators**. It is active throughout the **entire value chain**: development, construction, operation and maintenance.

Number 1 in the US in terms of operation-maintenance and in France among the utility companies, EDF Energies Nouvelles focuses its development in **two major sectors of Renewables**:

- wind power (onshore and offshore), which accounts for 87% of the installed capacities,
- solar power, which accounts for 10% of production capacities.

EDF is also applying a strategy of selective growth in less mature sectors such as marine energy and experimental applications related to storage and solar thermodynamics.

#### EDF EN in a few figures (at 30 June 2014) :

##### 10 GW installed

- > 7,190 MW gross developed, built and operated
- > 2,433 MW developed, built and operated
- > Reserve of 2,320 MW gross under construction

##### 10 GW managed in operation maintenance

- > 1.7 GW in Europe.
- > 8.4 GW in North America

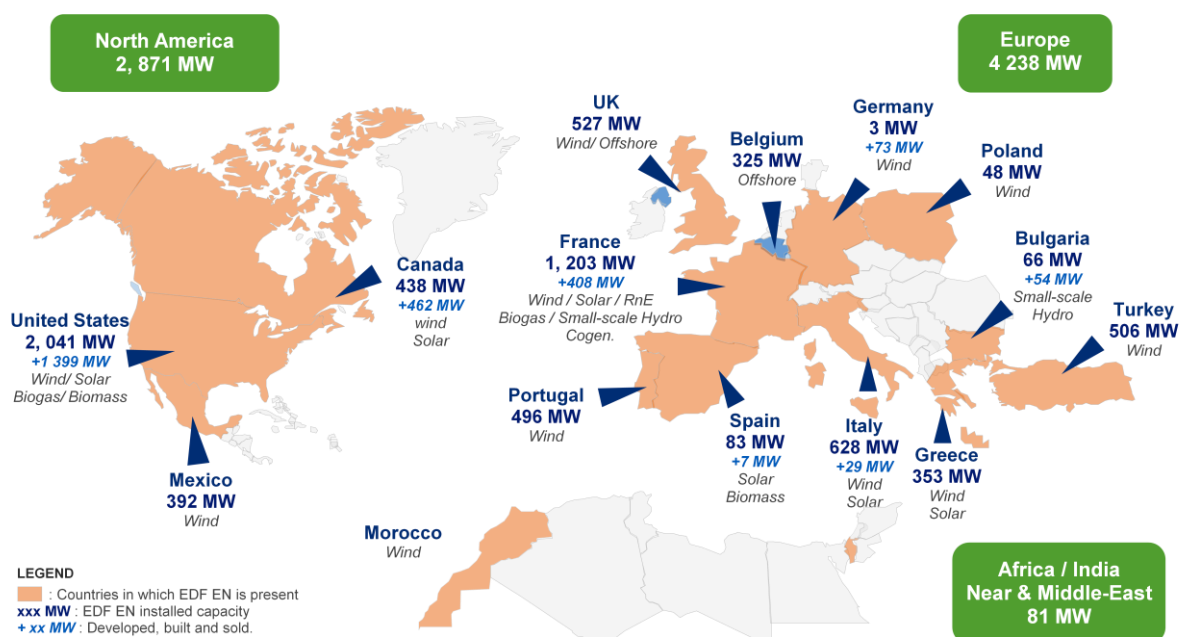
##### 10 TWh produced in 2013

- > 11.1 billion kWh in green energy produced in 2013, all subsidiaries combined

##### Presence in 18 countries

- > 58% of capacities in Europe
- > 40% of capacities in North America
- > New plants in Israël, South Africa and India.

#### EDF Energies Nouvelles: major positions in the world



Capacity as at 30th June 2014

\* Installed capacity = production capacity+ developed, built and sold capacity.

### Focus in on control centres:

- 2 centres to supervise plants in Europe and North America
  - 1 centre under construction for an offshore wind farm
- ⇒ To optimise production and ensure the proper running of the plants in association with the operation-maintenance centres.



## A core activity: wind power

Wind power is the **number one priority for development** for EDF Energies Nouvelles, with a total of 8,188 MW gross and 2,160 MW under construction.

- Number 2 in onshore wind power in France with 928 MW installed and 198 MW under construction
- Number 6 in the world, present in 14 countries



**In France, the largest and most innovative project is the “Ensemble Eolien Catalan” Wind farm**, currently under construction in the Eastern Pyrenees; it should be commissioned by the end of 2015. With 96 MW of installed capacity, it will be capable of providing the equivalent of the annual electricity consumption of 120,000 people. This fleet, developed by EDF Energies Nouvelles will be the **largest wind farm of France**.

It is characterized by:

- **the innovative technology known as “stealth” blades**, a world first. This solution adapts to specific sites according to the frequency of the nearby ‘Météo France’ radar and the local wind patterns and reduces the signature of the blades (and the tower) on radar screens,
- **takes into account the local habitat as well as the environmental and landscape challenges** (avoiding the Cathar and Corbières castles in the north, the Pyrenean mountains and Canigou in the south and the populated and tourist areas in the east),
- **safeguarding of bird migration** on the shore line, and of biodiversity,
- **a broad consultation**, conducted over more than 6 years, with the representative players within the territory.

#### The offshore wind farm, a promising future sector

- 2 target markets: France and the United Kingdom
- 1 fleet in operation at Teesside (62 MW)
- 3 projects under development in France (Courseulles-sur-Mer, Fécamp and Saint Nazaire)
- A total capacity of 1, 400 MW for these 3 projects, equivalent to the electricity consumption of more than 2 million people
- 7 000 jobs up to 2016 to consolidate a emerging industrial sector



## The European leader in solar energy

Solar energy is the **2nd priority for development** for EDF Energies Nouvelles. With 1,140 MW gross installed and 139 MW under construction, EDF is the leading **European company in the sector**. Present in 8 countries, EDF EN is installing its plants in areas where sunny conditions are optimal and manufacturing costs are under control. EDF EN is not only building power stations on the ground, but also installations on roofs in France, through its subsidiary EDF ENR.

In California, EDF EN operates the **Catalina solar power station, its biggest solar power project** with an output of 143 MWc. It is the 8th largest solar power station in the world, which benefits from an ideal location in the Mojave desert, a very sunny area all the year round where the generation and consumption periods coincide.

### Ombriwatt, solar power serving electrical mobility

EDF ENR, the subsidiary of EDF EN dedicated to solar power for residential customers, has created a solar solution for electrical mobility comprising a car port, i.e. a shelter for vehicles, and an electrical recharging station linked to a photovoltaic generator which covers the shelter.

This installation known as « self-production » produces solar energy to allow electric vehicles to run..



## Our ambition: to consolidate our positions among the top global providers

In the years to come, **EDF Energies Nouvelles**, will commit to the same objectives of the EDF Group, to **reach 25% of renewable energy (including Hydro)** by preserving its market share in a sector in full expansion.

To achieve these objectives, EDF intends to continue its geographical diversification:

- **Strengthen activity in the historical regions** (Europe and North America), in particular in the target countries of EDF (France, United Kingdom, Poland), these areas continuing to represent a significant portion of future capacity,
- **Continuing development in emerging markets** where Renewables have seen strong growth (South America, Middle East, Asia).

This strategy of diversification offers good protection regarding significant changes in the sector, both regulatory and technological.

EDF is also developing a **policy of partnerships** to reach new markets and to manage investments (local partnerships to penetrate new countries, financial agreements to share investments and risks and technological partnerships to develop new sectors).