



CAP 2030

The renewable energy
development strategy of the EDF
Group

PRESS PACK



1 DEVELOPMENT OF RENEWABLE ENERGIES: AN AMBITIOUS GOAL AS PART OF THE CAP 2030 STRATEGY

TARGET: TO DOUBLE THE GROUP'S INSTALLED POWER WORLDWIDE

As part of its CAP 2030 strategy, the European leader in renewable energies, the EDF Group, has set itself an extremely ambitious goal:

to double the Group's net installed power in the field of renewable energies, thus increasing from 28 GW today to over 50 GW in less than 15 years.

Essential on the international stage, hydro power is expected to represent almost a quarter of this created capacity and renewable energies the remainder, in particular wind and photovoltaic solar.

A demonstration of this commitment and strong signal:

a Renewable Energies centre, with representation on the Group Executive Committee, has been created. It incorporates the RE activities of the Group, that is to say, the hydro activities conducted by the Hydraulic Production and Engineering Division and those of EDF Energies Nouvelles (onshore and offshore wind, solar, marine energies, storage etc.).

In addition, this centre will oversee all of the Group's renewable projects, including those implemented by foreign affiliates.

In the field of alternative renewable energies such as geothermal, biomass and the recovery of lost energy, the Group relies on its affiliate Dalkia, which seeks to increase the proportion of such energies in the energy mix of heating networks.

In order to achieve this target of doubling installed capacity, the Group strategy is underpinned by:

→ Continued investments in renewables.

Every year, over one third of the gross industrial development investments made by the Group is allocated to renewable energies.

In 2014, €1.7 billion was invested in developing these energies and this figure reached €733 million in the first half of 2015¹.

Furthermore, approximately €450 million were allocated to the modernisation of EDF's hydro fleet.

In total, EDF allocated over two billion Euros of investments to renewable energies in 2014.

1. Gross investment figures.

The intention of the Group is to develop the most competitive technologies (hydro, onshore wind, photovoltaic solar etc.), to contribute to optimising technologies that are promising yet less mature and still costly (offshore wind, tidal, concentrating solar etc.) and to continue investing in innovation.

→ Strengthening positions across the world:

Present in more than 20 countries, EDF intends to continue its growth in key markets, in line with the Group's international strategy and targeting the most relevant projects. This involves siting facilities in the right location, with the right technology and taking account of specific local characteristics (acceptability, any support measures etc.), thereby increasing

the competitiveness of renewable energies: development of photovoltaic (PV) in California or Chile, wind or even hydro power in Brazil, for example.

→ The development of a partnership-based business model:

In order to anchor this strategy internationally, the Group is relying on a declared policy of partnerships, with the multiple aims of penetrating new markets, acquiring the best technologies, managing its investments and sharing risks. By way of example, in partnership with EREN Renewable Energy, EDF created a subsidiary dedicated to photovoltaic energy in India, Acme Solar. A partnership was also forged with SOWITEC, a large wind project developer, in order to establish a foothold in the Brazilian market.

Integrated engineering present within all renewable sectors

The EDF Group stands apart from other major energy players thanks to the integration of dedicated engineering competencies within each of its renewable sectors (hydro, wind, photovoltaic solar, heating networks etc.). This enables it to control the operation and maintenance of its installations and also to draw on expertise and competitive advantages in international markets, across all renewable energy technologies.



2 IN FRANCE: A CONTINUED INVESTMENT DRIVE

ONSHORE WIND: THE GIGAWATT MILESTONE PASSED

With the acquisition of two wind farms in Lorraine and Franche-Comté (Trois-Sources and Lomont), **the EDF Group has a gross installed capacity of over 1 GW (1,040 MW)² in France via its subsidiary EDF Energies Nouvelles, confirming its number 2 ranking in this market in France.**

In late 2014, 25 wind MW were brought on-line in Champagne-Ardenne and Picardy, equivalent to the annual consumption of more than 22,000 inhabitants. And the operation of the first tranche of the major project, Ensemble Eolien Catalan, in the Pyrénées-Orientales, started in June 2015 (44 MW).

100 MW of wind projects are currently under construction and will be commissioned in 2016.

The French wind farms of EDF Energies Nouvelles are primarily located in the regions of Languedoc-Roussillon, Picardy, Lorraine and Brittany, which offer the most favourable conditions for this type of energy.

PHOTOVOLTAIC SOLAR: COMMISSIONING OF AN INNOVATIVE SOLAR POWER PLANT IN GUIANA

In the French market, **EDF has almost 300 MWp** in operation and wishes to further strengthen its development: the Group therefore responded to the French government call for tender known as CRE3, for 800 MWp.

In Guiana, a department at the forefront of the development of renewable energies and their integration into the electricity system, **in early 2015 EDF commissioned one of the first power plants in France to combine solar generation, remote management and storage.** With an installed power of 5 MWp, the Toucan power plant is equipped with more than 55,000 solar panels and installed batteries absorbing the surplus energy produced and feeding it back according to the needs of the grid, thereby contributing to its stability. It is managed by means of software developed by EDF Store & Forecast and EDF Energies Nouvelles and which supplies highly accurate production forecasts.

Via its subsidiary EDF ENR, **EDF offers decentralised, own-energy generation solutions to individuals, companies and local and regional authorities, such as Ombriwatt, a photovoltaic**

². In gross installed capacity for EDF Energies Nouvelles. In general, EDF renewable energies data is expressed - unless otherwise stipulated - in gross figures.

generator installed on car park shelters and feeding charging points for electric vehicles. The Smartflower is another innovation offered by EDF ENR: a compact generator of novel design, it generates electricity by following the course of the sun throughout the day, thus optimising its efficiency compared with a roof-mounted installation.

HYDRO POWER: CONTINUED MAJOR MODERNISATION WORKS IN 2015

The EDF Group's number one renewable, hydro accounted for 20 GW of installed power in France and a production of 46.7 TWh in 2014³.

The teams of the Hydraulic Engineering Production Division operate 436 plants, guaranteeing diversified energy generation, at basic and peak consumption. The flexibility and reactivity of hydro power make it possible to feed the electricity grid at all times, and they constitute a back-up to the new energies that are variable according to wind and solar radiation conditions.

Hydro also delivers services for the electricity system (frequency and voltage regulation), which are essential for its balance. In addition, hydro power fulfils numerous functions at regional level and in terms of water usage such as low water replenishment, the irrigation of farm land, drinking water supply, navigation, tourism etc.

For a number of years, EDF has been investing heavily - approximately €450 million per year - in the modernisation and performance optimisation of this hydro-electric fleet.

In 2015, some major projects illustrate this commitment:

→ Performance optimisation and environmental integration: the example of the Romanche-Gavet project

The Romanche-Gavet project is the biggest hydraulic development project in France.

The new layout, comprising structures which are largely underground, will replace the existing six power plants and five dams in the Romanche valley and **will allow a 30% increase in electricity generation, estimated at 560 million kWh/year in the long term.**

This work is thus contributing to boosting the local economy and optimising generation whilst at the same time improving the living environment for local people and minimising the environmental impact of the development. The installation will work with the run of the river, that is to say, with no water storage capacity in the reservoir and it will therefore generate electricity according to momentary water inflows.

→ Modernisation of the hydro power plant at La Coche en Savoie

Started in 2013, this work will increase existing installed power by approximately 20%.

A 240 MW Pelton generator unit will be installed at this STEP (Station de Transfert d'Énergie par Pompage - Energy Transfer Pumping Station) hydro power plant, which will produce an additional 100 GWh every year, equivalent to the consumption of more than 40,000 inhabitants. This project will also help to improve the capacity of the power plant and will help to mitigate sudden variations in electricity demand, whilst at the same time facilitating maintenance operations.

3. Total hydro generation (including pumping - electricity necessary for the operation of the STEP and La Rance hydro installations) - in France + Island Energy Systems.

The micro hydro-electric power plant at Le Rondeau: an innovation in the heart of the town

Since February 2015, the Le Rondeau micro hydro-electric power plant, located in Echirrolles right in the centre of the agglomeration of Grenoble, has been supplying 100% renewable energy to more than 5,500 inhabitants. The first in France to combine four Very Low Head turbines abreast, this is the most powerful installation of this type in operation.

Perfectly integrated into its urban environment, it is equipped with very quiet blades and is fish-friendly, allowing fish to pass through. The French technology developed by MJ2 Technologies (Aveyron), in combination with the expertise of the EDF Hydraulic Engineering Centre, has made it possible to use the energy potential of this head.

MARINE ENERGIES: CONTRIBUTING TO THE RAPID RISE OF A FRENCH SECTOR

For France, the marine energies, in particular offshore wind, represent a key area for potential development. An emerging industrial, job-creating sector, it must be supported and consolidated through large-scale projects.

In this field, the EDF Group is involved in two main sectors:

→ **Offshore wind:**

Of the four projects currently ongoing in France, three are being developed by EDF Energies Nouvelles in Courseulles-sur-Mer, Fécamp and St Nazaire for a total capacity of 1,400 MW, equivalent to the consumption of almost two million people. In 2015, the projects were further advanced with the launch of the main industrial calls for tender, stakeholder consultations and technical discussions.

In February, the installation of the meteorological mast at Fécamp enabled the testing of an innovative gravity foundation in real conditions.

→ **Tidal:**

France enjoys very significant tidal potential in Europe with 3,000 MW and favourable marine currents. The Paimpol-Bréhat tidal project, run by EDF in partnership with DCNS/OpenHydro, will pass a key milestone by early 2016 with the submersion of its two pre-industrial turbines.

This will offer a means of confirming the efficacy of the technology developed, in particular with a view to the Raz-Blanchard project for which EDF Energies Nouvelles has been selected to construct a fleet of seven underwater turbine generators.



3

A STRONGER INTERNATIONAL PRESENCE

Present in more than 20 countries, the EDF Group has strengthened its international footing in 2015, by becoming established in Chile in particular and by penetrating the Brazilian onshore wind market. **In Europe, its number one position is confirmed with 25.5 GW of net installed power.**

ONSHORE WIND, PRIMARY FOCUS FOR DEVELOPMENT

Onshore wind remains the primary focus for development for the subsidiary EDF Energies Nouvelles, established in 15 countries, with 6.8 GW of gross installed power worldwide at the end of June 2015 (up 9% compared with the end of June 2014) and 1.3 GW are currently under construction.

A farm of almost 200 MW (Spinning Spur 3) was commissioned in Texas in October 2015 by EDF Renewable Energy, the American subsidiary of EDF Energies Nouvelles. With six wind farms, EDF has reached the installed gigawatt threshold in that State.

In Africa, a continent offering great potential for renewable energies in the coming years, the Group has inaugurated its first wind farm in South Africa (61.5 MW of installed power in the municipality of Nelson Mandela Bay). In Europe, development in

strategic countries is continuing: in the United Kingdom, in Scotland, EDF Energy Renewables (joint venture between EDF Energy and EDF Energies Nouvelles) has just announced the acquisition of the Dorenell wind project, which will supply approximately 130,000 Scottish households (minimum installed power of 177 MW). Its development is scheduled to start next year.

This subsidiary also operates the Teesside offshore wind farm (United Kingdom), the first one for the EDF Group.

PHOTOVOLTAIC SOLAR, LARGE-SCALE PROJECTS

In photovoltaic solar, the Group's installed capacity stood at almost 850 MWp at 30 June 2015, a 20% increase compared with the end of June 2014. Almost 270 MWp are currently under construction.

The year 2015 was marked by the launch of the first solar power plant project in Chile, with a power of 146 MWp, installed in the Atacama Desert which offers optimum solar radiation conditions.

In India the commissioning of 150 MWp of solar energy in the States of Rajasthan and Odisha has allowed EDF to consolidate its positions in this high-potential country less than a year after its entry into this market.

STRONG GROWTH IN THE ACTIVITIES OF OPERATION AND MAINTENANCE OF WIND AND SOLAR FARMS

In 2015, EDF Energies Nouvelles saw strong growth in its operation-maintenance activities, with a rise of 16% in the first half-year compared with the end of 2014. In total, it has almost 14 GW under management in ten countries, confirming the importance of this activity in its portfolio and its presence across the entire value chain.

DEVELOPMENT OF HYDRO POWER: PROJECTS IN BRAZIL AND CAMEROON

In hydro power, the objective of the Group is to significantly develop its generation capacity at international level, by leveraging its globally recognised expertise and its know-how in the construction of large dams.

Last November in Cameroon, the Group signed a framework agreement with its Cameroonian and foreign partners for the Nachtigal dam construction project. With a power of 420 MW, this project is set to meet 20% of the country's electricity needs by the year 2020. Supported by the local populations, it will involve actions promoting environmental and societal integration. In Brazil, through its subsidiary Norte Fluminense EDF has acquired a majority stake (51%) in the SINOP Energy Company which is in charge of the construction and operation of the SINOP hydroelectric dam (400 MW) in the State of Mato Grosso. The construction of the dam was started in the spring of 2014 and its commissioning is planned for early 2018.



4 INNOVATION, A MAJOR LEVER IN THE RE STRATEGY OF THE EDF GROUP

In a fast-evolving market which requires significant investments, EDF places primary importance on innovation in its ER strategy, not only for the optimisation and emergence of new technologies but also in the design and delivery of projects themselves, as well as their financing.

A NEW MODEL FOR DEVELOPING PROJECTS WITH OTHER COMPANIES

This year in the American market, under the American Business Act on Climate Pledge, **EDF entered into an innovative partnership with Procter & Gamble for the supply of wind electricity to their North American production sites⁴**. Through this approach, EDF is demonstrating its capacity to engage in new forms of partnership with its client companies in order to expand renewables even further.

A similar initiative was adopted with Microsoft for the supply of wind electricity to a large data centre based in Illinois, through a long term 20-year contract. This 175 MW farm was commissioned at the end of September 2015.

INNOVATION IN THE FINANCING OF RENEWABLES

To support the financing of renewables projects, in October 2015 the EDF Group issued a new Green Bond of US \$1.24 billion.

It follows the first issue of €1.4 billion, carried out in November 2013, which constituted a first in the field of corporate issues.

100% of the funds raised through this issue were invested in renewable energy projects (13 projects developed by EDF Energies Nouvelles for a total capacity of 1.8 GW), involving very strict control and exclusive allocation to renewables.

At local level, in France EDF Energies Nouvelles launched its first participative financing campaign to involve local people in the development of a wind farm in the Vosges and Bas-Rhin. The €135,000 funds raised exceeded the initial target of €100,000, demonstrating the support of local populations for renewable energies, and their willingness to invest in them.

4. Household and laundry care products manufacturing sites.

SOCIETAL AND ENVIRONMENTAL INNOVATION

Devising new solutions to protect the environment and preserve biodiversity constitutes a key focus for innovation for EDF. As an illustration of this approach, the Poutès dam will be entirely reconfigured to reconcile environmental imperatives, in particular bird migrations, and the generation of electricity. The planned structure, whose construction will start in 2016, will retain 85% of initial generation capacity, satisfying the annual needs of a town of 20,000 inhabitants. It is also the result of a successful consultation with the elected representatives of Haut-Allier and environmental associations.

A CUTTING-EDGE R&D POLICY

The EDF Group invests heavily in R&D programmes dedicated to renewable energies, in particular in the fields of renewable energy integration and intermittency management, smart grids, storage etc.

In offshore wind, EDF has identified the developer of a particularly innovative technology: **the "floating" LiDAR**. Based on the same principle as a radar, the LiDAR (Light Detection And Ranging) uses a laser to determine the speed of particles in the air and deduces the wind speed from this. It thus takes the place of the meteorological mast for the upstream collection of data on wind speed, even in the most difficult conditions and in deep waters.

Renewable energies within the EDF Group: key figures

- Presence in more than 20 countries
 - €2 billion of gross investments in 2014
 - European number one with 25.5 GW of net installed power (28.3 GW worldwide)
 - Almost 65 TWh of generation in 2014
 - European leader in hydro generation, with approximately 500 power plants (436 in continental France and 47 in Italy)
 - Almost 8 GW of gross installed capacity worldwide and almost 14 GW under operation-maintenance in renewable energies: wind, photovoltaic solar, other...
 - Number 2 in France for onshore wind with 1 GW gross installed capacity
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