

Press conference

EDF IS INNOVATING TO DECARBONISE THE ECONOMY

13 April 2022





Jean-Bernard LÉVY

Chairman and CEO of EDF





Accelerating renewable energies to accomplish the energy transition

Bruno BENSASSON

Group Executive Director in charge of the Renewable Energies division

Cédric LE BOUSSE

Director of Renewable Marine Energies in France for EDF Renewables



EDF, A GLOBAL PLAYER IN RENEWABLE ENERGIES COMMITTED TO GROWTH OF >10% PER YEAR

1/4 of the Group's installed capacity



figures as of 31 December 2021



CAP 2030, doubling EDF's net renewable capacity by 2030





EDF IS CONTINUING TO DEVELOP ITS HYDROPOWER ACTIVITIES IN FRANCE AND, IN PARTICULAR, ABROAD: +1 GW GROSS SINCE 2015





Sinop (400 MW)

France La Coche (237 MW) and Romanche-Gavet (97 MW)







TWO MAJOR CONSTRUCTION PROJECTS

*

Cameroon Nachtigal dam (420 MW)



United Arab Emirates STEP* at Hatta (250 MW / 6h storage)

*Pumped storage power station

WORLDWIDE, ABOUT 100 PROJECTS UNDER STUDY FOR + 16 GW

In France, 70 projects = 3.5 GW including:

STEP: about 10 projects

Small Hydropower: about 30 projects

HYDROPOWER

EDF IS INNOVATING TO SUPPORT HYDROPOWER PRODUCTION AND OPERATIONS

A STATISTICS IN COLUMN

NEW STORAGE AND PRODUCTION TECHNOLOGIES	Marine STEPs to ensure security of supply Project under development on Reunion Island	Simulation of a marine STEP
NEW OPERATING TOOLS (robotics, connected objects)	Nessie helping to improve safety and the environment An innovative robot for underwater work such as sediment removal In collaboration with Watertracks	Robot Nessie

EDF IS ACCELERATING SOLAR ENERGY PRODUCTION: 1.3 GW UNDER CONSTRUCTION IN 2021 (x14 vs 2015)



EDF SOLAR

EDF AT THE FOREFRONT OF SOLAR ENERGY IN FRANCE





EDF IS INNOVATING FOR THE COEXISTENCE OF END USES IN NEW AREAS





EDF IS STEPPING UP ITS DEVELOPMENT OF ONSHORE AND OFFSHORE WIND POWER: CONSTRUCTIONS x2 IN 2021 vs. 2015





IN FRANCE: FIRST REPOWERING FOR ONSHORE WIND WHILE OFFSHORE WIND IS TAKING SHAPE





EDF IS INNOVATING FOR THE ENVIRONMENT AND **COMPETITIVENESS**

RECYCLABLE BLADES	OBJECTIVE By 2025, first 100% recyclable blades	
23	 Investment in R&D Partnership with Siemens Gamesa 	Blades stored for the future offshore wind farm in Saint-Nazaire (Loire-Atlantique)





EDF IS DEPLOYING A WIDE RANGE OF ENERGY STORAGE SOLUTIONS: +1.1 GW GROSS CAPACITY ACHIEVED OR SECURED SINCE 2018





EDF IS INNOVATING TO IMPROVE THE INTEGRATION OF RENEWABLE ENERGIES INTO THE ELECTRICITY NETWORK

Peru 🗖

Winner in Iquitos

MICROGRID

Combination of PV (~100 MW) and batteries (4h) for renewable electricity that can be managed on an isolated grid



France

FLEXIBILITY

Grand'Maison (Isère): turbine-pump coupling

Vogelgrun (Haut-Rhin): flow battery coupling





THE CHALLENGES OF ACCELERATION IN RENEWABLE ENERGIES

RESOURCES	SUPPLIERS	CUSTOMERS	SOCIETY AND ENVIRONMENT
Training and recruitment Financial resources	Supply chains Project control	Competitiveness of technologies Public (tenders) and private (corporate PPA) applications	Acceptance and approval of projects Preservation of biodiversity

RENEWABLE ENERGIES ARE AN ESSENTIAL COMPONENT OF A DECARBONISED ENERGY SYSTEM FROM UPSTREAM TO DOWNSTREAM





Questions





EDF Group: a major player in decarbonisation serving its customers

Marc BENAYOUN

EDF Group Senior Executive Vice President, Customers & Energy Services





GREENHOUSE GAS EMISSIONS OF THE MAIN SECTORS OF THE ECONOMY IN FRANCE





THE GROUP HAS THE SOLUTIONS TO DECARBONISE A LARGE PROPORTION OF END USES



ELECTRIC MOBILITY PLAN: EDF IS AHEAD OF SCHEDULE



The EDF Group invested very early in this market

6 000 charging stations deployed each month

€250m invested between 2019 and 2021



* Including operations in the USA



IN THIS EMERGING MARKET, THE EDF GROUP IS A SOUGHT-AFTER PARTNER





INNOVATIONS FOR ALL CUSTOMERS



THE EV100 PROJECT: CONVERTING 100% OF THE GROUP'S LIGHT VEHICLE FLEET TO ELECTRIC BY 2030

EDF: First French group to join the EV100 initiative of the NGO "The Climate Group" in December 2017



[°]CLIMATE GROUP Among the 121 companies that signed the EV100 commitment by the end of March 2022, the EDF Group is:

No. 1 worldwide for its "EV100 commercial fleet" commitment with 45,014 light vehicles No. 1 worldwide for its fleet of electric vehicles with more than 7,700 electric vehicles at the end of 2021 (17.3%) No. 1 worldwide* for the progress of the electrification of its fleet with + 1,950 electric vehicles between September 2020 and the end of August 2021

*for the 2nd consecutive year

EV100 ALLOWS US TO INNOVATE AND ANTICIPATE

THE NEEDS OF OUR BUSINESS CUSTOMERS AND THEIR EMPLOYEES

TRANSPORT

A COMPLETE RANGE OF SOLUTIONS

TO DECARBONISE INDIVIDUAL HOMES



BUILDING

SUPPLY:

A wide range of Vert Électrique offers:

- Vert Électrique Weekend
- Vert Électrique Régional
- Green Electric Auto

HEAT PUMP & RENOVATION:

IZI is in the TOP 3 of the heat pump market with a significant acceleration in sales in 2021 (x3 vs 2020).

Development of a complete insulation range.

SELF-CONSUMPTION :

EDF ENR: leader in self-consumption in France with more than 30,000 installations and a 25% market share in 2021.

ENERGY SAVINGS: "MES ECOS & MOI"

Up to 12% savings for off-peak customers who connect to the service 2 to 3 times a month (results audited and validated by DATASTORM).

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DALKIA: SOLUTIONS TO SUPPORT THE DECARBONISATION OF BUILDINGS

Two main activities: low-carbon decentralised production and energy demand management

Development and use of local renewable and recovered energy sources, particularly through heating and cooling networks (biomass, geothermal energy, thalassothermal energy, recovery of waste heat, etc.).

Energy savings through Energy Performance Contracts and the management of energy consumption by facilities via an interactive platform: the Dalkia Energy Savings Center (DESC).



In 2021

ENERGY RENOVATION OF PUBLIC BUILDINGS



ENERGY PERFORMANCE CONTRACTS







DIGITAL INNOVATION (BIM GEM)







DECARBONISING INDUSTRY AT DALKIA

more than **2,500** industrial sites

Decarbonisation refers to all techniques that make it possible to reduce the use of fossil fuels such as gas and coal. Dalkia offers a wide range of solutions.

Saving energy by combining human expertise and digital innovation

Energy Performance Contracts The "Dalkia Energy Savings Center" Dalkia Analytics powered by Metron

Making the most of "lost" heat

Recovering heat produced by industrial processes for use in heating networks



ARCELOR MITTAL DUNKIRK





CONSTELLIUM ISSOIRE

STELLANTIS

CHARLEVILLE MÉZIÈRES

Decarbonising the energy mix

Low-carbon boilers: biomass, grade B wood, Solid Recovered Fuels (SRF) Electrification of end uses: heat pumps



POTENTIAL OF 17 WINNING BIOMASS HEATING PROJECTS

ARKEMA

ARKEMA – LANNEMEZAN CHAUFFERIE CSR

10,000 tonnes of CO₂ avoided



More than 100 sites equipped with Dalkia Analytics by Metron



SUBSTANTIAL AND ACCELERATED CO₂ REDUCTIONS





Questions





THE HYDROGEN PLAN

Alexandre Perra

EDF Group Senior Executive Vice-President, Innovation, Strategy and Planning

Christelle ROUILLÉ

CEO of Hynamics



HYDROGEN, AN ESSENTIAL LEVER FOR REDUCING OUR DEPENDENCE ON FOSSIL FUELS AND ACHIEVING CARBON NEUTRALITY

1.

Low-carbon hydrogen: a key driver for achieving carbon neutrality in addition to direct electrification

2.

Hydrogen is currently largely produced from fossil fuels. The process therefore emits a lot of CO_2 : to produce 1 kg of hydrogen, 10 kg of CO_2 are emitted

3.

The EDF Group is committed to producing 100% low-carbon hydrogen produced by an electrolyser which itself powered by low-carbon electricity:

- Low-carbon electricity network (France)

or

 Decarbonised electricity sources, renewables or nuclear

STARTING NOW, A MASSIVE DECARBONISATION POTENTIAL

Starting now

In transport:

First direct mobility uses (buses, refuse collection vehicles, trucks or trains in non-electrified areas)

In industry:

To substitute hydrogen produced using hydrocarbons that serves as a raw material

To decarbonise certain industries such as the steel industry



STARTING NOW, A MASSIVE DECARBONISATION POTENTIAL

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In addition from 2030 onwards

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In transport:

To create synthetic fuels in maritime and air transport



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To decarbonise certain industries such as the steel industry

To create synthetic fuels in maritime and air transport

In the longer term

In electricity production:

To replace gas in Combined Cycle Gas Turbines

To support grid flexibility in regions with few controllable sources or in isolated networks



TO ACCELERATE THE DEEP DECARBONISATION OF THE MOST CO $_{\rm 2}$ EMITTING SECTORS





To develop **3 GW gross** of low-carbon hydrogen production projects worldwide by 2030

Become a European leader in **100% low-carbon** hydrogen production by 2030

€2 to 3 billion of investments co-financed through industrial partnerships and by drawing on national and European support mechanisms

EDF, A HYDROGEN PIONEER



STRONG AND LONG- STANDING EXPERTISE IN R&D	EQUITY INVESTMENTS	A SUBSIDIARY DEDICATED TO HYDROGEN	INDUSTRIAL PARTNERSHIPS TO DEVELOP TECHNOLOGIES AND END USES
20 years of R&D research Electrolyser test platform at EDF Lab in Les Renardières €50 million invested over the last 20 years	Shareholder in McPhy since 2018 (electrolyser manufacturer) Investment in the Hy 24 decarbonated hydrogen investment fund	Creation of Hynamics in 2019 Integrated offer, production and marketing	 <u>Examples:</u> Alstom: to optimise the refuelling of hydrogen trains Borealis: to produce low-carbon ammonia Domo Chemicals: to decarbonise the chemical industry









EDF Group positioning Partnerships and subcontracting



















EDF Group positioning Partnerships and subcontracting

EDF, A LEADER IN LOW-CARBON HYDROGEN TODAY



> 1 GW of projects under development A pipeline of ~ 60 projects worldwide

The Group is developing numerous low-carbon hydrogen production projects in Europe...

... and is making progress on projects combining renewable energy and hydrogen production internationally (Americas, Middle East...)





Decarbonising mobility; AuxHyGen station in Auxerre



1 MW capacity with possible extensions up to 3 MW

Up to 400 kg of renewable hydrogen produced per day

5 hydrogen-powered buses and other end uses to come: utility vehicles, trucks, trains and boats

Eventually 2,200 tonnes of CO_2 avoided per year, equivalent to the carbon footprint of 200 inhabitants



Decarbonising industry: Hynovi project with cement manufacturer Vicat in Isère



330 MW capacity by 2025

Production of carbon-free methanol from CO₂ emitted by the cement plant and low-carbon hydrogen

Up to 200,000 tonnes of e-methanol per year

500,000 tonnes of CO_2 avoided per year, equivalent to the carbon footprint of 45,000 people



Decarbonising an industrial-port ecosystem: Tees Green Hydrogen project in the UK



30 to 50 MW capacity with possible extensions up to 500 MW

Electricity supply from an offshore wind farm and a photovoltaic farm operated by EDF Renewables UK

Ecosystem of hydrogen consumers including mobility, port and industrial uses





TO ACCELERATE THE DEEP DECARBONISATION OF THE MOST CO $_{\rm 2}$ EMITTING SECTORS





Questions



Upcoming press events



Agrivoltaics at EDF Lab les Renardières

AuxHyGen station in Auxerre

Inauguration of the Poutès dam

edf



Jean-Bernard LÉVY

Chairman and CEO of EDF





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APPENDICES



Renewable energies, a fast-growing global market driven by falling costs



Sources: IEA World Energy Outlook 2021 (net zero emissions by 2050 scenario), BNEF New Energy Outlook 2021 Red Scenar

Source: Bloomberg New Energy Finance (BNEF)

In 2022, the offshore wind farms in Saint Nazaire and Fécamp will be completed

Saint-Nazaire offshore wind farm



Fécamp offshore wind farm







Dunkirk © Société Sinay

Projects designed to allow cohabitation with fishing

2011-2020: tendering and development phase

- \rightarrow Selection of an area of least hindrance to fishing
- ightarrow Establishment of the consultation body
- ightarrow Adaptation of the technical characteristics to promote cohabitation: alignment of wind turbines, routing of electrical cables
- $\rightarrow\,$ Involvement of fishing communities in the site studies and sea trials
- $\rightarrow \mbox{ Sharing of existing feedback from European wind farms}$

2020-2024 : construction phase

- ightarrow Progressive closure of the area and crossing corridors (world firsts)
- ightarrow Introduction of compensation measures
- \rightarrow Further consultation
- ightarrow Monitoring studies of fishery resources

From 2022: operation phase

- \rightarrow Implementation of **maritime safety measures**
- ightarrow Monitoring studies of fishery resources
- \rightarrow Publication of scientific studies

Potential for offshore wind development in France by 2050

Estimation of the distribution of offshore wind capacities across the metropolitan maritime coastlines





Landscape issues: consultation a fundamental aspect of EDF Renewables' approach

Dialogue, monitoring and "made to measure" co-construction throughout the duration of a wind farm project. Cooperation with elected representatives, local authorities and residents in defining measures to improve the living environment, in accordance with the ERC (Avoid-Reduce-Compensate) approach.

From the outset of the project	During development and construction	During operation
 Co-construction of the project with local stakeholders: → Discussions with elected officials, landowners, local associations → Setting up participatory processes open to all citizens, to enable them to participate voluntarily 	 → Work with landscape experts Analysis of the site and proposals for the siting of wind turbines for better integration into the local landscape → Information for the population prior to the submission of applications for authorisation → During the public enquiry, invitation to the residents to come and obtain information and express their opinion on the project 	 → Possible awareness-raising actions on renewable energies → Additional energy production for the area (self-consumption or production for the grid) → Possible development of green tourism → Installation of information panels on wind energy → Construction of shelters and tables for hikers
		 → Development of the area → Landscape diagnosis of the area carried out by a landscape gardener → Creation of planted spaces → Redevelopment of living areas

Customised management of biodiversity issues throughout the life of our land and sea facilities

Environmental assessment process(environmental impact study + ecological monitoring)



Initial assessment of the natural environment

Stages of activity

ΥĪ

Project design - Analysis and assessment of impacts During the construction phase, operation phase and dismantling phase



"Avoid - Reduce - Compensate" approach



Ecological monitoring



Customised management of biodiversity issues throughout the life of our land and sea facilities

In France, the involvement of some thirty experts at EDF Renewables, independent experts and consultancies is part of the Group's environmental policy, which aims to preserve and enhance the biodiversity of our sites.

	🔆 Solar	🛧 Onshore wind	📩 Offshore wind
Positive impacts	 → Creation of habitats → Provision of cover and feeding areas (e.g. pastures) for certain animals 	 → Creation of suitable habitats for certain terrestrial species → Improvement of species knowledge (indirect) 	 → Protection of biodiversity through the creation of restricted access areas → Improved knowledge of fauna and flora species → Reef impact
	ightarrow Willingness to cooperate: partnership with voluntary organisations and scientists (FNE, LPO, FCEN IUCN*)		
	ightarrow Projects aimed at combating	global warming	







* France Nature Environnement; League for Birds; Federation of conservatories of natural areas; International Union for Nature Conservation

Recycling How to recycle ...





EDF Renewables, a major player in offshore wind energy on the European continent



