Béatrice Buffon Interview
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Executive Vice President,

EDF Renewables

The following interview was conducted by Ms. Randa Takieddine with Mrs. Béatrice Buffon in March of 2021.

Béatrice Buffon began her career as a finance manager at COGETHERM, an EDF subsidiary specializing in the development of gas cogeneration projects. In 2001, she joined SIIF Energies, which would become EDF to become project director in 2003. Her work focused on the development of biomass and onshore wind projects, as well as offshore wind projects in France, Belgium, and the United Kingdom. From 2007 to 2009, she served as Deputy Director of POWEO Renewable Energies.

She returned to EDF in 2010 as director of development for large ground-based photovoltaic projects, then in 2011 became director of development for offshore wind power in France. In April 2012, her team won the tenders for 3 projects representing a total capacity of 1,500 MW. The development phase of these projects, which is now complete, resulted in the launch of the construction of the first French offshore wind farm in August 2019, with the construction of the next two scheduled to start this year. Béatrice Buffon is a graduate of the École Polytechnique, and is a Knight of the National Order of Merit.

Q. Firstly, some of our readers outside the world of energy may I not know too much about EDF and the scope of its activities. So, can you first describe what EDF is as a company?

A. EDF is one of the world's major energy utilities. If I had to define EDF in a few words, I would say we are an industrial group leading the way in delivering sustainable low-carbon energy solutions for customers.

With a net installed generation capacity of 122 GW, of which 73 GW is nuclear, 20 GW thermal and 30 GW renewables (hydro, wind, solar), EDF produced 550 TWh of electricity in 2019 worldwide, 90% of it carbon-free.

EDF employs 165,000 people, primarily in Europe but also in 14 other countries including the US and China. As an integrated group, EDF is active at every level of the value chain, from generation to services, working closely with our 40 million customers. In 2019, EDF reported sales of more than €70 billion and our investments reached €14 billion. We are also investing heavily in R&D with more than 2,700 staff working on research and development and an annual R&D budget of more than €700 million.

Our priorities are captured in our raison d'être: "Build a net zero energy future with electricity and innovative solutions and services, to help save the planet and drive wellbeing and economic development." In a word, our culture is about long-term vision and public interest, with a constant focus on innovation and decarbonisation.

Our wide range of expertise allows us to address all the challenges facing the power sector. This is a real advantage knowing that the energy transition will impact every facet of the value chain.

Q. The EDF is mostly owned by the State of France. So how much is EDF's commercial activities controlled by the State? Does it have commercial freedom to act independently of the State?

A. From day one, EDF was given a large autonomy to fulfill its mission to guarantee reliable and affordable electricity for the country. It was founded in 1946, as a "public industrial and commercial establishment", not a government entity. The idea was that policy questions should be clearly separate from EDF's activities, which were guided by industrial and economic considerations. EDF is today a limited company. The French State owns 84% of its shares, and the rest is held by institutional and retail investors as well as employees, all of whom participate in its development.

The roles are clear: The government defines the country's energy policy within which the EDF strategy is pursued. As a shareholder, the State acts through the Agence des Participations de l'Etat, the agency that manages all of the State's holdings including the stake in EDF.

EDF's Board of Directors reflects these roles and this diversity: a third of the members represent the State or are appointed by shareholders based on a government recommendation, a third are independent members appointed by shareholders, and a third are employee representatives.

Q. Areva has been integrated into EDF as a nuclear engineering entity. How has that integration worked?

A. When it was integrated into EDF Group in 2018, Areva NP went back to being called Framatome, and EDF is now its largest shareholder with a 75% stake. Synergies are being developed between Framatome and EDF at many levels including: pooling of engineering tools and methods for new projects via the joint venture EDVANCE, training courses for maintenance technicians and engineers, co-development of innovative reactor operating solutions via the Booster programme, and lastly cooperation to explore opportunities in the areas of decommissioning and waste management in Europe and Japan. The significant improvement in Framatome's financial results over the past three years proves that the integration has been a success.

emissions, but when France decided to implement a CO2 tax on transport, it was a nightmare. The law had to be withdrawn under the pressure of yellow vests demonstrators.

So, it is not easy, and I don t think we can say "don't worry the technology will solve the problem" because alone, it won't solve the problem. In Europe, the political will is there, but Poland has to be convinced to abandon coal, and that is not easy. In the US, if Mr. Biden wins, he will rejoin the Paris Agreement, and you would see a growing will for regulations. However, if Mr. Trump is re-elected, the hope will be in the states acting independently: some big ones like California are ready to take regulations against global warming.

Q. France is noted as having the cheapest electricity within Western Europe. However at least one third of its nuclear power stations may close in the 2020's. Will electricity in France inevitably get more expensive now?

A. France does count among the large countries in Europe where electricity is the least expensive. Household electricity prices in France are 18% below the European average and 42% lower than in Germany and some 30% lower than in Italy, Spain and the United Kingdom. This is even more noteworthy if we consider that CO2 emissions from electricity generation in France stand at a very low 52 g/kWh, and just 13 g/kWh at EDF, which is more than 80% below the European average.

Such strong performances in terms of economics and CO2 show that it is possible to reduce emissions while keeping electricity affordable. This is already the case in France, which relies on both nuclear and renewables.

EDF has major ambitions for renewables in France and worldwide, with a programme that calls for improving the efficiency of its existing hydropower plants in France and doubling by 2030 of its net renewable capacity installed worldwide in the fields of hydro, solar and wind. The spectacular drop in the costs of renewables makes them more and more competitive.

Regarding nuclear, France's existing nuclear fleet delivers electricity that is competitive, carbon-free and dispatchable, meaning it can be adapted to fluctuations in power demand and renewable generation. In addition to extending the service life of existing reactors, EDF is preparing, at the request of the French government, a programme to build six EPR2 reactors which is scheduled to be unveiled by mid-2021.

It is our belief that achieving carbon neutrality in France and Europe will require making use of all carbon-free technologies and selecting a mix based on multiple criteria including economic factors, flexibility needs and energy security. Therefore, our goal in France is to develop significant renewables and new nuclear capacity that will gradually replace existing nuclear power plants, and to reach an around 50/50 mix by 2035, putting the country and Europe on the right path to achieve carbon neutrality by 2050.

Q. EDF is also a significant exporter of electricity. Will exports of electricity decline now?

A. In 2019, EDF produced 432 TWh of electricity in France, or 80% of the country's total. Net exports reached 56 TWh, which had a €2 billion positive impact on the French trade balance, a figure that has been fairly stable for many years now.

The same export opportunities are set to continue as electricity costs in France remain competitive. There will be even more trading possibilities since interconnection capacity between France and neighbouring countries will increase considerably over the coming years, with a major maintenance and expansion programme already underway.

Q. Is it true that most of EDF renewables activity is outside of France?

A. In France, EDF operates around 23 GW of renewable assets (21 GW of hydro and 2 GW of wind and solar) and continues to develop new projects. EDF is also the leader in offshore wind in France with the ongoing construction of three offshore wind farms for a total capacity of 1.5 GW.

Outside France, EDF operates around 13 GW of renewable assets today, and develops an extensive projects portfolio in hydroelectricity, wind and solar fields, representing more than 30 GW in Europe, in North and South America, in Asia, in Africa and in the Middle East. We are already involved in very large solar projects in the Middle East (Dewa 3, Al Dhafra). By developing our renewable activities in growing electricity markets, we are contributing to the energy transition of many countries. International development is also a breeding ground for innovation that allows us to test new business models.

Q. Can solar and wind powered generation compete against nuclear power in France? What metrics would you use to compare renewables against nuclear power?

A. I would say that solar, wind, hydro and nuclear power complement one another in France more than they compete. We need all these energy sources.

Hydroelectricity is a key asset that EDF intends to maintain and develop, as the storage capacity and the flexibility it provides are highly valuable to ensure security of supply and facilitate the integration of solar and wind energy.

Solar and wind power are seeing spectacular growth, which is in turn driving remarkable cost reductions. This is good news for electricity decarbonisation across the globe!

Nuclear power is a source of competitiveness, manoeuvrability and security of supply. The flexibility offered by the nuclear reactors in France - as they can ramp production up to 80% or down in under 30 minutes - is one of the factors that make it possible to leverage the complementarity between renewables and nuclear.

Regarding the metrics that can be used to compare different energy sources, one one cannot simply compare the cost of dispatchable resources to intermittent ones,

as costs for storage and networks have to be taken into account. We therefore believe that the best approach is to look at the power system as a whole.

Q. Apart from wind and solar power, is EDF looking at other technologies such as hydrogen? We believe you are looking at battery storage projects?

A. EDF is exploring every area of innovation: low-carbon hydrogen, storage technologies, floating wind power, next-generation solar cells and small modular nuclear reactors. If the cost of the energy transition is to be contained, we must look at a wide range of innovations.

Decarbonised hydrogen will notably be useful to decarbonise certain industries as well as long-distance heavy-duty transport; two sectors that are harder to electrify directly. In Europe, the bulk of CO2-free hydrogen supply will come from electrolysis, which Hynamics, EDF's dedicated hydrogen subsidiary, is already working on. EDF is exploring ways to use hydrogen produced with electrolysis in every form, with renewables, nuclear or via power grids.

As for storage, EDF's plan calls for the development of 10 GW of storage capacity worldwide by 2035. The group completed or secured a number of projects in 2019 including a 150 MW hybrid solar and battery storage project in the US. Like hydrogen, electricity storage must be the subject of constant innovation. EDF R&D is very active on this front, notably working to improve battery life and deliver next-generation batteries.

Q. EDF, a recognised stakeholder in combatting climate change, has undertaken to produce increasingly low-carbon electricity, and achieving carbon neutrality by 2050. What do you believe will be the main steps in EDF reaching this goal? Will new nuclear designs be a main part of this journey or will wind and power play an increasing role?

A. I EDF is indeed very involved in the fight to achieve carbon neutrality in France and Europe by 2050, as reflected in our *raison d'être*. In our view, the three key points to reaching carbon neutrality are:

1. Decarbonising electricity. France has already come most of the way: 98% of the power generated by EDF in France is from nuclear and renewable sources (hydro, wind, solar). We need to maintain that head start by maintaining a mix of renewables and nuclear, thus guaranteeing carbon-free generation, security of supply and affordable electricity prices.

2. Electrifying our economies by replacing fossil fuels in transport and buildings. This notably means developing electric vehicles (EDF made great strides in charging systems in France, the UK and US in 2019 and aims to supply electricity for 600,000 EVs in Europe in 2022) and heat pumps (for which EDF offers services for households and firms). Electrification of end-uses is also an essential booster for energy efficiency. Keeping up with these new needs will require producing more electricity. The French government's plan forecasts an around 30% rise in electricity demand by 2050. Electricity's share of energy consumption is expected to increase from just under 25% to more than 50%.

3. Last is decarbonising the remaining 50% of the economy, i.e. all end-uses that cannot be directly electrified easily, especially in industry and heavy-duty transport. A wide variety of solutions and innovations will be required here, including biomass, biofuels and hydrogen from electrolysis.

Electricity has a bright future! Innovation will be crucial in every area. EDF has nine research centres in France, Germany, the UK, China, the US, Singapore and Italy, plus more than 300 academic and industrial partnerships across the globe, and a network of efficient start-ups working on sustainable, low-carbon, competitive solutions to address the needs of our customers in France and around the world.