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# Renewables, Networks and **Energy Transition** Investments

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## Investments in renewables, grids, and other energy transition domains are growing

### Why, when, and who? A quick update.

Mitigating climate change requires a significant acceleration in the commercial development of multiple technologies including: clean power generation with renewables (wind, solar, hydro); hydrogen; storage; CCUS; transportation; and heating/cooling electrification. Smart grids, of course, are now the backbone of every exchange.

In this article, we will cover investments in energy sector technologies. Should you wish to get a holistic overview of the contribution of all these technologies, deep and digital, we recommend reading our recent paper, *Fit For Net Zero – Europe's 55 Quests for Net Zero Emissions*,<sup>1</sup> which was published by Capgemini Invent in conjunction with Breakthrough Energy, the European leg of Gates Ventures. Europe, along with Gates Ventures, has announced in June 2021 an investment of €820M to build several large-scale commercial projects that will help mature four chosen technologies, serving as a booster for promising technologies that are not yet competitive with fossil fuel today.

We also share analysts' predictions and compare players' announcements from utilities, as well as Oil & Gas players, on their diversification route from fossil fuels to new energies. We also detail:

- Investments to be made by 2030 in renewables (mainly solar and wind) and the smart grid
- Priorities for hydrogen, storage, CCUS, transportation electrification, and biofuels
- Overarching trends and priorities, including what each player is betting on and who may become the leaders for today and tomorrow in each domain

By the time you read this article, new announcements will likely have been made, detailing new ambitions. As such, take this as a snapshot from this point in time (summer 2021).

In the 2020 edition of WEMO, we stated that the average investment of Oil & Gas operators outside of their core business only represented 0.8% of their CAPEX. The International Energy Agency (IEA) said in June 2021, that we are now at 4% on average, a significant progress, with far more than 10% for most European IOCs. Progress has been made, but acceleration is still needed.



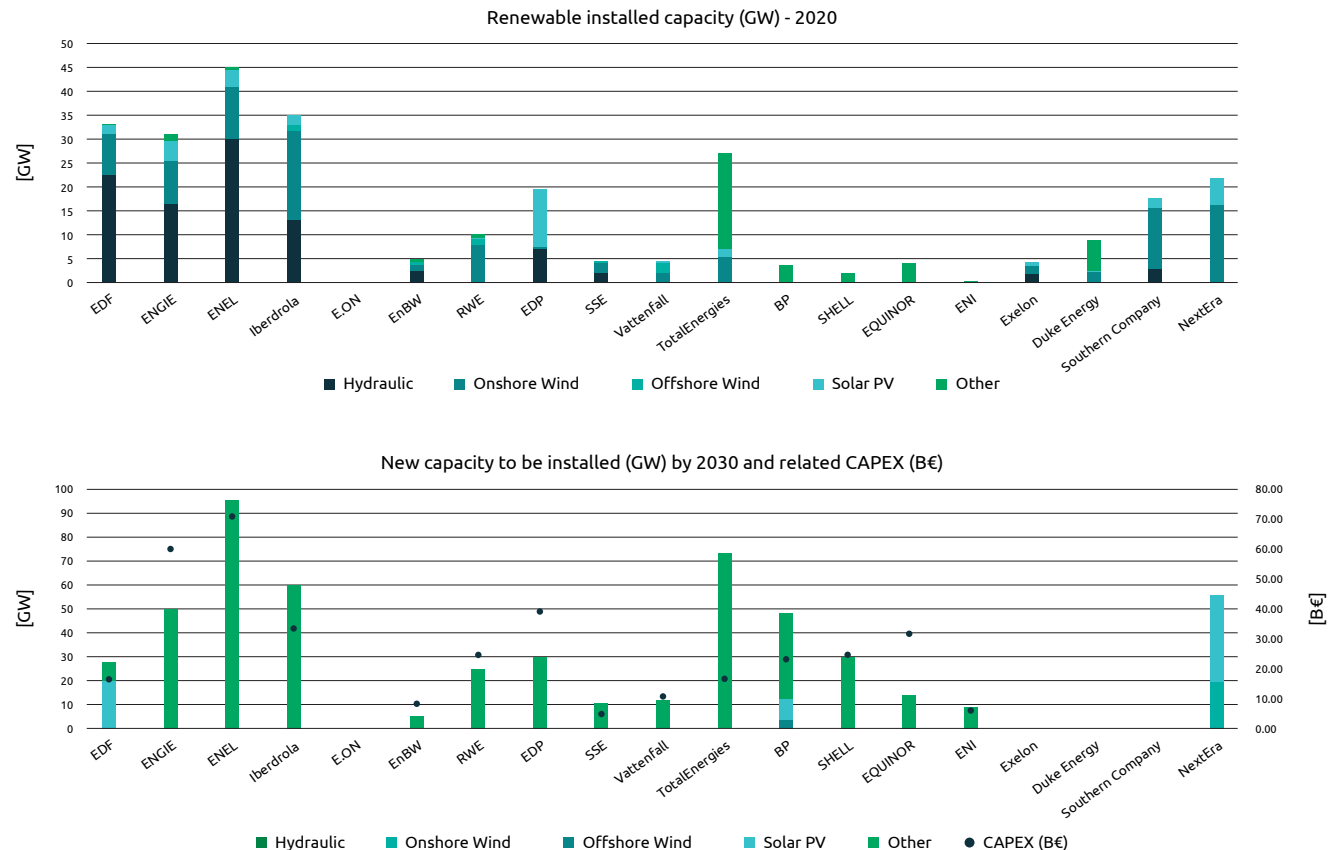
Europe's 55 quests for  
Net Zero Emissions

## Renewables: Anticipated growth through 2030 thanks to new investments

- The IEA and multiple other experts state that mitigating climate change requires organizations to increase investments in renewables by multiples of 5 to 10, starting now and continuing for the next 30 years.
- According to BNEF, there are four renewables supermajors today: ENEL, IBERDROLA, ORSTED, and NextEra. These organizations have a common track record:
  - Shifting early from fossil fuels
  - Leveraging regulatory support
  - Investing massively in renewables with clear choices (technologies, geographies)
- Our survey shows that these organizations will remain majors and could be joined by two or three additional Oil & Gas majors, (notably European, TotalEnergies, BP, and Shell) as well as one or two utilities wanting to accelerate significantly and join the pack (Engie).
- We should note also that:
  - Investment can be announced without details on the technologies.
  - U.S. IOCs have not yet shifted.

FIGURE 1

### Renewables: Anticipated growth through 2030 thanks to new investments



Sources: Eurostat 2021



- All renewables supermajors are investing in hybrid assets, combining wind, solar, and storage for a significant share of their new installations (~40% of new investments).
- Communications about new capacities and related investments are not totally consistent among players.

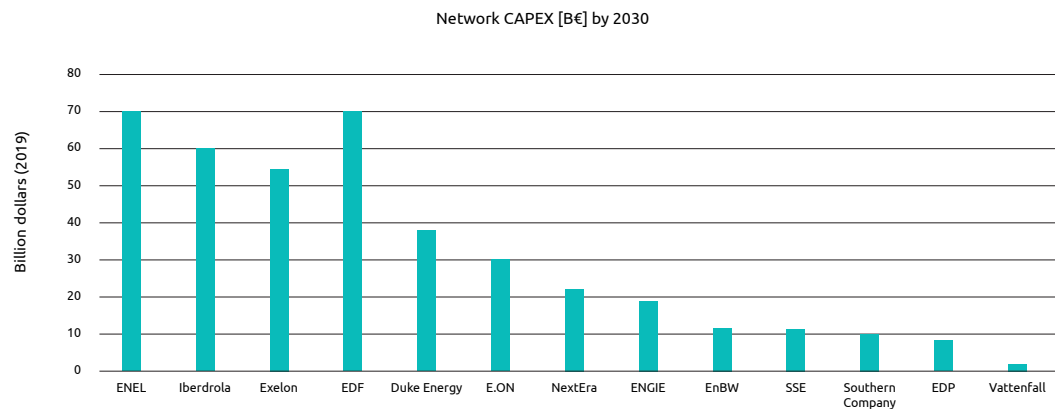
**The number of renewables majors will probably grow from 4 supermajors today to 8 to 10 majors by 2030, with 3 Oil & Gas European IOCs joining the pack. Most of the 2030 renewables majors are European, with NextEra being the only U.S. company in the league. This investment pace doesn't meet climate change needs.**

### **Grid investments should include scaling-up smart grid**

- IEA predicts that investments in aging electric grids will double in the next decade. Between 2025 and 2030, up to \$400B pa will be invested in electric grids. The share of Digital (compared to hardware) will be up to 30% of the \$400bn for the Distribution Network, less for Transmission Networks, already partly Digitized.
- It may come as no surprise that many experts say that for every dollar invested in renewables, another dollar will also need to be invested in the grid to manage generation assets distribution and intermittency.
- There are many triggers for the deployment of the electric grid at scale. The smart grid concept appeared in the early 2000s along with the first wave of smart metering. Twenty years after, there's a burning platform to scale smart grids, considering:
  - Grid stability endangered by a higher share of distributed and intermittent renewables, shifting a one-way flow grid to a two way-flow.
  - Self-consumption and related extra-energy injected in the distribution grid (which lowers the transiting volume in grids and requires increased investments to manage it).
  - Massive electrification expected (led by electric vehicles (EV) charging, vehicle-to-grid technology, heat pumps development, etc.).
  - Storage and flexibility development.
- Years of smart grid experimentations, including thousands of projects worldwide.
- Technology maturity (IoT, communication networks, such as 5G, AI, and RPA, substation intelligence, and ability to communicate).
- Electric grid point of convergence with other grids (gas, hydrogen, heating and cooling networks). Gas to Power and Power to Gas.
- Need for new services that are network performance or customer satisfaction oriented.
- Growing the smart grid at scale will take between 10 and 15 years for the most advanced DNOs and tens of billions in investments, which is consistent with plans announced by the largest network operators.
- Perhaps without surprise, the four largest European DNOs (EDF covering RTE and Enedis in France, ENEL in Italy, Spain, and Latin America, Iberdrola in Spain, UK, Latin America, and North America and EON in Europe) are leading the pack. State Grid, the Chinese giant T&D network operator, may also be part of this group though no communication has been captured so far from the organization. EON will probably accelerate its investments in Smart Grid. Gathering EON + RWE + Innogy stakes in grid (the German mercato) provoked a slower start.

FIGURE 2

### Network CAPEX [B€] by 2030

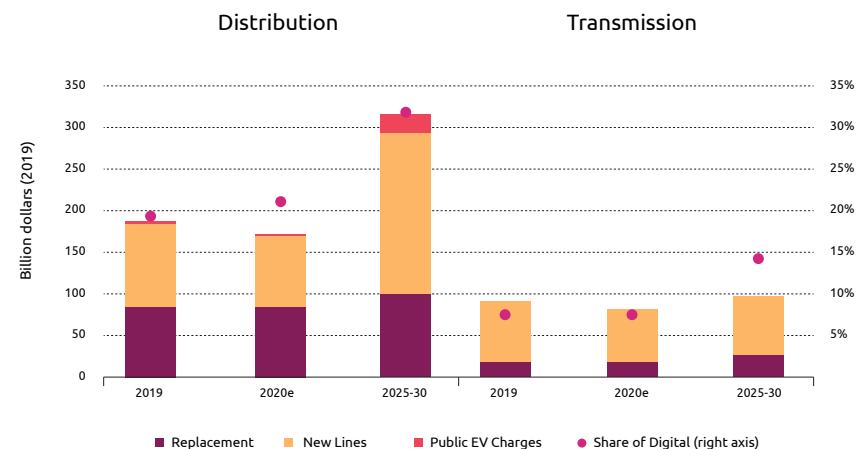


Sources: companies communications

- In the U.S., only two companies, EXELON and Duke Energy are showing investments in networks comparable to the largest European players.
- The Texas storm and outage in March 2021, as well as recent announcement on infrastructure development by the U.S. federal administration from a COVID recovery and Energy Transition combined perspectives, will likely boost the ambitions of the U.S. for Smart Grids. This is a wake-up call.

FIGURE 3

### Annual investment in electricity networks 2019-2030 in the Stated Policies Scenario



Sources: World Energy Outlook, IEA, 2019; World Energy Outlook, IEA, 2020; Electricity security in tomorrow's power systems, IEA, 2020

FIGURE 4

## Energy transition choices for selected leading utilities

	Électricité de France (EDF)	ENGIE	Enel	Iberdrola	NextEra Energy
<b>SOLAR</b>	2.2 GW installed, 20GW in project by 2030	3,8 GW capacity ~50GW new capacities by 2030 (solar + wind)	3.15 GW today (~+95GW renewables by 2030)	1.9 GW today, + 60GW + renewables by 2030	5,47 GW solar end of 2020. 55 GW global renewables by 2025
<b>WIND</b>	8.4 GW installed, ~7GW additional by 2030	9,2 GW in portfolio including offshore (ocean wind). Acceleration (+50GW 2030)	10.8 GW today (~+95GW renewables by 2030)	13.2 GW today +60GW renewables by 2030	16 GW wind capacity end of 2020. 55 GW global renewables by 2025
<b>HYDROELECTRICITY</b>	22.5 GW installed, no extra room for growing the capacity in France	16.3 GW installed	30.15 GW installed	18,6 GW today	--
<b>BIOMASS</b>	Limited and not growing capacity (coal plant conversion)	--	--	--	--
<b>STORAGE</b>	Ambition to grow 8GW and become a leader	Second life batteries	Initiatives without details at that stage	Initiatives without details at that stage	Growing storage along with renewables (hybrid farms). Already 180MW capacity (limited) but plans to invest \$1bn in 2021. Serious acceleration.
<b>HYDROGEN</b>	Creation of Hynamics, share holder of McPhy (electrolysers) and Eifel	Ambition to become a global leader in hydrogen, partnering with industries (consumers)	--	3 corridors in regions and 5MW electrolysers each	Plans to build a 20MW electrolyser.
<b>EV CHARGING</b>	100,000 IZIVIA charging stations today	--	780,000 public and private charging points by 2023	150,000 charging stations to be installed, multiple partnerships. EV100 member	EV charging program, notably in Florida.
<b>BIOFUELS, BIOGAS</b>	--	Biogas ambition	--	--	--
<b>CCUS</b>	Air capture demonstration	--	--	--	--
<b>OTHERS</b>	--	Heat and cooling networks. Bio-diversity initiative	Digital and platformization Startups collaboration.	Circular economy, biodiversity protection.	Circular economy, biodiversity protection.

Sources: companies communications

## Utilities' energy transition update

- Energy transition has been a core mission for utilities for several years. This started with energy efficiency efforts, such as replacing traditional bulbs with more efficient ones, a long time ago.
- While most of the leading utilities have invested in renewables, their choices against other energy transition domains, such as storage, biomass, hydrogen, and CCUS, vary.
- We compare here the actual positions and choices made by utilities, as well as Oil & Gas players, due to the blurring lines between the Energy & Utilities sector and Oil & Gas, as well as diversifications projects.
- Generally, utilities emit about 10 times less than O&G IOCs, notably for our panel. Some, like EDF, rely mainly on low-carbon electricity generation (nuclear and renewables). Others (ENGIE, ENEL) still operate coal or gas plants, though decommission roadmaps exist.
- Key positions of utilities in energy transition:
  - All players are betting on renewables development with more or less intensity.
  - Other significant choices include Hydrogen (EDF, Engie), EV charging (ENEL, EDF), and storage (EDF).
  - ENGIE is also betting on biogas, heating and cooling networks as well as client solutions. This is perhaps obvious for an original gas centric player.

- NextEra is an interesting case to study. The company is markedly bigger in renewables today as compared to the other European companies and has plans to continue to invest heavily. As such, NextEra will remain in the frontrunners league. That said, it will be interesting to consider the company's position in energy transition, given that the company has never declared a net-zero emissions target. While the company's CEO thinks the targets are "disingenuous," NextEra continues to invest significantly in hydrogen, storage, and green mobility.

## Oil & Gas energy transition update

- The 2020 WEMO report stated an average investment of IOCs outside of their core business of only 0.8%, which was mainly oriented on renewables and biofuels. This amounts to basically nothing. However, as of June 2021, the IEA reported a significant increase of up to 4%, with European majors floating between 10 to 20%. A level of investments, for European leaders, in the range of leading Utilities.
- The following pages show a picture of four IOCs' energy transition commitments, actual emissions, and energy transition pillars: BP, SHELL, TotalEnergies, and Exxon Mobil.
- BP, SHELL, and TotalEnergies have clear objectives on climate change mitigation, under the pressure of their stake and share holders, but also in a diversification perspective with the forecasted end of the fossil fuels era.

- Exxon Mobil sticks to historical core business, and hasn't announced any significant Energy Transition projects, beyond shy 2025 emissions reduction targets.
- The large European players with deep pockets are clearly pivoting to becoming utilities and are in the race for becoming renewables majors (or even supermajors). These companies have also announced investments in hydrogen and e-mobility to mitigate Scope 3 emissions.
- All operators, including Exxon Mobil, show interest in CCUS, as demonstrated through R&D and commitments for the future based on results already achieved.
- Biofuels is a "no brainer" for all in helping to meet demand for their clients, as well as leverage their large R&D investments and existing refining facilities.



FIGURE 5

## Energy transition strategies of selected Oil & Gas majors

	BP	Royal Dutch Shell	ExxonMobil	TotalEnergies
<b>Mission statement</b>	Our purpose is <b>reimagining energy for people and our planet.</b>	Shell's purpose is to <b>power progress together with more and cleaner energy solutions.</b>	<b>Affordable and sustainable energy solutions are required to advance global prosperity. We invest in technology and communities to bring the world better energy.</b>	<b>Become the responsible energy major.</b>
<b>GHG emissions (actuals – Gt/Y)</b>	1.2	1.7	0.12 (Scope 1 & 2 only, no reporting Scope 3 so far)	0.45
<b>Energy Transition Commitments/Roadmap</b>	2025: -20% emissions 2030: -30-35% emissions 2050: -100% emissions	2023: -6 to 8% emissions 2030: - 20% emissions 2035: - 45% emissions 2050: -100% emissions	2025: -15 to 20% GHG compared to 2016) 2025: -40 to 50% methane intensity And -35 to 45% methane flaring New plan under activist's pressure	Carbon neutral by 2050 (1+2), Carbon neutrality by 2050 in Europe (1+2+3) 60% carbon intensity reduction by 2050 (15% 2030)
<b>Energy Transition Investments</b>	US\$ 0.5 – 5 bn / y 2020 - 2025 (\$60 bn by 2030)	US\$ 3 bn / y low carbon electricity	\$10bn over 20 years (since 2000). ExxonMobil sticks to historical core business, and hasn't announced any significant energy transition projects, but moves forward on hydrogen and CCS	US\$ 1.5 – 2bn / y low carbon electricity
<b>Energy Transition Pillars</b>	Natural gas/ Renewables/ City solutions/ Mobility/ Reduction in Oil Productions/ Carbon Pricing/ Energy Management	Natural Gas/ Renewables/ Helping Customers Decarbonate/ Mobility/ Hydrogen Market/ Utilities	Scope 1 & 2 emissions, methane flaring reduction + Hydrogen and CCS	Natural Gas/ Renewables/ Energy Efficiency/ Sparing use of oil/ Helping customers decarbonate/ Carbon Sinks/ Carbon Price

FIGURE 6

## Energy Transition domains of selected Oil & Gas majors

	BP	Royal Dutch Shell	ExxonMobil	TotalEnergies
SOLAR	1.5 GW installed, 8GW in pipeline	1.6 GW capacity	--	~5 GW installed, ~14GW in pipeline
WIND	1.7 GW in US, 3GW in UK pipeline	6 GW in portfolio or development	--	~1 GW installed, ~5GW in pipeline
HYDROELECTRICITY	--	2018 market feasibility study for North America	--	--
BIOMASS	BP Bunge Bioenergia in Brazil	IH^2 biomass for fuels	--	La Mede site
STORAGE	BP Ventures acquisition	Limejump subsidiary	--	Saft
HYDROGEN	>10% green hydrogen market by 2030	Global leaders in green hydrogen	Low carbon hydrogen production with Gas + CCS: blue hydrogen	Along with Engie, large hydrogen project
EV CHARGING	10,000 > 70,000 points by 2025	60,000 > 500,000 points by 2025 > 2,500,000 by 2030	--	150,000 by 2025
BIOFUELS	Partnership with Qantas for aviation	HEFA, synthetic fuels, biogas production	R&D (Algae) + agreement with Global Clean Energy Holdings to purchase 2.5 million barrels of renewable diesel per year for five years, starting in 2022	La Mede biorefinery
CCUS	Net Zero Teesside project	-25Mt / y by 2035	Latest reporting in 2017: 6.6 million metric tons of CO2 for storage	10% of R&D allocated
OTHERS	Cities partnership with Microsoft	Shell Energy Utilities/Broadband	Plastic waste management	Electricity retailer (Lampiris, Total Direct Energie, EDP SP)



## Energy Transition: All can be winners

- Significant funds (CAPEX) totalling tens of billions in the next decade and thereafter is needed for every large player to meet its ambition.
- Shareholders and stock markets encourage the investments in renewables. Let's consider that:
  - The capitalisation of ORSTED on the stock market is comparable to BP's, a company twenty times ORSTED's size. BP's capitalisation has benefited of the economic recovery, market tension and barrel price increase.

- The same effect has occurred in North America, with NextERA stock value being comparable to ExxonMobil's.
- All operators are investing to grow renewables.
- Utilities have started earlier and four renewables supermajors appeared (ENEL, IBERDROLA, ORSTED, NextEra).
- With their diversification imperative and deep pockets, European major IOCs joined the race recently and could be assuming leadership positions.
- So, it will be possible to find money for growing renewables; One should consider also the portfolio rotation (growing assets and selling them with a significant pay-back).
- It's impossible to become a champion on every dimension of the energy transition. No company could afford it. They have to make choices on technologies and in geographies. So, what are the best bets? A difficult question indeed. There are choices: Investing in EV charging infrastructures or in the hydrogen value chain? Storage or CCUS? Biofuels or biogas? Wind or solar or both (with hybridization)? Onshore or Offshore wind?
- Without forgetting to maintain a significant R&D effort to grow new promising technologies and bring them to high TRL<sup>1</sup> / BRL<sup>2</sup> levels.

- Now let's consider the networks (Smart Grid) investment. For networks, there is a question about investments compensation given the copper and fiber dilemma. Compensation schemes from regulations cover hardware investments; in many cases, not enough is directed to the software side of the Smart Grid. Regulation must evolve, so long as Smart Grids are the backbone of energy transition.

- **Easier to formulate than to execute, there's a winning energy transition route for all.**
- **Clear choices, consistency and resilience are needed.**
- **European IOCs are in the race.**

1. TRL : Technology Readiness Level
2. BRL : Business Readiness Level

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