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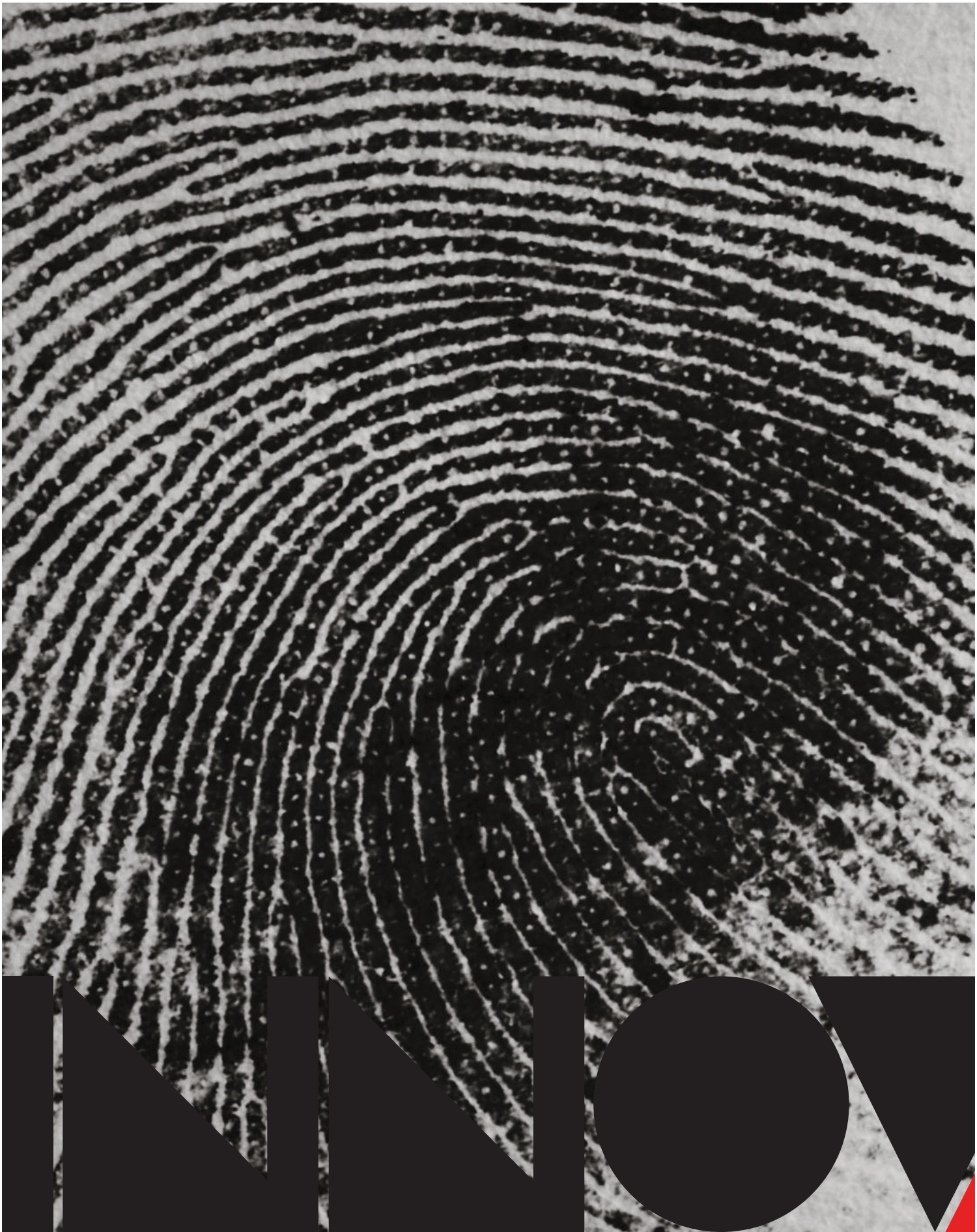
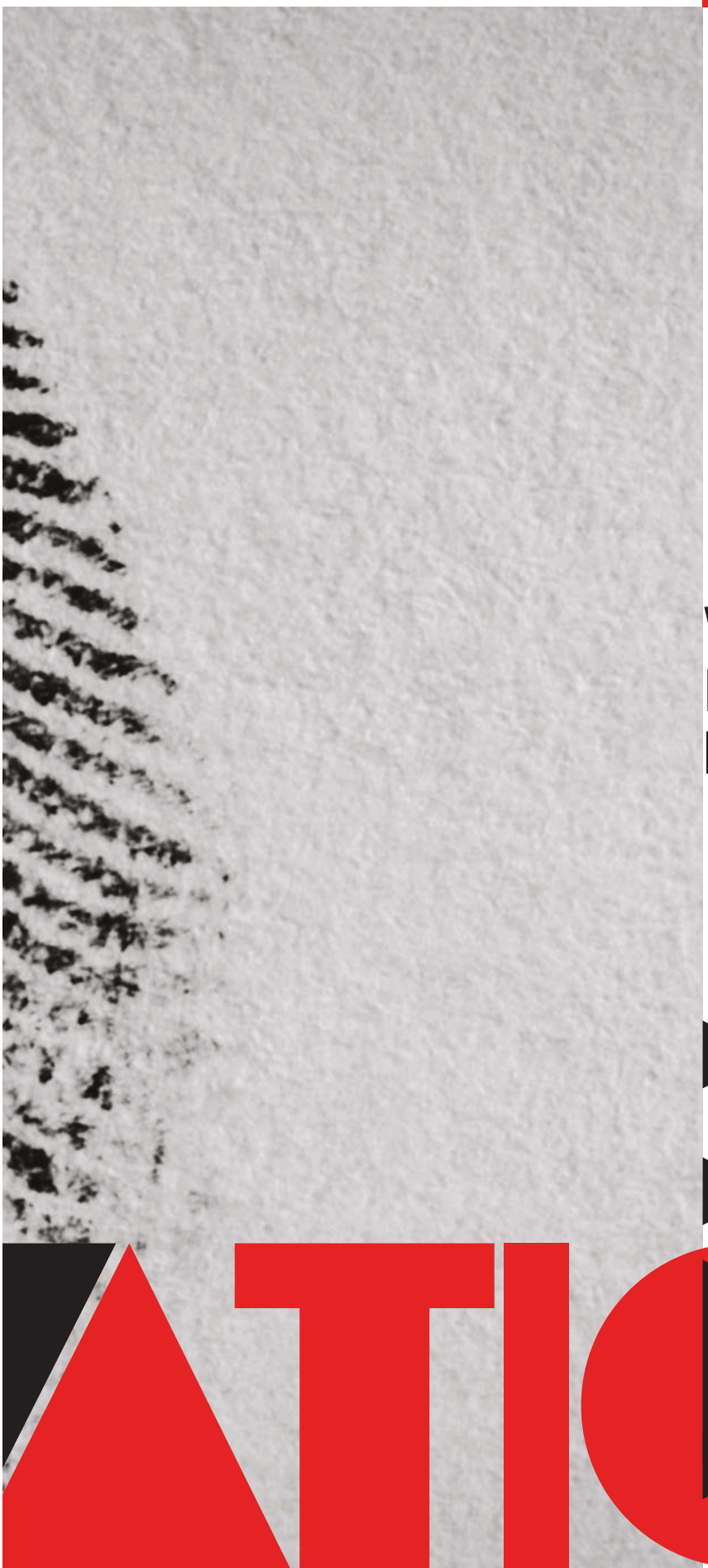
02
STRATEGIC APPROACH





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02 STRATEGIC APPROACH

2.1 BUSINESS ENVIRONMENT

2.1.1 RENEWABLE ENERGY IS A COST-EFFECTIVE WAY TO FIGHT CLIMATE CHANGE

2.1.1.1 CLIMATE CHANGE WARNING SIGNS AND THE URGENCY FOR DECARBONIZATION

2018 was the fourth warmest year on record[1], as global temperatures were 1.16°C above the average temperature of the late 19th century[2]. With increasing global surface temperatures, the possibility of more frequent and fiercer extreme weather events is more likely to occur, scientists warn. In 2018, the severe effects of global temperatures' rise have been felt in every region of the planet through extreme weather episodes and natural disasters. The hurricanes of Florence and Michael caused significant damages in the US, while in California the worst wildfires were recorded. In the Pacific, typhoons Mangkhut and Yutu hit the Philippines, Guam, South China and the Mariana Islands. Europe experienced both record cold and hot temperatures. In Latin America, Argentina and Uruguay suffered from severe drought. However, floods were the more devastating natural disasters in 2018, with reports coming from all over the word, North Korea, Nigeria, Japan and Indonesia being some examples.

All these catastrophes have been particularly deadly. According to data from the *Centre of Research on the Epidemiology of Disasters,* in 2018 so far approximately 5,000 people have died and 28.9 million have needed emergency assistance or humanitarian aid because of extreme weather.

In 2018, new studies that have broadened our understanding of climate change, were released. In October, the UN *Intergovernmental Panel on Climate Change (IPCC)* published a landmark report[3] revealing that global temperatures are moving towards a catastrophic 3°C during this century, with additional warming after that. The report also warns that we have just 12 years to make "massive and unprecedented changes" to global energy infrastructure, as temperatures could reach 1.5°C as soon as in 2030.

The *United Nations Environment Program* ("UNEP") released in November 2018 its annual report on the "emissions gap", this is, the distance between countries' pledged commitments for meeting the targets of the 2015 Paris Agreement and the pathways that experts estimate could actually achieve those targets. The Report finds that if countries don´t rise their commitments and cut 2030 emissions beyond current pledges, exceeding 1.5°C would no longer be avoided. Also, it reveals that, unless the emissions gap is closed by 2030, the 2°C target is highly unlikely to be reached. According to the UNEP, annual greenhouse gas emissions reached in 2017 a record high of 53.5 billion tons after three years of decreases. However, in order to limit global warming to 2°C, emissions in 2030 will need to be around 25% lower than 2017's (55% lower to meet the 1.5°C target). The Report concludes that the promises made by signatory countries of the Paris Agreement are not enough to close the "emissions gap". According to the UNEP, to cap global warming at 2°C, national carbon-cutting pledges annexed to the Paris Agreement must collectively triple by 2035. To hold the rise in Earth's temperature to 1.5°C, such efforts would have to increase fivefold.

[1] Source: NASA and National Oceanic and Atmospheric Administration (NOAA)
[2] Source: Berkeley Earth found
[3] "Global Warming of 1.5°C" released in October 2018

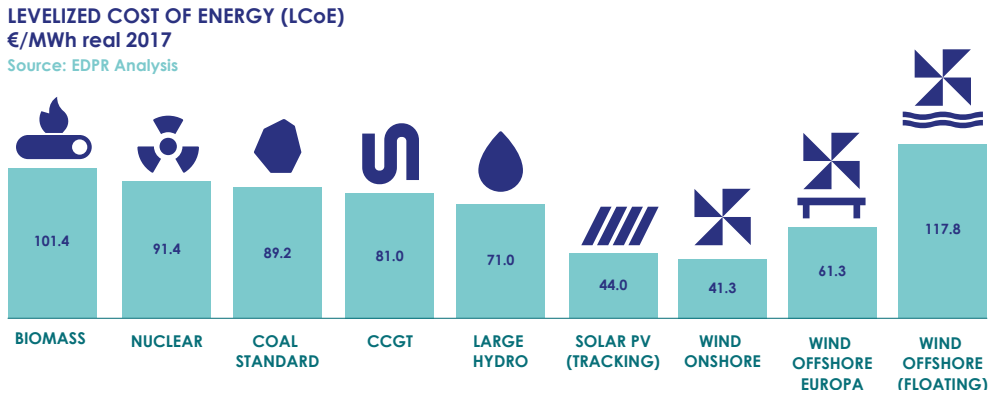
2.1.1.2 WIND AND SOLAR PV WILL BE KEY TO FIGHT CLIMATE CHANGE

All the aforementioned studies have in common the fact that we are running out of time if we want to avoid catastrophic global warming. Therefore, next decade is set to be crucial and since we don´t have time to rely on new technologies, existing and affordable options need to be capitalized. In this context, wind and solar PV technologies are expected to play a key role.

The IPCC, in its latest report[1] , says that renewables will need to provide up to 85% of global electricity by 2050 in order to avoid the worst effects of climate change.

The "Emissions Gap Report" released by UNEP presents different enhanced mitigations measures but highlights three broad areas that have the largest potential: renewable energy from wind and solar power; energy-efficient appliances and cars; and afforestation and stopping deforestations.

This much needed clean-energy transition is possible because it's affordable and makes economic sense. Onshore wind and solar PV are among the cheapest sources of energy in a growing number of countries, which has been highlighted by the most reputed analyst agencies including Lazard, Bloomberg New Energy Finance and IRENA. The competitiveness of renewables has been clearly evidenced in 2018 by wind's (both onshore and offshore) and solar PV's tenders reaching record low prices all around the globe.



"We've long been saying that more wind makes economic sense, as it's the cheapest form of new power. It's great that the IEA now see wind being the no. 1 source of electricity in Europe in less than 10 years. That'll mean new wind farms and modernisation of existing ones, all of which will bring jobs, growth and revenues to local communities"

Wind Europe CEO Giles Dickson

Good evidence of the competitiveness of wind and solar PV energy, is that energy experts expect a large deployment for the coming years. According to Bloomberg New Energy Finance (BNEF)[2], wind and solar PV will cover around 48% of World's electricity demand by 2050 (compared to 7% in 2017).

BNEF also points out that solar PV will be the largest growing technology. It predicts that almost half of all new electricity generating capacity worldwide between 2017 and 2050 will be solar PV.

Prospects for wind energy are also excellent. For example, the International Energy Agency's "World Energy Outlook 2018" indicates that wind energy in Europe is set to overtake coal, nuclear and gas to become the EU's largest source for power generation as soon as in 2027. According to the IEA, wind electricity in the EU will more than triple to 1,100 TWh by 2040.

[1] "Global Warming of 1.5°C" released in October 2018
[2] "New Energy Outlook 2018" released in June 2018

2.1.2 THE EVOLUTION OF RENEWABLES AROUND THE WORLD IN 2018

WIND

Global wind addition seems to have remain relatively stable in 2018[1], with analysts forecasting around 51-53 GW of new capacity, close to the 2017's 52.6 GW figure.

In **North America,** the US installed 7,588 MW in 2018, an 8% increase over 2017, bringing total US installed capacity to 96,488 MW, according to AWEA (American Wind Energy Association). By State, Texas led with 2,359 MW installed, followed by Iowa (1,120 MW), Colorado (600 MW), Oklahoma (576 MW) and Nebraska (558 MW). At the end of 2018, 19 States had already surpassed the "1 GW of installed capacity landmark", being Texas the biggest wind State with a cumulative capacity or nearly 25 GW. Mexico installed almost 1GW of new capacity, the highest capacity additions ever, reaching a cumulative capacity of 5 GW, while Canada added 566 MW.

In **South America**, Brazil installed 2 GW of new capacity during 2018 according to data released by the Global Wind Energy Council (GWEC).

European wind additions witnessed a slow-down in 2018 with 11.7 GW of gross capacity added, a fall of 32% compared to the record level seen in 2017. Today, 189 GW of wind power capacity are installed in Europe, 10% of these being offshore.

Regarding onshore wind, 9 GW of new facilities were connected, according to data released by WindEurope. These modest results are explained by a decreased of new installations in Germany, where only 2,402 MW of onshore wind were connected, compared to the record 2017 figure of 5,334 MW. Similarly, new UK onshore wind installations plummeted by nearly 80% in 2018 to 598 MW. However, these results were partly compensated by a strong year in France (1,563 MW) and Sweden (720 MW).

Europe connected 2.65 GW of new **offshore** wind capacity, achieving a cumulative capacity of 18.5 GW according to latest figures from WindEurope. These figures show a 15.8% fall on 2017's record annual total, when 3.15 GW were added. The UK and Germany saw again the largest additions, connecting 1,312 MW and 969 MW respectively. Belgium added 309 MW and Denmark 61 MW. Offshore wind already represents around 2% of all the electricity consumed in Europe. A noteworthy figure was the size of newly installed turbines, which averaged 6.8 MW, 15% higher than the previous year.

Africa and Middle East installed 962 MW of new capacity in 2018, over 300 MW more than in 2017, being the leading countries Egypt and Kenya, that respectively connected 380 and 310 MW, according to GWEC.

SOLAR PV

In 2018 the solar market seems to have increased at a slower pace, although not cumulative data have been released at the time of this report. According to different estimates, the world could have installed around 95-109 GW, compared to 99 GW in 2017.

China, the world's biggest solar market, installed 44 GW, down 18% in annual terms and reaching a cumulative capacity of 174 GW according to official National Energy Administration data.

The US added 11.7 GW in 2018, in line with 2017 results, according to Bloomberg New Energy Finance[2]. The growth in the US was mainly driven by a spike in utility-scale installations, while the residential market has been stagnated year-over-year due to the end of net metering in several states.

The EU installed around 8 GW of new solar capacity in 2018, a 36% increase on 2017, according to figures from SolarPower Europe. Solar facilities in Europe-wide, including countries outside the EU-28, grew by around 20% to 11 GW in 2018 compared with the previous year. Germany was the most dynamic market with 2.96 GW of newly installed PV capacity, representing a year on year growth of 68%. European growth was also driven by other growth markets like Turkey (1.64 GW) and Netherlands (1.4 GW).

[1] Global Wind energy Council (GWEC) data have not been released at the time of preparation of this report
[2] Published in its Sustainable Energy in America Factbook, published in collaboration with the Business Council for Sustainable Energy

2.1.3 SUPPORTIVE POLICY INSTRUMENTS

A wide range of remuneration schemes has traditionally supported Renewables' projects. However, the most frequent schemes are:

- **FEED-IN TARIFF (FIT) SYSTEMS:** most popular scheme due to its simplicity and visibility for investors, where generators receive either a fixed payment for each unit of electricity generated regardless of the market price, or a payment on top of the market price ("Feed-in premium" and "Contract-for-difference" schemes).

- **QUOTA OBLIGATIONS:** on top of the market price, generators receive certificates for their final energy ("Green Certificates" or "GC") which can be sold to the off-takers obliged to fulfil a specific quota (a share of energy that must come from renewable sources), therefore providing additional income to the generators.

- **TENDERS AND AUCTIONS:** are becoming increasingly popular, they do not represent a support category per se as they are used to allocate financial support to different renewables technologies and to determine the support level of other types of support schemes, such as feed-in systems, in a competitive bidding procedure.

- **OTHER:** includes investment grants, low interest loans and tax exemptions to support renewables.

The table below describes the overall current regulation in the geographies where EDPR operates.

COUNTRY	SHORT DESCRIPTION
BELGIUM	• Market price plus green certificate (GC) system Separate GC prices with cap and floor for Wallonia (€65/MWh-100/MWh) • Option to negotiate long-term PPAs
BRAZIL	• Old installed capacity under a feed-in tariff program ("PROINFA") • Since 2008, competitive auctions awarding 20 years PPAs
CANADA	• Feed-in Tariff (Ontario). Duration: 20-years • Renewable Energy Support Agreement (Alberta)
FRANCE	• The majority of existing wind farms receive Feed-in tariff for 15 years: • First 10 years: €82/MWh; Years 11-15: depending on load factor €82/MWh @2,400 hours to €28/MWh @3,600 hours; indexed • Wind farms under the RC 2016 scheme receive 15 years CfD which strike price value similar to existing FIT fee plus a management premium
GREECE	• 20 years CfD, allocated by tender, and providing long term visibility with a public counterparty and minimizing market risk
ITALY	• Wind farms in operation prior to the end of 2012 are remunerated under a pool + premium scheme applicable for the first 15 years of operation • Wind farms commissioned from 2013 onwards: competitive tenders for a 20-year CfD scheme, implemented as a floor in the wind farm electricity price, conducted as reverse auctions where operators bid on the amount of the deduction on the pre-defined base amount
MEXICO	• Technological-neutral auctions (opened to all technologies) in which bidders offer a global package price for the 3 different products (capacity, electricity generation and green certificates) • EDPR project: bilateral Electricity Supply Agreement under self-supply regime for a 25 year period
POLAND	• Electricity price can be established through bilateral contracts • Wind receive 1 GC/MWh which can be traded in the market. Electric suppliers have a substitution fee for non compliance with GC obligation. From Sep-17 onwards, substitution fee is calculated as 125% of the avg market price of the GC from the previous year and capped at 300PLN.

COUNTRY	SHORT DESCRIPTION
PORTUGAL	• Old regime (before 2006): Feed-in Tariff (FiT) inversely correlated with load factor throughout the year. Duration: 15 years for a FiT updated monthly with inflation, through the later of 15 years of operation or 2020. Following agreement of the wind sector with the government in 2012, wind generators were offered the possibility to extend FiT's duration in exchange of annual payments between 2013 and 2020 • New regime (after 2006): Feed-in-tariff awarded for a period of 20 years limited by a maximum total electricity production of 44 GWh per installed MW
ROMANIA	• Wind assets (installed until 2013) receive 2 GC/MWh until 2017 and 1 GC/MWh after 2017 until completing 15 years. 1 out of the 2 GC earned until Mar-2017 can only be sold from Jan-2018 and until Dec-2025. Solar assets receive 6 GC/MWh for 15 years. 2 out of the 6GC earned until Dec. 2020 can only be sold after Jan-2021 and until Dec. 2030. GC are tradable on market under a cap and floor system (cap €35/floor €29.4) • Wind assets (installed in 2013) receive 1.5 GC/MWh until 2017 and after 0.75 GC/MWh until completing 15years • The GCs issued starting in Apr-2017 and the GC postponed to trading from Jul-2013 will remain valid and may be traded until Mar-2032
SPAIN	• Wind energy receives pool price and a premium per MW, if necessary, in order to achieve a target return established as the Spanish 10-year Bond yields plus 300bps • Premium calculation is based on standard assets (standard load factor, production and costs) • Since 2016, all the new renewable capacity is allocated through competitive auctions

UNITED STATES OF AMERICA	• Sales can be agreed under PPAs (up to 20 years), Hedges or Merchant prices
	• Green Certificates (Renewable Energy Credits, REC) subject to each state regulation
	• Tax Incentive:
	  • PTC collected for 10-years since COD ($24/MWh in 2018)
	  • Wind farms beginning construction in 2009 and 2010 could opt for 30% cash grant in lieu of PTC

UNITED KINGDOM	• 15-years indexed CfD awarded through competitive auctions

2.1.4 REGULATION OVERVIEW

EU REGULATORY DEVELOPMENTS

Clean energy package

In 2018, the Clean Energy for All Europeans package witnessed great progress, with the approval[1] of many of the proposals, including the "Recast Renewables Directive" (RED II) and the Governance Regulation.

The RED II calls for energy from renewables to account for at least 32% of EU's gross final energy consumption by 2030, with an upwards revision clause by 2023. This target significantly improves the original European Commission (EC) proposal of 27%. The RED II also requires Member States (MS) to provide at least, five years visibility on their support for renewables, including the timing, volumes and budget for future auctions. The Directive also allows MS to conduct technology-specific auctions. European countries will also be required under RED II to identify and remove existing administrative barriers to the development of corporate renewable Power Purchase Agreements (PPAs). Finally, the RED II requires permit granting procedures to be streamlined with a maximum of two years for regular projects and one year in case of repowering[2].

The Governance Regulation defines how MS will cooperate with each other and with the EC to reach the objectives of the Energy Union. It requires MS to submit a detailed "National Energy and Climate Plan for 2030", in which they must explain how much renewable energy they intend to provide and how they will proceed. In order to ensure MS' progress towards the 2030 goal, the regulation introduces three interim targets[3] and a "gap-filler mechanism" (if there is a gap at EU level, those MS which fall below their reference points will have to cover the gap by implementing measures at national level).

On 18 December the EC, the European Parliament and the Council reached a deal on the Electricity Market Design package, which will help to integrate higher shares of renewables. It confirms the priority of dispatch for existing renewables installations. New renewables facilities will still benefit from transparent rules on curtailment that will replace the priority of dispatch, including compensation for lost revenues where re-dispatch is not market based.

2050 long-term strategy

On 28 November 2018, the EC presented its strategic long-term vision for a "prosperous, modern, competitive and climate-neutral economy by 2050", ahead of the UN climate summit (COP 24). The strategy extensively underlines the opportunities for swift and ambitious energy and climate action. This policy document sets a path towards climate neutrality and includes analysis of current policy measures and future scenarios that cover all sectors producing greenhouse gas emissions.

Not surprisingly, the energy sector plays a central role in making Europe climate-neutral. Maximising the deployment of renewables and the use of electricity is deemed critical by the strategy to fully decarbonize Europe's energy system. According to the document, by 2050, more than 80% of electricity would be coming from renewable energy sources and wind energy is expected to represent 51-56% of it.

EUROPE AND BRAZIL: 2018 REGULATORY DEVELOPMENTS

This chapter describes the most relevant recent regulatory developments (if any) in the European-Brazilian countries where EDPR is present.

SPAIN

On October 6, the Spanish Minister for Energy transition and environment introduced, through the publication of Royal-Decree Law 15/2918, several measures aiming at limiting electricity cost for consumers and serving as a first step towards the long-term energy transition targeted by the Government. The implemented measures include, among others, the suspension of the 7% generation tax during a period of 6 months, the facilitation of self-consumption and the administrative extension until March 2020 of the connection rights for the renewable plants awarded in last year's auctions.

[1] By the European Parliament, the European Commission and the Council
[2] Both extendable for an additional year in case of specific circumstances and notwithstanding environmental and judicial procedures
[3] 18% by 2022, 43% by 2025 and 65% by 2027.

FRANCE

On June 20, the French Government announced that France's first six offshore wind farms would proceed after parties agreed to lower the tariffs they had secured in 2012 or 2014. This agreement unblocks the projects that had been in a stalemate after the government had reported that projects could be re-tender if an agreement was not found.

In September, the results of the second onshore wind auction were announced. France awarded a total of 118 MW to five projects, less than one-fourth of the 500MW capacity on offer. The average winning price was not disclosed.

The government enacted on 1 December two measures aimed at speeding up onshore deployment. These measures remove one level of jurisdiction in the appealing processes, this is, when projects are challenged in the courts.

BELGIUM

The Government of Wallonia approved also in March the so-called "Pax eolienica" which is a set of 15 measures aimed at fostering wind energy development in the region, among which the government is considering the reduction of the support for new onshore projects.

On September 29, the Energy commission of Wallonia approved a decrease in the number of Green Certificates granted by MWh (value of the parameter Keco) to new projects from 1 to 0.86 starting in January 2019.

POLAND

On June 29, the Polish Parliament. approved a set of amendments to the Renewables Act ("RES Act") and to the Wind Farm Investment Act ("WF Act"). The amendments of the RES Act do not include any relevant change towards operating assets Green Certificate ("GC") scheme and focus mainly on operative changes and clarifications to the new tender scheme. The amendments of the WF Act include a return to the initial taxable base of the Real Estate Tax as of January 2018 and the extension of validity of the Building Permit.

A wind and solar joint auction for projects exceeding 1 MW in size was held on November 5. All contracted power went to wind, with 31 wind projects selected, at an average price of PLN 196/MWh (around 45.4€/MWh). EDPR secured a 15-year long-term contract for a 38 MW project.

ROMANIA

On June 26, Law 198 validating Government Emergency Ordinance 24/2017, amending Law 220/ 2008 was finally approved. The final set of amendments included among others (i) a potential change to a Feed-in-Premium scheme for operating assets; (ii) a gradual increase in the maximum allowed impact to final consumers (currently of maximum 11.1€/MWh), (ii) the removal of the loss of GC from positive unbalances (iii) the pro-rata allocation of GCs sold in the centralised platforms when the supply exceeds demand; and (iv) modifications in the postponement of solar PV GCs.

GREECE

Renewables projects in Greece are supported by 20-years feed-in premiums (Contracts-for-Difference) awarded through auctions. The first full-scale renewables auction was held on July 2, with 277 MW of capacity awarded. The 171MW of wind capacity went to seven projects, with a 45MW project being awarded to EDPR. The rest of the capacity (106 MW) went to solar PV projects.

A second auction round was held on December 10, in which 222 MW of renewables contracts were awarded. Seven wind projects with a total capacity of 160 MW were awarded contracts, while the remaining capacity went to solar PV projects. The weighted average bid for onshore wind projects was 58.60 euros/MWh, a 16% reduction compared with the previous auction. EDPR secured a 10-year CfD for a 15 MW wind project.

BRAZIL

In April 4th, Brazil held its first reverse auction of 2018 for power from renewable sources (Leilão A-4). As a result, 39 projects with a total capacity of 1,024.5 MW were allocated. In total, 806.6 MW of solar PV (at a marginal price of 118.4 BRL/MWh) were granted, and 114.4 MW of wind (at a marginal price of 67.6 BRL/MWh). The rest of the capacity was granted to hydro and biomass projects.

An A-6 auction was held on 31th August, in which long-term PPAs were awarded for 669.5 MW of clean energy capacity, including 538.8 MW of wind. The average auction price for wind was 90.45 BRL/MWh. EDPR secured 20-years PPAs for two wind farms with registered capacity of 176 and 253 MW.

NORTH AMERICA: CONTINUE LEADING THE WAY

UNITED STATES

Historically, the typical framework for wind and solar developments in the US has been decentralised, with no national feed-in tariff, resulting in a combination of three key top line drivers:

- PTCs: Production Tax Credits are the dominant wind incentives in the US and represent an extra source of revenue per unit of electricity generated ($24/MWh in 2018), over the first 10 years of the asset's life.
- ITCs: Investment Tax Credits equals to 30% of the initial capex and are the primary solar incentives.
- PPAs: long-term, bilateral Power Purchase Agreements by which a renewable developer can sell its output to another company at a fixed price, usually adjusted for an agreed escalator.

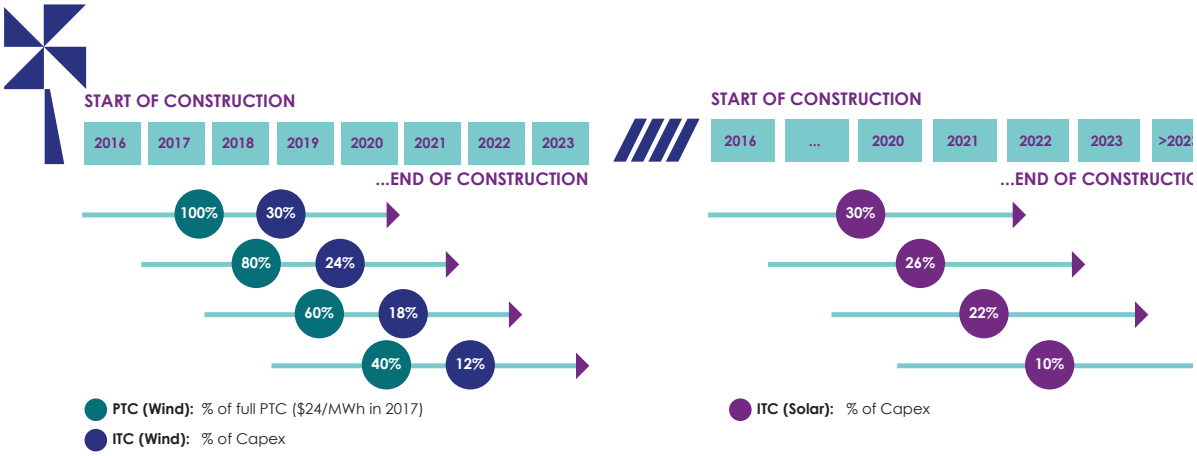
In addition, many states have passed legislation, mainly in the form of Renewable Portfolio Standards (RPS), that require utilities to purchase a certain percentage of their energy supply from renewable sources, setting penalties to those that do not accomplish. Typically, states use Renewable Energy Credits (RECs) as the compliance mechanism. Utilities or other subject entities are required to procure enough RECs to meet their obligations under the RPS. Utilities can choose to invest directly in renewable generation assets and generate a REC for each unit of renewable energy produced or, alternatively, can purchase RECs produced by other renewable generators either through long-term bilateral contracts or in the secondary market. As a result, many utilities set up auction systems to seek long-term power purchase agreements with renewable energy generators by which they procure renewable energy and RECs.

The relevant recent regulatory developments are below described.

On December 2015, the US Congress approved the "Consolidated Appropriations Act, 2016" that included an extension of the PTC for wind (including the possibility of a 30% ITC instead of PTC) and an extension of the ITC for solar. As part of the extensions, Congress also introduced a phase out of the credits. Wind projects that start construction in 2020 or later will not be eligible for the PTC or ITC and solar projects placed in service after 2023 will qualify for just 10% ITC. On May 2016, the US Internal Revenue Service (IRS) issued guidance that wind farms have 4 years from their start of construction to be placed in service and qualify for the PTC. As a result, projects that start construction prior to year- end 2019 and are placed in service prior to year-end 2023 will be eligible for the PTC. The IRS ruling also includes a provision that allows developers to secure the PTC if 5% of a project's capital components by dollar value are safe harboured in a given year and construction is completed within 4 years. Thus, if a developer safe harbours 5% of project Capex in 2016 for a given project, the project will qualify for the 100% PTC if construction is completed by year-end 2020.

On 22 June 2018, the IRS released Notice 2018-59, which provides guidance to determine when a solar project begins construction for ITC purposes and specifies that projects have until 2024 to be placed in service and qualify for the ITC at levels above 10%. The ITC percentage for a solar project is determined based on the year in which construction of the project begins – provided the solar project is also placed in service before Jan 1, 2024 – as follows: (i) before Jan 1, 2020, 30%; (ii) in 2020, 26%; (iii) in 2021, 22%; and (iv) any time thereafter (regardless of the year in which the solar project is placed in service), 10%. Similar to the IRS guidance regarding the wind PTC, establishing the beginning of construction is deemed by (i) engaging significant physical work or (ii) paying or incurring 5% of the ultimate tax basis of the project. Thus, if a developer safe harbours 5% of project Capex in 2019, the project will be qualified for a 30% ITC if the construction is concluded before Jan 1, 2024. Similarly,

if a developer safe harbours 5% of project Capex in 2021, the project will be qualified for a 22% ITC if the construction is concluded before Jan 1, 2024. The graphic below depicts the phase-out calendar:

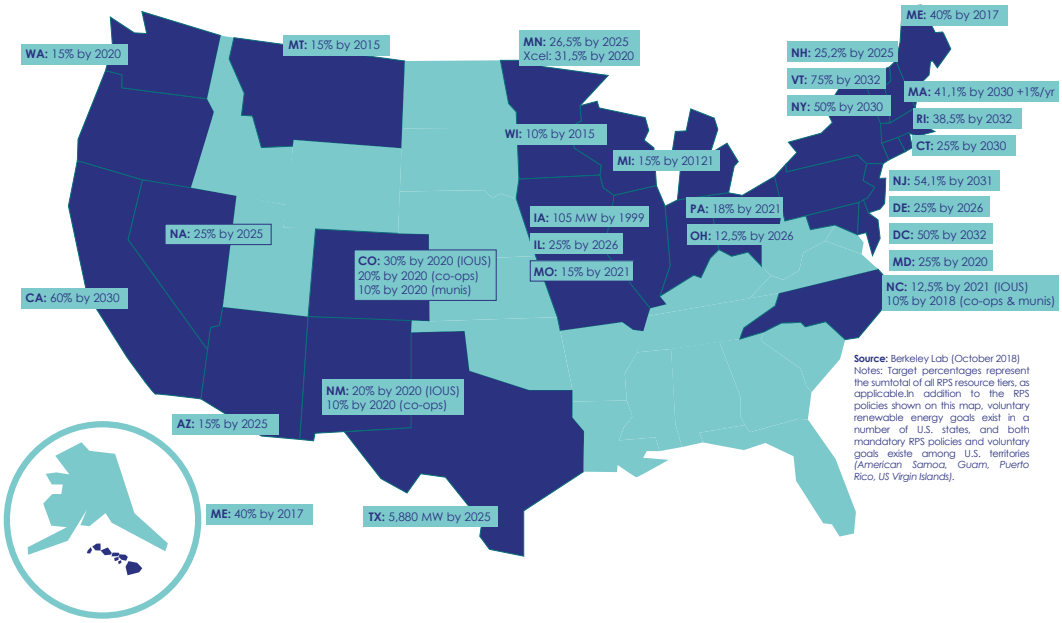


Regarding RPS, states have continued to upgrade their targets in 2018; California upgraded its RPS targets to 60% by 2030 and added a goal of 100% zero-carbon electricity by 2045, Connecticut increased and extended its Class 1 target to 40% by 2030 and Massachusetts increased the growth rate of its target to 2% (from 1%) over the 2020-2029 period, New Jersey increased and extended its Tier 1 target to 50% by 2030. In addition, both New York and New Jersey established and strengthened commitments to procure offshore wind with New York creating an offshore wind procurement program with a target of 2,400 WMW by 2030 while New Jersey increased its offshore wind carve out to 3,500 MW.

RPS obligations as a percent of state retail consumption (as of November 2018) are shown in the map below. Some states have separate goals for different types of utilities such as investor-owned utilities (IOUs), cooperatives (co-ops) or municipal power companies (munis). Other states like Iowa and Texas, have set targets for installed capacity, rather than for a percentage of sales.

RPS POLICIES EXIST IN 29 STATES AND DC

Apply to 55% of Total U.S. Retail Electricity Sales



Another regulatory factor that could affect demand for renewable energy is national legislation or rule-making regarding carbon emissions. On August 2015, the Environmental Protection Agency (EPA) announced the Clean Power Plan (CPP), a rule to cut carbon pollution from existing power plants. On February 2016, the Supreme Court stayed implementation of the CPP pending judicial review and on October 2017, the EPA, led by Scott Pruitt, announced that it would sign a proposed rule to repeal the CPP. On 21 August 2018, the EPA proposed the Affordable Clean Energy (ACE) rule to replace the CPP to establish emissions guidelines for states to develop plans to address GHG emissions from existing coal-fired plants. The rule would allow states full discretion to set heat-rate improvements (HRI) for unit-specific emissions standards. The HRIs may be overstated, since they appear to be based on potential improvements at inefficient plants that have already retired; i.e. the existing fleet may have already applied BSER measures and therefore do not have room for improvement. Public comment on the proposed Affordable Clean Energy (ACE) rule closed October 30, 2018. Comments are under review by EPA and a final version of the rule is planned to be published sometime in the second quarter of 2019. On a state level, some states already participate in carbon reduction programs. For example, California is a member of a carbon allowance market along with Quebec and Ontario. Meanwhile, some states in the eastern US (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont) are members of the Regional Greenhouse Gas Initiative which seeks to reduce carbon emissions from the power sector. New Jersey and Virginia are joining RGGI in 2019 with Pennsylvania considering membership.

After the mid-term elections, the 116th United States Congress will be comprised of a Republican-majority Senate and a Democratic-majority House of Representatives. In the prior Congress, Republicans held majorities in both the Senate and the House of Representatives. With this change, a shift in governing philosophy is expected. Democratic representatives have informally proposed a range of potential legislative actions having to do with climate change. One of these proposals is a "Green New Deal" which features a 100% United States RPS standard. Such a standard, if implemented, would increase demand for renewable electricity in the U.S. However, new legislation regarding climate change and renewable energy has yet to be formally proposed and the details of such legislation, if proposed at all, are unclear. Additionally, any legislation passing the Democratic-majority House of Representatives would also to have to pass the Republican-majority Senate and be signed by President Trump before becoming law. While this "Green New Deal" is not currently a likely success, it is an indicator that Green goals are becoming bolder and seeking greater results such as, in this case, a 100% renewable mandate. Currently, federal policy could reduce renewable support if the CPP is replaced with a weak alternative, or it could strengthen renewable support if support moved towards the left in the next election.

In January 2018, President Trump announced a 30% tariff beginning in 2018 and decreasing by 5% per year, exempting the first 2.5 GW of imports in each year. As a result, the cost of some modules have increased generally causing delays or cancellation of some planned projects in 2019.

GROWTH PROSPECTS

Growth in the US is motivated by several forces, including primarily the planned coal capacity retirements, RPS compliance in several states and demand from commercial and industrial entities (C&I).

RPS	**29 states** + DC	▪ Renewable Portfolio Standards defined at state level; ▪ RPS policies cover 56% of total US retail electricity sales;
Coal & Nuclear	**>35 GW** retirements until 2030E	▪ Coal (23% fleet): old & non-compliant w/ environment; independent of CO_2 issues; ▪ Nuclear: ~16 GW in 2018 and ~15 GW proposed until 2030
C&I	**>6 GW PPAs** signed in 2018	▪ Renewable demand from RE100 companies is projected to grow to 123 TWh by 2022, 59% over 2017 levels

CANADA

Historically, new Canadian renewable supply is largely determined by provincial procurements. While some provinces already produce much of their electricity through renewable sources (largely due to hydro power), Alberta, Saskatchewan and Ontario have taken steps to increase renewable energy production. Alberta's climate leadership plan includes a December 31, 2030, coal phase-out, a price on carbon and a requirement for 30% of electricity generation to come from renewables by 2030. Alberta is pursuing a Renewable Energy Program to develop 5 GW of renewable electricity generation capacity by 2030. SaskPower, the principal electric utility of Saskatchewan, has a target of 50% renewable generation capacity by 2030. New Brunswick has committed that 40% of in-province electricity sales will come from renewable sources by 2020. Nova Scotia has set emission caps for its electricity sector, and has also committed up to 50% of electricity will come from renewable sources by 2020.

On June 21, 2018, Canada adopted the Greenhouse Gas Pollution Pricing Act including a federal carbon pollution pricing system. This system includes both an output-based pricing system as well as a regulatory charge on fuels. Each province submitted plans which were assessed against the requirements of the federal benchmark. While the ultimate impact of this is unclear, any increase in emissions pricing favours zero emissions resources like wind and solar PV.

MEXICO

Mexico redesigned its energy sector beginning with the constitutional amendment in 2013 and ending with implementation by end of 2018. The reforms brought about the end of state-owned vertically-integrated monopolies and opened the door to significant opportunities for private sector participation across the supply chains for oil and gas and for electricity. Mexico's energy reforms advanced significantly in 2016 implementing changes that will provide remuneration for all forms of generation including wind and solar. The key mechanisms of interest to renewable developers are the implementation of the wholesale electricity market, long-term supply auctions, and financial transmission rights. Mexico has conducted three long-term supply auctions in order to procure new renewable electricity.

However, newly elected President Andres Manual Lopez Obrador announced the general guidelines for electricity generation policy stating that there would be a change of regime. President Obrador called for a technical and administrative audit of the electricity market with CFE directors in charge of performing the review. The measures to resolve what he called the country's "energy dependence in the purchase of electricity" would not be taken in the short term, but the new administration would be elaborating a plan based on the findings of the CFE study. While the long-term ramifications of President Obrador's actions are difficult to forecast, it seems prudent to consider the possibility that changes will occur in the way new wind and solar supply is contracted and remunerated.

2.1.5 OFFSHORE WIND IS BECOMING MORE MATURE

OFFSHORE WIND: A KEY GROWTH MARKET

Offshore wind installations account for less than 4% of total wind installations, with the majority of the today's operating wind being onshore. However, the offshore sector has been growing at a fast pace, as shown by recent years' data. The offshore wind market grew by around 3.5-4 GW in 2018[1] and accounted for around 7% of total wind capacity. For the coming years, analysts expect an even faster expansion. For example, Bloomberg New Energy Finance expects the market to grow at a compound annual growth rate of 17% between today and 2030, with the sector reaching a total capacity of 154 GW in 2030.

Offshore wind in the United States

Although offshore wind power is still in the early stages of development in the United States, with only a 30 MW operating project off the shores of Rhode Island, policymakers and developers are working to push the industry forward. The US Department of Energy predicts around 22 GW of offshore wind by 2030. In the East Coast, seven States have announced ambitious offshore wind targets and/or issued offshore wind power solicitations: Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Maryland and Virginia. As part of the States' plans, New Jersey and New York have recently launched solicitations for 1.1 GW and 800 MW respectively. These solicitations follow around 2 GW of awarded capacity in other States such as Massachusetts, Connecticut, Rhode Island and Maryland. In Massachusetts, Equinor Wind, Vineyard Wind (a joint venture between Avangrid and Copenhagen Infrastructure Partners) and Mayflower Wind Energy (a joint-venture between EDP Renewables and Shell) were the successful bidders in the auction for offshore wind leases off Massachusetts concluded in December 2018. In California, where the state has issued policy to rely on carbon-free electricity by 2045, the Bureau of Ocean Energy Management (BOEM) has identified 3 potential lease areas off its coast and it is anticipated the first lease auction may be held in 2020.

This development is expected to be supported by different drivers. One is the **expansion to other geographies**. Although nowadays the bulk of the market is in Europe, and more precisely UK and Germany which collectively account for 78% of European offshore wind installations, new opportunities are rapidly emerging in Asia and the US. In the 2020s, established markets like the UK, Germany, Netherlands and China, will be joined by new markets like Taiwan, Japan, South Korea and the US.

New technology developments such as **floating foundations** will increase the potential of offshore wind technology. Nowadays, floating structures are no longer confined to R&D as the technology has developed significantly in recent years and prospects are bright. In 2017, the first commercial wind farm using floating turbines, the 30 MW Hywind project, was commissioned and is now operating successfully off the coast of Peterhead, in Scotland.

EDPR's floating projects

EDPR, through a joint venture, is developing 25 MW project off the coast of Portugal, which will be a flagship project in the innovative sector and will contribute to the development, standardisation and manufacturing improvement of multi-MW modular floating platforms. This project comes after a first stage in which the consortium built and successfully operated for 5 years a floating turbine. Also, the French government selected in 2016 a consortium comprising EDPR to build a 24 MW pilot floating wind farm off Leucate in the Mediterranean. The wind farm is expected to become the first floating offshore wind farm in the Mediterranean.

The wind industry is following floating developments with great interest, as the technology enables to move into deeper waters, in which fixed-bottom

The wind industry is following floating developments with great interest, as the technology enables to move into deeper waters, in which fixed-bottom foundations are not technically viable. According to Wind Europe, 80% of all the European offshore wind resource is located in deep waters (60 meters or more) where floating solutions are the sole real choice. Moreover, floating foundations are the only option for countries with limited continental platform areas, such as Japan and the US west coast. In addition, not only floating offshore may unlock new areas, but also can push the industry to areas far from the shore, where wind resource is typically more powerful and reliable.

Experts believe that the floating market will see sustained growth in the coming years, supported by a sharp decline cost. The U.S. Department of Energy's projections suggest floating foundations will be cost-competitive with fixed ones by the mid-2020s.

[1] According to different estimates, as at the time of the publication of this report, no cumulative data have been released

DECREASING COSTS ARE BOOSTING OFFSHORE'S COMPETITIVENESS

Offshore wind has traditionally been more expensive than onshore's, as lead times for projects are longer, while the development, construction and O&M is far more complex, mainly due to the challenging environment. However, the cost of offshore wind is witnessing a rapid decline. According to IEA[1], the average cost for offshore wind came down by 25% from 2012 to 2017, though cost reductions were limited as continued development moved projects into deeper waters further from shore, offsetting gains from technical performance improvements (mainly turbine development). For the next decade, IEA forecasts average costs to decline by over 30%.

Bigger turbines

Bigger offshore wind turbines allow higher production for two reasons. First, bigger rotors and blades can cover a wider area, which increases the capacity of the turbine. But also: a taller turbine allows blades getting up higher, where the wind blows more steadily, which eventually increases the turbine's capacity factor. Also, larger turbines help to amortise installation and foundation costs.

In January 2019, Siemens Gamesa Renewable Energy (SGRE) unveiled its 10 MW offshore wind turbine, which, according to the company, will produce 30% more power annually than its 8 MW predecessor. Just under a year ago, GE Renewable Energy announced its next model would be a giant 12 MW turbine, which is expected to be ready as soon as in 2021. Vestas also announced in 2018 its new 10 MW turbine, from a previously rated 9.5 MW, which is expected to become the first 10 MW+ turbine available on the market.

The industry is also working on concepts for even larger turbines and it's commonly believed that 13-15 MW turbines could be available from 2024 onwards

Cost reductions are mainly driven by technological advancement that include bigger turbines; enhanced construction expertise; continuous improvements in foundation design and installation methods; a mature supply chain; economies of scale, and, strong competition, among others.

Although offshore's LCOE is still higher than onshore's or solar PV's, the technology has several advantages that can help to compensate for its higher costs. For example, it allows developing gigawatt-scale projects near densely populated coastal areas where land can be expensive, and its higher capacity factors, allow more power per unit of capacity. Moreover, offshore wind is at an earlier stage of development compared to onshore's or solar PV, and therefore, its price is expected to fall faster, which would ultimately improve its competitive position.

Offshore's increasing competitiveness has been reflected in recent auctions' prices. Results of latest offshore wind competitive processes in Netherlands, Germany, Denmark and UK, clearly reflect lower LCoEs. In 2017 and 2018, German offshore auctions for existing projects[2] witnessed "zero bids", which means that those projects will only be eligible for the wholesale electricity price without any premium[3]. On similar lines, the Netherlands also held a subsidy free offshore wind auction for 700 MW in March 2018. In the UK, Dong Energy and a consortium comprising EDPR and Engie, secured two Contract for Difference deals worth £57.50/MWh in the second offshore wind auction, held in 2017. In the first CfD auction (conducted in 2015) the average price was £117.14/MWh, more than twice 2017's price.

Although all European offshore countries have experienced similar trends in the last few years, prices are not comparable among countries as each auction design is different. For example, in the UK, developers are liable for all the grid connection costs, unlike in Germany, Denmark or Netherlands. But falling prices undeniably reflect the rapid decline of offshore wind levelised cost of electricity.

[1] International Energy Agency, World Energy Outlook 2018
[2] That were permitted or at an advanced planning stage
[3] These auctions marked the transition phase to a new centralized system in which the state selects and pre-develops suitable offshore areas. Aggressive bidding in 2017 and 2018 primarily may reflects the fact developers strived to avoid ending up with stranded assets

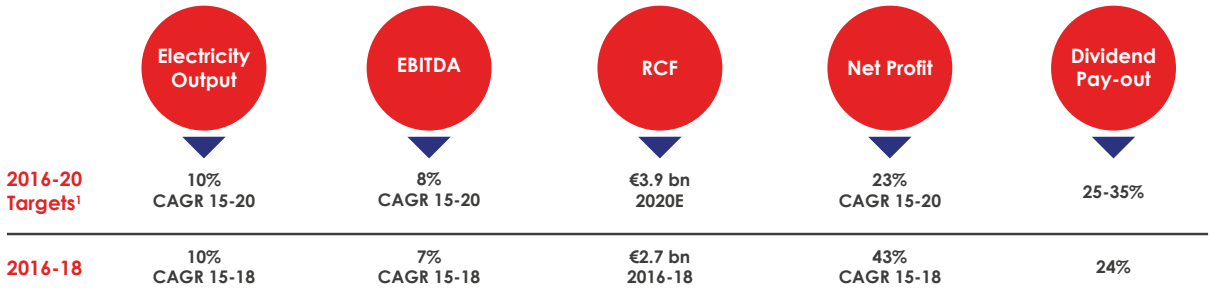
2.2
STRATEGY

EDPR'S Strategy is supported by three pillars: Selective Growth, Operational Excellence and Self-funding Model.

Since its inception, EDPR has been performing a strategy focused on selective growth, by investing in quality projects with predictable future cash-flows, and seamless execution, supported by core competences that yield superior profitability, all embedded within a distinctive and self-funding model designed to accelerate value creation. As a result of undertaking such strategy, at the same time flexible enough to accommodate changing business and economic environments, EDPR remains today a leading company in the renewable energy industry.

SELECTIVE GROWTH	OPERATIONAL EXCELLENCE	SELF-FUNDING BUSINESS
Solid value creation, investing in quality projects with predictable cash-flow stream	Profitable growth supported by distinctive core competences and unique know-how	Growth enhanced by a funding strategy designed to accelerate value creation
Prioritize quality investments in EDPR core markets	Technical expertise to maximize production (>97.5% availability)	Investing in visible growth opportunities
Projects with long term contracts awarded	Competitive projects leading to a superior load factor	Profitable assets generating robust retained cash-flow
Technological mix: wind onshore, offshore, floating and solar	Unique O&M strategy to keep lowering Core Opex /MW	Selling projects' stakes to keep enhancing value growth

EDPR 2020 investment case is supported by a distinctive strategic agenda which is being successfully delivered in order to outperform its goals.



EDPR business model set to deliver predictable and solid growth targets in core markets positioning to successfully lead a sector with increased worldwide relevance.

2.2.1 SELECTIVE GROWTH

Growing selective is the key principle behind EDPR's investment selection process, it ensures that the projects that are finally built have the best fit with the Company's low risk profile. This is achieved as new projects have long-term PPAs secured or have been awarded long-term contracts under stable regulatory frameworks, as well as exhibiting above portfolio average load factor.

SOLID GROWTH

EDPR's extensive pipeline has been an important contributing factor to the successful execution of this strategy as the availability of multiple projects coupled with strong development expertise guarantees that only the best, fully optimised projects are finally selected for investment.

TECHNOLOGICAL MIX:
Securing long-term growth in new key areas like Solar and Offshore:

SOLAR
0.4 GW SECURED

FLOATING
22 MW SECURED

WIND OFFSHORE
0.6 GW NET SECURED

MW ADDED IN 2016-2018:
2.0 GW
of which 0.7 GW in 2018

Geographical Breakdown
1.3 GW in North America; 0.3 GW in Europe;
0.4 GW in Brazil

MW SECURED (COD >2018)*:
>3.1 GW
1.3 GW in North America, 0.8 GW in Brazil,
0.4 GW in Europe and 0.6 GW offshore projects
* reported at December 2018

With 826 MW built in 2018, of which EDPR sold an 80% stake in a 200 MW wind farm, in 2018 EDPR added 665 MW to its portfolio. EDPR medium-term prospects is supported by solid and outstanding strategy execution, with technological and geographical diversified value accretive projects of more than 3.1 GW secured and to be installed from 2019 onwards.

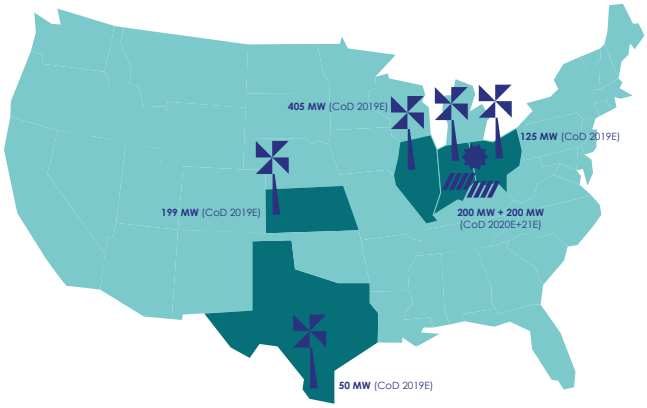
NORTH AMERICA: EDPR MAIN GROWTH MARKET DRIVEN BY PPAS SECURED

Over the last 3 years, North America has been EDPR's main growth market, with 1.3 GW added, representing 66% of EDPR total additions in the period. Within North America market EDPR is present in the United States (5,552 MW installed), Canada (200 MW installed) and Mexico (30 MW installed).

In the United States, the visibility over Production Tax Credit (PTC) tax scheme, the strong demand from both utilities, and commercial and industrial companies for long-term PPAs from wind energy projects, combined with EDPR's diversified portfolio of projects in this market support this solid growth opportunity.

The December 2015 extension of the PTC provided long-term visibility to US growth and reinforced the strong fundamentals of the US wind market, while supports EDPR's choice to growth in the country.

UNITED STATES PROJECTS SECURED FOR FUTURE GROWTH
(by state and expected CoD)



In 2018, EDPR was awarded more than 1.2 GW of long-term energy sale agreements in US, of which 50 MW related to a project installed in 2018, 0.8 GW for projects to be installed in 2019 and 0.4 GW for 2020-21.

EUROPE: FOCUS ON LOW RISK REGULATORY FRAMEWORKS

In 2018 EDPR installed 211 MW in Europe, namely in Italy, Portugal and Spain representing c.30% of total capacity additions in the year. EDPR growth in Europe is supported by identified short-term opportunities and medium-term pipeline options. In terms of growth, in Spain is expected to be added 29 MW in 2019-20, which are currently under construction, in Portugal 170 MW will be added with a 20-year feed-in tariff, of which 47 MW are under construction, in Italy 66 MW expected to be added with a 20-year contract, of which 50 MW are under construction, in France and Belgium EDPR has 19 MW under construction and plans to add more than 60 MW through pipeline development. Finally, in Poland is expected to be added 38 MW in 2020 and 60 MW in Greece in 2020/21, all projects awarded with a tariff in 2018 auctions.

BRAZIL: IN PROJECTS WITH LONG-TERM PPAS

In Brazil, EDPR installed 137 MW in 2018. With the objective to remain actively prospecting opportunities in Brazil, namely auction opportunities, given the strong fundamentals of the country, with high growth of electricity demand, robust renewable resources and availability of long-term energy supply agreements through an auction system, for future growth EDPR has already secured more than 850 MW for projects to be operational in the period of 2022 to 2024, of which 199 MW related to solar project in the state of São Paulo.

TECNHOGICAL MIX

Growing in Solar given its increasing competitiveness

In order to take advantage of this profitable renewable technology and considering its increasing competitiveness, EDPR has been developing efforts to growth in solar PV technology. The US is the core market for this growth, where the technology is boosted by the Investment Tax Credit scheme, while opportunities are also being screened in Europe, Brazil and Mexico. In 2018 EDPR secured a PPAs for the 200 MW Riverstart project in the United State and for the 199 MW Pereira Barreto project in Brazil, both with CoD expected for post-2020.

Investing in Offshore Wind Technology

Offshore projects are being developed by EDPR, to support growth options and to capture this new wave of industry development. These projects, located in the UK, France and United States, are expected to start operations post-2020, but are already being developed through partnerships, from which the Company is also able to further develop technological expertise in the sector. In 2018 EDPR - Shell joint venture is awarded with exclusive rights to develop wind offshore project in Massachusetts.

Floating: breakthrough wind energy technology

Windplus consortium, which is jointly owned by EDP Renováveis (54.4%), Engie (25%), Repsol (19.4%) and Principle Power Inc. (1.2%), is developing Europe's second floating wind farm, involves anchoring three turbines on semi-submersible platforms at water depths of up to 100 metres. The wind farm will be in the Atlantic about 20 km (13 miles) off the coast of Viana do Castelo in northern Portugal.

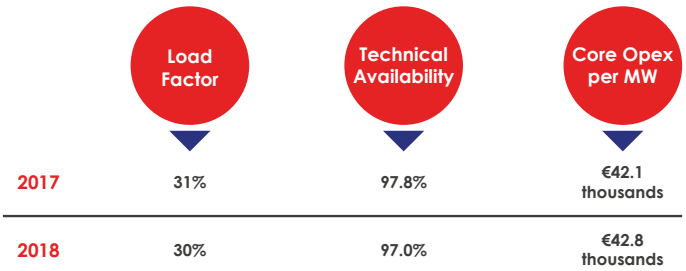
The farm's total capacity of 25 MW will be enough to power 60,000 homes for a year. The turbines, each with 8.4 MW capacity, will be the most powerful turbines installed on a floating base at sea.

The installation represents a flagship project in the innovative sector of floating wind energy and will contribute to the development, standardisation and manufacturing improvement of multi-MW modular floating platforms, which is a key objective under the Strategic Energy Technology Plan (SET-Plan) of the European Commission.

2.2.2 INCREASING EFFICIENCY

One of the strategic pillars that has always been a keystone of the Company, setting it apart in the industry, is the drive to maximise the operational performance of its wind and solar plants. In this area, EDPR's teams, namely in operations and maintenance (O&M), have established a strong track record. EDPR has set targets for three key metrics: Load Factor, Technical Availability and Core Opex per MW. These metrics provide an overall view of the progress in EDPR wind assessment, O&M and cost control efforts. They also serve as good indicators for the overall operational efficiency of the Company.

STRONG EXECUTION



Delivering operating excellence metrics while keeping costs under control.

MAINTAINING HIGH LEVELS OF AVAILABILITY

Availability is the ratio between the energy actually generated and the energy that would have been generated without any downtime due to internal reasons, namely due to preventive maintenance or repairs. Therefore, it is a clear performance indicator of the Company's O&M practices as it focuses on reducing to a minimum any malfunctions and performing maintenance activities in the shortest possible timeframe.

The Company has always maintained high levels of availability, having registered availability of 97.0% in 2018. EDPR will continue to improve availability through new predictive maintenance optimisation measures supported by the 24/7 control and dispatch centre, reducing damages most common during extreme weather and improving the scheduling of planned stops. Also, a new spare parts warehousing strategy will be key in reducing downtime during unexpected repairs.

LEVERAGING QUALITY GROWTH ON DISTINCTIVE WIND ASSESSMENT TOWARDS 33% LOAD FACTOR

Load factor (or net capacity factor) is a measure for the renewable resource quality, that reflects the percentage of the maximum theoretical energy output, in a given period.

Ensuring the assets generate the maximum amount of energy possible is a key success factor. With regards to the operating portfolio, optimising load factor is linked to the improvement of availability as above described and, if possible, introducing productivity enhancement retrofits that boost production by equipping older turbine models with the most up-to-date technological improvements available to increase efficiency in the utilisation of the available resources of renewables. The energy assessment and engineering teams are responsible for the wind farms and solar plants development and design in a way that maximises load factor. They define the optimal layout of the plant by matching the positioning and choice of turbines with the characteristics of the site, specially the terrain, from the collected resource measurements and their estimated energy outputs.

The Company has consistently maintained levels of load factor in the range of 29-30%, having registered 30% in 2018, which is below the P50 (mean probability) assessment for the current fleet, given the lower wind resource in the period when compared with an average year. For 2020 EDPR plans to reach 33% load factor, mainly on the back of the increase competitiveness of new capacity additions.

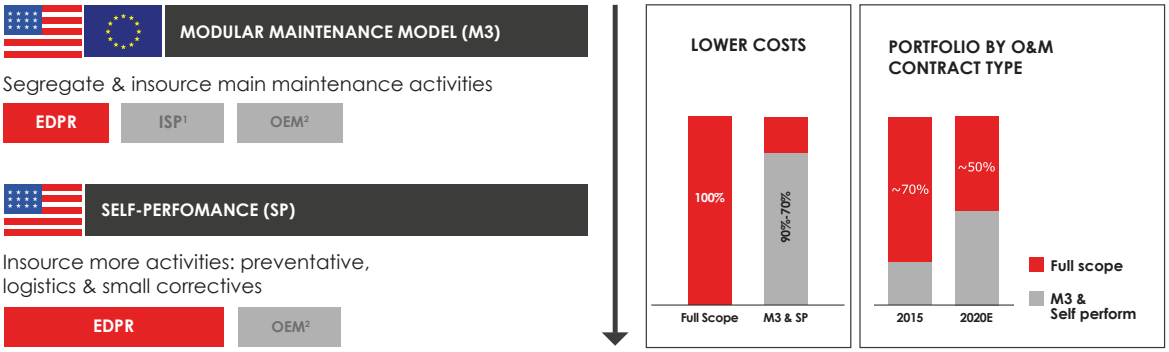
INCREASING EFFICIENCY, BY REDUCING CORE OPEX/MW

In addition to all company initiatives to boost production, EDPR also focuses on strict cost control efforts to improve efficiency and profitability. Leveraging on the experience accumulated over time, EDPR plans to reduce Core Opex/MW by 1% CAGR 2015-20. Core Opex is defined by Supplies and Services (including O&M activities) and Personnel costs, which are the costs that EDPR can actively manage. The target of reducing the manageable company costs structure, also benefits from the economies of scale of a growing company. With regards to O&M, that represents c.30% of total Opex, EDPR has already delivered results through the implementation of its M3 (Modular Maintenance Model) system and self-perform program to some of the wind farms that are no longer under initial warranty contracts.

M3 PROGRAM AND SELF-PERFORMANCE

As EDPR's fleet becomes more mature the initial O&M contracts signed with the turbine suppliers expire. When that happens, the Company needs to decide between renewing the maintenance service with the OEM (Original Equipment Manufacturer) or insourcing activities to operate the wind farm on its own, whilst maintaining high levels of availability.

Based on EDPR's expertise, under the **M3 program** O&M teams will decide on the optimal balance between external contractors and in-house maintenance. Usually, EDPR keeps control of high value-added activities such as maintenance planning, logistics and remote operations while outsourcing, under direct supervision, labour-intensive tasks. This new program has quickly generated savings in operational expenses and increased control over quality. During 2018 self-perform maintenance was implemented in additional facilities whose maintenance contracts were up for renewal. The **self-perform** program is a step further in EDPR's integration of maintenance tasks and activities, which is being implemented in the US, and consequently minimises third-parties' dependency. EDPR targets to increase the share of its fleet under the M3 and Self-Perform program to c.50% by 2020, from c.30% levels in 2015.



Notes: [1] ISP - Independent Service Provider; [2] OEM - Original Equipment Manufacturer

INCREASING PRODUCTION

EDPR aims to increase its total production by 10% CAGR 2015-20. This growth is to be supported by its distinctive competences and accretive projects.

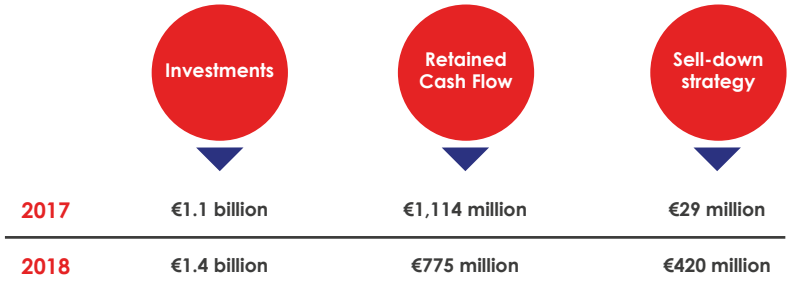
EDPR is also creating value through the improvement of its assets by implementing new technologies to boost turbine power output without requiring major component changes. Performance Analysis teams are collaborating with the manufacturers to determine the best practices to apply this new technology. For instance, installing new versions of the software on the older machines with the support of the manufacturer, improves the operation of the turbine and increases their efficiency. Another measure is the implementation of Vortex generators where components are installed on the blades, modifying and improving the blades' aerodynamics, achieving an increase in efficiency.

2.2.3 SELF FUNDING INITIATIVES

EDPR self-funding model has been a cornerstone of EDPR's strategy and its success has been crucial for funding growth.

The self-funding model relies on a combination of the Retained Cash Flow from operating assets and EDPR's strategy of selling stakes in projects in operation or under development, along with the US Tax Equity structures to finance the profitable growth of the business. This model, substitutes the initial financing strategy that depended on corporate debt from EDP, the major shareholder of EDPR and allows the company to create value while recycling capital.

STRONG EXECUTION



RETAINED CASH FLOW

The primary source of funds for the Company is the EBITDA generated from existing assets, which after paying debt services costs, deducting capital distributions to equity partners and taxes is called Retained Cash Flow, meaning the amount available to pay dividends to EDPR shareholders and/or to fund new investments.

A strong Retained Cash Flow generation of c. €3.9 billion is expected for the period 2016-20.

EDPR indicated in May 2016, a dividend pay-out ratio policy in the range of 25-35% of its annual net profit, thus allowing most of the Retained Cash Flow to fund growth. The dividends paid in 2018 amounted to c. €52 million.

FROM ASSET ROTATION TO SELL DOWN

Proceeds from selling stakes in operational or under development assets are also important sources of funds for the self-funding model of EDPR in financing its profitable growth. This enables the Company to crystalize the value yet to be realised from the future cash-flows of its existing projects over their long remaining lifetime and reinvest the corresponding proceeds in the development of new value accretive projects, with superior returns.

Until 2017, these transactions involved the Company selling minority stakes (typically 49% stake) at project level while maintaining full management control. The scope of these transactions tend to be mature projects, generally already operating and thus significantly de-risked, with high visibility to future cash-flows, that can be attractive to institutional investors from whom EDPR can source a competitive cost of finance.

In 2018, EDPR closed its first Sell Down transaction. Under this strategy, EDPR sells majority stakes in projects in operation or in late stage of development, allowing the Company to recycle capital, with up-front cash flow crystallization, and create value by reinvesting the proceeds in accretive growth, while continuing to provide operating and maintenance services. On the top of these, the Sell Down strategy makes visible the value creation on reported financial statements, as capital gains are booked in the income statement.

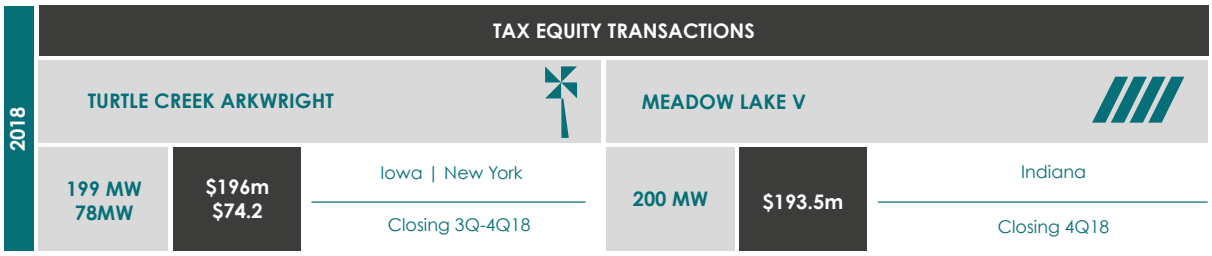
In detail, in December 2018 EDPR closed an agreement with Axium Infrastructure to sell an 80% equity shareholding in a portfolio of fully-owned wind onshore assets in the United States and Canada. The portfolio totals 499 MW and comprises 3

winds farms and cash proceeds totalled about $260 million. Based on the transaction price and expected economic liabilities (tax equity and project finance)once projects are fully completed, the total implied enterprise value for 100% of the assets amounts to $860 million, which translates to an implied enterprise value multiple of $1.72 million/MW.

US TAX EQUITY

EDPR always aims to find external financing to its projects, namely through tax equity structures, typical of the US. The use of tax equity in the US enables an efficient utilisation of the tax benefits generated by the project, otherwise unusable, therefore improving projects' economics. In a simplistic view, tax equity investors contribute a sizable part of the initial project investment, receiving in return almost all of the PTCs granted to the project for first 10 years of operation along with the benefits from the accelerated depreciation.

In 2018, EDPR completed the funding needs of its 2018 US projects, all with long-term agreements, by completing a total of $464 million of value accretive institutional equity funding.



2.3
RISK MANAGEMENT

In line with EDPR's controlled risk profile, Risk Management process defines the mechanisms for evaluation and management of risks and opportunities impacting the business, increasing the likelihood of the Company in achieving its financial and sustainability targets, while minimising fluctuations of results.

RISK MANAGEMENT PROCESS

EDPR's Enterprise Risk Management Process is an integrated and transversal management model that ensures the minimisation of the effects of risk on EDPR's capital and earnings, as well as the implementation of best practices of Corporate Governance and transparency. EDPR's Enterprise Risk Management Process is inspired on Basel Committee on Banking Supervision's principles, guidelines and recommendations and is similar to other risk management frameworks. The process aligns EDPR's risk exposure with the Company's desired risk profile. Risk management policies are aimed to mitigate risks, without ignoring potential opportunities, thus, optimising return versus risk exposure.

The process is closely followed and supervised by the Audit and Control Committee, an independent supervisory body composed of non-executive members.

Risk management is endorsed by the Executive Committee, supported by the Risk Committee and implemented in day- to-day decisions by all managers of the Company.

EDPR created three distinct meetings of the Risk Committee in order to help decision-making, separating discussions on execution of mitigation strategies, from those on the definition of new policies:

- **Restricted Risk Committee:** Held every month, it is mainly focused on development risk and market risk from electricity price (market, basis, profile, GCs and RECs). It is the forum to discuss the evolution of projects under development and construction and the execution of mitigation strategies to reduce merchant exposure. It also monitors the limits of defined risk policies, with regards to counterparty risk, operational risk and country risk.
- **Financial Risk Committee:** Held every quarter, it is held to review main financial risks and discuss the execution of mitigation strategies. Exchange rate risk, interest rate risk and credit risk from financial counterparties are most relevant risk reviewed in this committee.
- **Risk Committee:** Held every quarter, it is the forum where new strategic analysis are discussed and new policies are proposed for approval to the Executive Committee. Additionally, EDPR's overall risk position is reviewed, together with EBITDA@Risk and Net Income@Risk.

RISK MAP AT EDPR

Risk Management at EDPR is focused on covering all risks of the Company. In order to have a holistic view, they are classified in five Risk Categories.

In 2018, EDPR updated its Financial Risk Policy, providing further detail in the process for hedging FX of net investment, interest rate and inflation. The purpose was to further summarise the guidelines and methodologies used to manage financial risks at EDPR, which are discussed quarterly on the Financial Risk Committee.

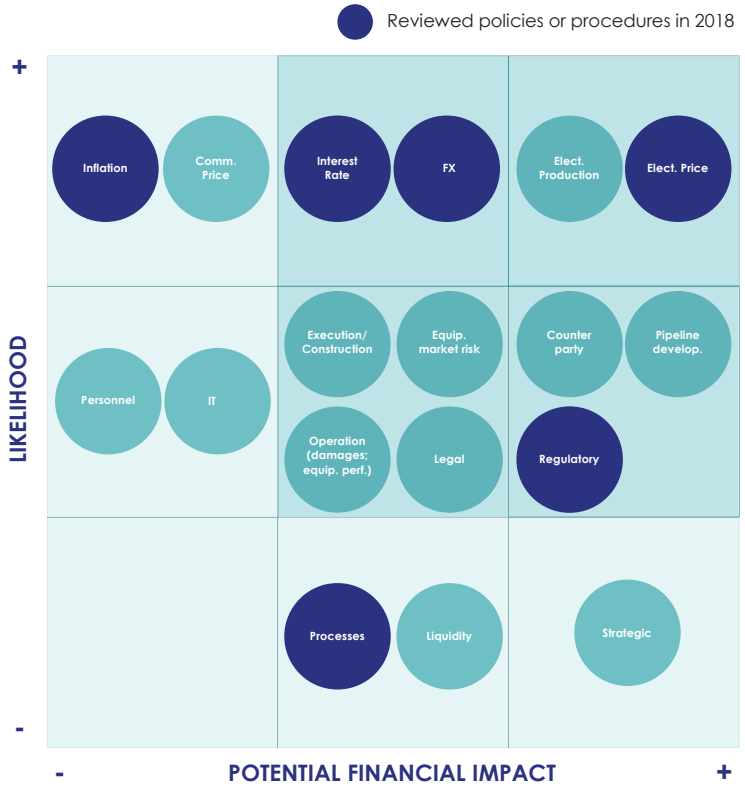
EDPR together with other project partners, structured and carried out a pre-hedge (before Financial Close) of inflation, interest rate and FX in Capex, for the Moray Offshore project in the UK. This pre-hedge allowed EDPR to reduce exposure to market risks, under Britain's current uncertain political situation. The inflation pre-hedge carried out by EDPR was the first of its kind for the Company.

A comprehensive strategic study on long-term hedging strategies of electricity prices through PPAs or financial hedges was also carried out during 2018, as well as the development and implementation of automated tools that help better control and manage balancing costs within EDPR geographies.

Additionally, EDPR updated its view on the sustainability of RES policies in the geographies where the Company is or could potentially be present. This deep-dive analysis was performed within the scope of the Country Risk Policy, which was approved and implemented in 2015.

EDPR RISK MATRIX BY FINANCIAL IMPACT

EDPR Risk Matrix is a qualitative assessment of likelihood and impact of the different risk categories within the Company. It is dynamic and it depends on market conditions and future internal expectations.



Within each Risk Category, risks are classified in Risk Groups. The full description of the risks and how they are managed can be found in the Corporate Governance chapter. The graph above summarises the Risk Categories, the Risk Groups and the Risk Management mitigation strategies at EDPR.

RISK CATEGORY		RISK GROUPS
MARKET RISKS	It refers to the risk to EDPR resulting from movements in market prices. Due to the relationship between wind production and electricity price production risk is considered within market risk. In particular, market risks are changes in electricity prices, production risk, interest rates, foreign exchange rates and other commodity prices.	• Electricity Price Risk • Electricity Production Risk • Commodity Price Risk • Liquidity Risk • Inflation Risk • Exchange Rate Risk • Interest Rate Risk
COUNTERPARTY RISK	Risk that counterparty to a transaction could default before final settlement of the transaction's cash flows. A direct economic loss would occur if transactions with the counterparty had positive economic value at the time of default. Even in the case of not defaulting, it may not comply with its contract obligations (timing, quality, etc.), implying additional higher costs due to its replacement or to delays in fulfilling the contract.	• Counterparty Credit Risk • Counterparty Operational Risk
OPERATIONAL RISK	Defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events (such as an increase in equipment default rates, increasing O&M, or natural disasters).	• Development Risk • Legal Claims Risk (Compliance, Corruption, Fraud) • Execution Risk • Personnel Risk (Health and Safety, Human Rights, Discrimination) • Operation Risk (Damage to Physical Assets, Equip. Performance, Environmental) • Processes Risk • Information Technologies Risk
BUSINESS RISK	Potential loss in the company's earnings due to adverse changes in business margins. Such losses can result, above all, from a serious increase in equipment prices or changes in the regulatory environment. Changes in electricity prices and wind production are considered market risks.	• Regulatory Risk (renewables) • Equipment Price Risk • Equipment Supply Risk
STRATEGIC RISK	It refers to risks coming from macroeconomic, political, social or environmental situation in countries where EDPR is present, as well as those coming from a change in competitive landscape, from technology disruptions, from changes in energy markets or from governance decisions (investment decisions criteria, Corporate Governance and Reputational issues).	• Country Risk • Competitive Landscape Risk • Technology Disruptions Risk • Invest. Decisions Criteria Risk • Reputational Risk • Meteorological Changes • Corp. Organisation and Governance • Energy Planning

MITIGATION STRATEGIES

- Close analysis of natural hedges to define best alternatives
- Hedge of market exposure through long term power purchase agreements (PPA) or short-term financial hedges
- Natural FX hedging, with debt and revenues in same currency
- Execution of FX hedging for net investment (after deducting local debt)
- Execution of FX hedging to eliminate FX transaction risk, mainly in Capex
- Execution of interest rate hedging
- Execution of inflation hedging
- Alternative funding sources such as Tax equity structures and Multilateral/Project Finance agreements

- Counterparty exposure limits by counterparty and at EDPR level
- Collateral requirement if limits are exceeded
- Monitoring of compliance with internal policy

- Supervision of suppliers by EDPR's engineering team
- Flexible CODs in PPAs to avoid penalties
- Partnerships with strong local teams
- Monitor recurrent operational risks during construction and development
- Close follow-up of O&M costs, turbine availability and failure rates
- Insurance against physical damage and business interruption
- Strict compliance with legal requirements and zero tolerance for discrimination, unethical behavior or fraud
- Attractive remuneration packages and training for personnel
- Revision and compliance with all regulations that affect EDPR activity (H&S, environmental, taxes…)
- Control of internal procedures
- Redundancy of servers and control centers of wind farms

- Careful selection of energy markets based on country risk and energy market fundamentals
- Diversification in markets and remuneration schemes
- Diversification in technologies
- Follow-up of regulation changes in markets where EDPR is present to adjust strategy if needed
- Active involvement in major industry associations in all EDPR markets
- Signing of medium-term agreements with equipment manufacturers to ensure visibility of prices and supply
- Relying on a large base of equipment suppliers to ensure supply

- Careful selection of countries
- Worst case profitability analysis of every new investment considering all risks factors
- Risk-return metrics at project and equity level
- Consideration of stress case scenarios in the evolution of energy markets for new investment decisions
- Follow-up of cost effectiveness of renewable technologies and potential market disruptions

EDPR SUSTAINABILITY RISKS

EDPR's commitment with its stakeholders means that the Company cares about assuring best practices in corporate social responsibility. EDPR has identified five risk factors key to the sustainability of the Company. The highest standards have been put in place to mitigate these risks:

- **Corruption and Fraud Risk:** EDPR has implemented a Code of Ethics and an Anti-Corruption Policy. The Code of Ethics has its own regulation that defines a process and channel, open to all stakeholders, to report any potential claim or doubt on the application of the code. The Ethics Ombudsperson is behind this communication channel, and is responsible for analysing and presenting to the Ethics Committee any potential ethical problem. The anti-corruption mailbox is also available to report any questionable practice and wrongdoing.
- **Environmental Risk:** EDPR has implemented an Environmental Management System, certified with the ISO 14001:2015, in order to follow best practices in the sector.
- **Human Resource Risk:** EDPR forbids any kind of discrimination, violence or behaviour against human dignity, as stated in its Code of Ethics. Strict compliance is enforced, not only making the Ethics Channel available to all stakeholders but also through constant awareness from all employees of the Company.
- **Health and Safety Risk:** EDPR has deployed a H&S management system, complying with OHSAS 18001:2007, pursuing the "zero accidents" target.
- **Human Rights Risk:** EDPR has committed, through its Code of Ethics, to respect international human rights treaties and best work practices. All suppliers which sign a contract with EDPR are committed to be aligned with EDPR's Code of Ethics principles.

In addition, quantification of the financial impact on the Company's performance of these five sustainability risk factors is included within the Operational Risk analysis. Every year, EDPR evaluates the economic impact of its Operational Risk, following the guidelines of Basel III. The analysis includes the identification, estimation and mitigation of individual operational risks belonging to the short, medium and long term in all its geographies. For this purpose, EDPR takes into account present and future relevance of these risks, as well as historical data of their impact, with the help of department heads. The final results of the Operational Risk analysis are then communicated to the Executive Committee and shared with every department involved.

In 2018, none of these five sustainability risk factors had a material financial impact on the Company's performance, even though EDPR was not able to reach its "zero accidents" target. During 2019, EDPR will continue to work towards achieving that goal.

EMERGING RISK AT EDPR: TRADE WAR

In recent times, there have been trade tensions between US, China, Canada, Mexico and EU, which raise concerns about the implementation of incremental trade tariffs not only between these countries, but globally.

In the renewable energy sector, a raise in tariffs on foreign goods or an increase of local content requirements could affect the profitability of projects already committed, through the impact on equipment prices and supply. Likewise, it could change the cost-competitiveness of renewable energies with respect to traditional energy sources. A good example of this are the tariffs raised in 2018 by the U.S. administration on Chinese solar panels, which harmed the growth plans of solar energy installations in the U.S.

EDPR mitigates this risk by diversifying its technological and geographical footprint, by including in its pipeline portfolio solar, onshore and offshore wind assets, spread across 13 different countries, with an eye on expansion to new geographies.