



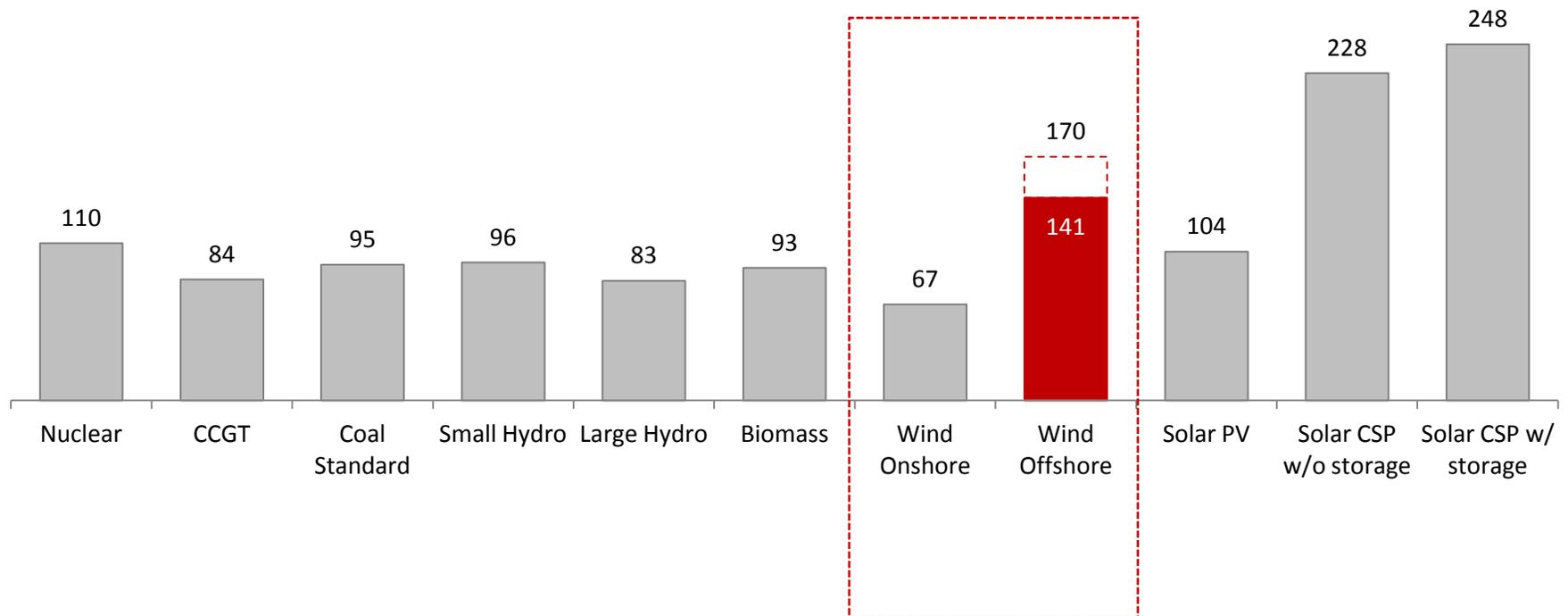
Offshore Wind development

October 2014

In terms of total costs, offshore wind is still not competitive with other technologies....

Levelized cost of energy, by technology

2014 €/MWh



Source: EDPR analysis

...However, offshore wind can make sense in some countries

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In countries where onshore development is difficult

- This may be the case in countries:
 - Very densely populated where potential onshore sites are scarce
 - With high onshore penetration where untapped sites are not longer available/feasible
 - Suffering from high NIMBY activism
 - With lengthy or very stringent onshore regulation
 - With limited onshore wind resource or benefiting from good resource but in locations far away from demand centers
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As an opportunity to develop an industrial cluster

- Offshore wind may spur economic development not only due to the wind farm's construction, but also the opportunity to develop a national value chain industry
 - Opportunity to develop a new technology cluster based on technology and/or to relaunch existing industry or facilities (ex: port infrastructure)
 - According to available studies, the renewable energy industry is more labour-intensive (compared to conventional technologies), meaning that, on average, more jobs are created for each unit of electricity generated from renewables than from conventional technologies
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3

If offshore achieves important reduction costs

- Offshore has cost reduction opportunities in multiple areas:
 - Larger turbines and bigger wind farms
 - Increased reliability
 - Scale effects and industrialization
 - Standardised and optimised offshore foundations design
 - Industrialized manufacturing
 - Innovative transmission solutions
 - Improved grid access
 - Etc...

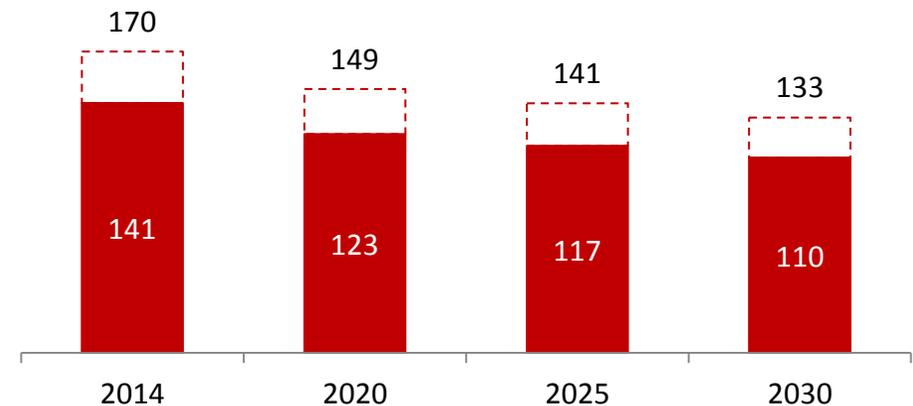
Offshore wind is expected to achieve important reduction costs

Main LCOE reduction opportunities

- **Technology improvements:**
 - Larger turbines
 - Significant cost scale economies on new foundations enabled by advanced structures
 - Technical availability improvements due to higher reliability and operational excellence
- **Learning effects as capacity is deployed:**
 - Reduced perceived risk allows for reduced debt and equity cost
 - Operational excellence and lessons learned allow for shorter development cycles and less costly project execution costs

Expected evolution of LCOE for offshore wind

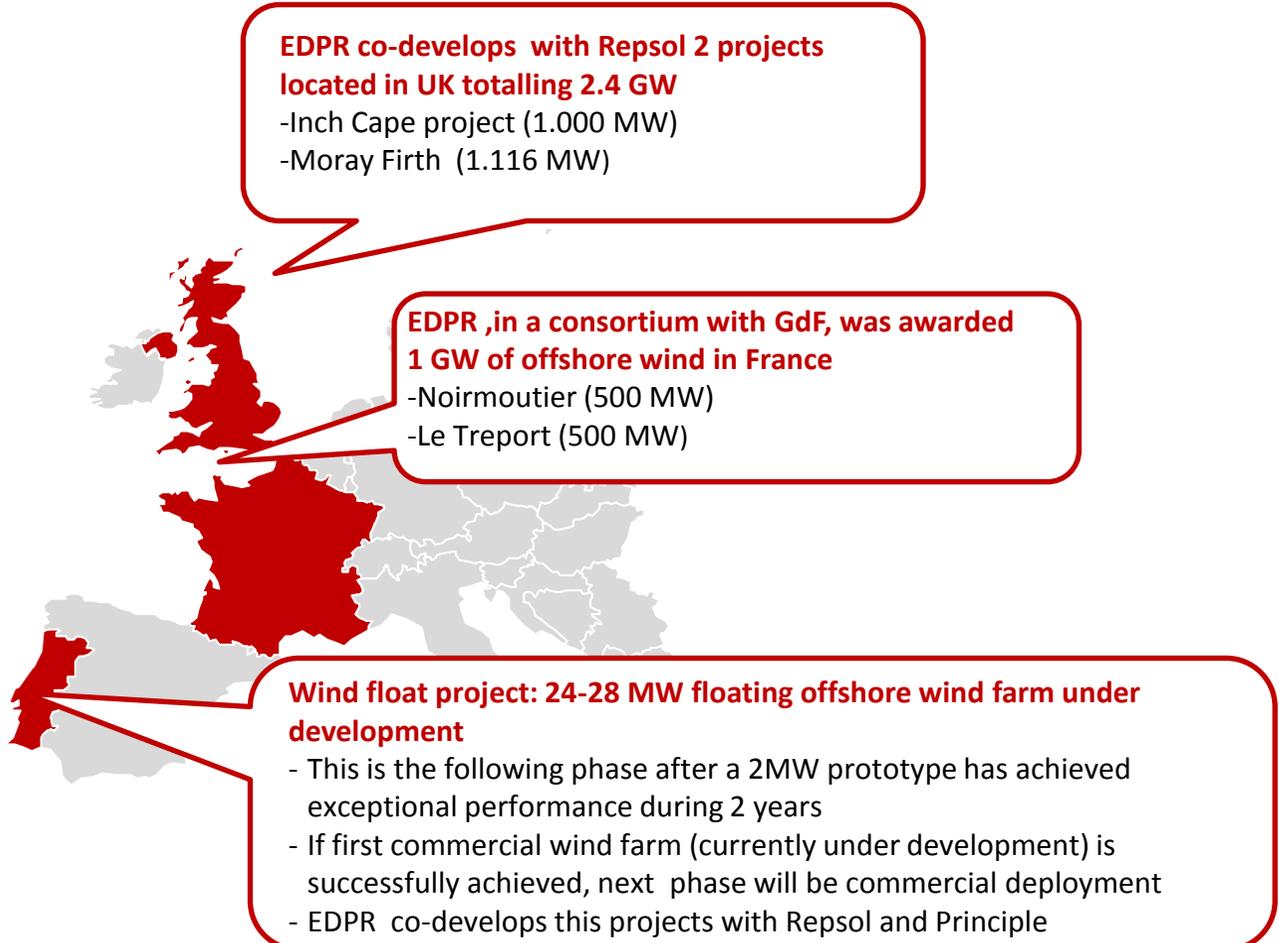
2014 €/MWh



EDPR believes in offshore wind as a feasible option for the electricity mix in some countries and has the capabilities to deploy it

For these reasons, EDPR is developing offshore projects accounting ~ 3,5 GW in three countries

Overview of EDPR's offshore wind projects in Europe



EDPR has firmly embraced offshore wind as a pillar of its growth strategy

EDP supports industrial development in countries where it invests

Offshore wind may present an opportunity to create an industrial cluster...

- Offshore wind development will necessarily contribute to create industrial clusters
 - Particularly because there is not an industrial pole defined at European level yet
- EDP supports industrial development contributing to it in countries where it invests

...as EDP achieved following the attribution of 1.200 MW of onshore in Portugal...

- EDP, participating in a consortium, was awarded 1,2 GW of onshore wind capacity in Portugal
- EDP's consortium resulted winner of the tender as it offered a substantial discount over the Portuguese wind tariff and committed to create an industrial cluster that could provide the country with important economic benefits, most notably:
 - Development of a national cluster by the opening of 3 factories that supply wind turbines and components
 - Creation of both direct and indirect employment
 - Attraction of direct investment
 - Contribution to regional development in particular by promoting underprivileged areas
- EDP has effectively complied with its commitments and most projects are already operating

...and is currently doing it for offshore projects in UK, France and Portugal

- In general EDPR has worked to identify established suppliers and new entrants at all levels in the supply chain and has supported their entry into the offshore wind market
- In UK, Moray's work has already driven the formation of new businesses and consortia to meet the challenges of economic serial production, as well as proposals for utilising existing local port facilities for project delivery and O&M
- In France, Areva is developing its 8 MW turbine following EDPR's consortium success in the tender
 - A large industrial plan will be also developed
- In Portugal, several industries participated in the Windfloat prototype and are expected to further benefit from the second phase of the project consisting on a 25 MW wind farm

Offshore risks, and consequently consumers' costs, may be lowered by a correct design of the regulatory framework

Long-term contracting is the most efficient way to remunerate wind projects...

- For a given level risk in the business, a remuneration with higher risk will need to be set at a higher expected value in order to reach the same level of value creation for the investor
- Therefore, the way to minimise the cost for the electricity system is to create a scheme that provides investor with the higher visibility over the remuneration as possible
 - A higher visibility entails a lower risk for the equity investor, lower financing costs for the finance entities that will allow a lower cost of capital, therefore lower required profitabilites
 - Lower required profitabilites translate into lower required remuneration
- Lower required remuneration will be passed to final consumers that will benefit from lower electricity tariffs for the same level of renewable penetration

...and it's paramount not to introduce additional risks to the developer, in particular if the developer cannot adequately manage these risks

- Cost minimization is achieved when parties are allocated those risks for which they are better positioned to manage
- Correctly designed offshore regulatory schemes should entail power purchase obligation from an State-entity in order to:
 - Avoid the risk of not finding an offtaker
 - Eliminate discounts needed to sell the energy under a PPA (that are finally passed on to consumers)
 - Minimize counterparty risk
- Electricity transmission risk must be managed by the operator that can better manage it, that is, the TSO

French offshore wind system as an example of well-designed scheme

Awarding criteria

- As in the first tender, the regulator selected the winning bids using a points system that scored the bidding consortia on three criteria
 - **Tariff price** (40 points): bidding consortia propose their preferred 20-year fixed price tariff (with no limits on load hours) at a minimum of €140/MWh , and below a ceiling set at €220/MWh or at 20% above the median value of all the offers
 - **Industrial component** (40 points): use or creation of a domestic supply chain, risk management and developer experience, industrial partnerships, ability of access capital, etc.
 - **Environmental impact** (20 points): reducing the number of turbines by using larger models and putting in place adequate quality checks for environmental monitoring

Remuneration system

- Winning projects receive a 20-year fixed tariff (although annually inflated)
- Power purchase obligation by EDF at a fixed price determined by the bidders in their submission
 - No counterparty risk
 - No commercial discounts needed to sell the power, allowing for a lower bid

Impacts of EDPR's projects

- The two projects are expected to attract around € 3,5 bn of investment and create 6.000 direct and indirect jobs in manufacturing and installation
- The consortia will deploy 125 of the 8 MW Areva turbines, which are currently under development, and will further create two companies in Rouen and Nantes

Main conclusions

- Offshore may be a good option when designing an efficient and balanced generation mix
- However, it's important to create the correct environment in order to lower its cost as much as possible
- EDPR is ready, willing and able to contribute to the deployment of its offshore pipeline