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Fresh thinking for decision makers

Pushing forward: The
future of Offshore Wind
Energy | The young indu-
stry has opportunities
most others could only
dream of | But it is close
to squandering the mo-
ment | Solution lies
within the industry itself

|| An entire new offshore wind power industry and a new supply chain must be developed on a scale that will match that of the North Sea oil and gas endeavour. **||**

European Offshore Wind Energy Association

**EUROPE 2011:
3.3 GW**

**CHINA 2020:
30 GW**

**EUROPE 2020:
40 GW**



Without offshore wind power, Europe and many other parts of the world will fall short of their carbon emission targets and fail to avert some of the most dramatic consequences of climate change. At the same time, these countries will find themselves uncomfortably dependent on foreign energy suppliers from Russia and the Middle East.

To avoid this bleak future, the UK, Germany, Denmark and France, among other European nations, are pushing for offshore wind energy and providing incentives for the construction of offshore wind farms. By June 2011, 3.3 GW of offshore wind capacity had been installed in European waters – enough to power between 700,000 and 1.3m homes. In the future, even more offshore wind energy will be needed.

In fact the young offshore wind industry has before it an opportunity most other industries could only dream of, especially in Europe where the economic crisis has left most with far dimmer prospects.

The European Wind Energy Association (EWEA) targets 40 GW of offshore wind capacity by 2020. Though Europe is the biggest offshore wind market today, China is aiming to quickly harness its gigantic potential, targeting to install 5 GW by 2015. By 2020, China hopes to have installed 30 GW of offshore wind energy – almost twice the amount of energy produced by the Three Gorges Dam.

In global terms, the International Energy Agency, the most influential intergovernmental energy agency, wants 12 % of electricity to come from wind energy by 2050. This would mean 47 GW of wind energy would need to be installed every year for the next 40 years. Each year this would require an investment of \$81 bn – the size of the entire European Stabilization Fund (EFSM) when it was launched last year to provide loans to struggling member states. A large chunk of the investment would go to offshore wind, given that the agency believes that 32 % of wind capacity will be located at sea by 2050, up from 19 % in 2030. But offshore wind companies are perilously close to squandering the moment. Building a wind farm out at sea still costs twice as much as building one onshore and six times as much as constructing a natural gas fired combined-cycle plant. It is little wonder then that the offshore wind industry's survival is teetering on a knife's edge.

But there is a solution and it lies within the industry itself: Increased co-operation and collaboration along the value chain. Players from construction right through to wind farm maintenance must create a seamless transition to end the seemingly endless cost overruns and delays that so far has kept the industry from becoming economically viable.

DEVELOPMENT OF OFFSHORE WIND CAPACITY IN THE FUTURE

19 % 2030

share of wind energy capacity that will be located at sea in 2030.

32 % 2050

share of wind energy capacity that will be located at sea in 2050.

Source: IEA

THE OPPORTUNITY: EUROPE'S DASH FOR OFFSHORE WIND IS GOING GLOBAL

The IEA warned in November 2011 that, despite the recent economic slowdown, the world was hurtling towards dangerously high carbon emissions levels. In its flagship annual World Energy Outlook, the agency said the world needed to divert course immediately by building low-carbon energy generation, such as offshore wind farms, or risk its entire carbon budget being eaten up by 2017. Fatih Birol, the IEA's chief economist, said: "We think that the door is about to close if there are no major new, bold policies put in place." The decreased appetite for nuclear power since the meltdown at Japan's Fukushima Daiichi nuclear plant, has made alternative low-carbon power generation, such as offshore wind, even more vital.

The stakes for the offshore wind industry are high and go far beyond the companies and governments directly involved. In its most recent, influential Human Development Report, the United Nations warned that the economic progress of the world's developing nations could stall, or even be reversed, by 2050 if the use of low carbon energy sources such as offshore wind fails to take off.

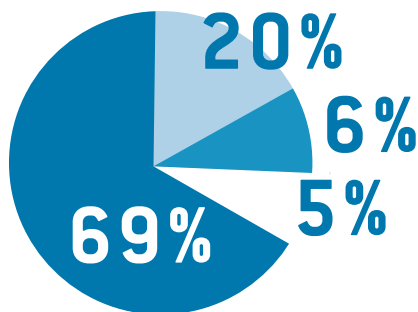
Europe is at the forefront of the dash to offshore wind. In the first half of 2011, 11 offshore wind farms were under construction in Europe, with 101 new offshore wind turbines being connected to the grid. There are now 49 wind farms spread across the waters of 9 European countries providing 3.3 GW of capacity. Europe's future ambitions are even bigger with another 150 GW of offshore wind capacity is in the planning stages, according to the European Wind Energy Association (EWEA).

In Germany, the Japanese nuclear disaster prompted Chancellor Angela Merkel to push forward by 14 years the closure of her country's last 17 nuclear plants. It also served as a catalyst to push forward with renewed seriousness towards the goal of reaching 25 GW of installed offshore wind capacity by 2030. Feed-in tariffs were improved and in June Berlin launched a 5 bn EUR programme for state-owned KfW bank to provide financing for up to 10 offshore wind farms.

The UK too is forging ahead with offshore wind, having recently opened the world's largest offshore wind farm in the North Sea. British offshore wind energy has been spared from the financial cuts London has made in other areas of renewable energy, such as biomass, and next year will see the launch of a 3 bn Pound "green investment bank", which is expected to set offshore wind as one of its priorities.

Denmark, the leader in wind turbine technology, has recently increased its renewables targets, making it likely the country will have to meet those new goals by significantly expanding offshore wind power, while Norway this year launched the first floating turbine in its waters. France in May finally became serious about developing a domestic wind industry and meeting its 6 GW 2020 off shore wind target by putting out a tender.

MAJORITY OF OFFSHORE PROJECTS IS STILL IN PLANNING PHASE



- Planned
- Approved
- Operating
- Under construction

Offshore projects and pipeline in UK, Netherlands, Germany, Denmark and France

Source: Windpower.net, Roland Berger

The US, which does not yet have one turbine in its waters, nevertheless has big plans. It wants to deploy 10 GW of offshore wind capacity in the next decade and 54 GW by 2030. To accelerate technical advances, the US Department of Energy's Offshore Wind Initiative is investing 43 m USD in 41 projects across 20 states over the next five years. But the biggest hurdle lies in the power of individual states to scupper the creation of an integrated electricity grid for offshore wind farms to feed into and the absence of a reliable legal support scheme. These are some of the reasons the US lags far behind China in its efforts to attain similar targets.

China plans to install 5 GW of offshore wind capacity by 2015 and 30 GW by 2020, according to its National Energy Administration. This year the country kicked off the construction of 1 GW of offshore wind power following its tender in October 2010 for four wind farms off the well populated coast of East China's Jiangsu province. China is determined to nurture a domestic offshore wind industry and Chinese turbine manufacturers are quickly forging ahead. For example, Zhang Chuanwei, chairman of Ming Yang, the Chinese turbine manufacturer, has set cost targets of 12.000 RMB (1.400 Euro) per kW of installed offshore capacity, compared with the current cost of around 18.000-20.000 RMB. Mr. Zhang's competitors in China and beyond will have to make similar efforts if the offshore industry is to realize its huge potential and eventually rid itself of the need for the current level of government subsidies and incentives.

2. OFFSHORE WIND ENERGY'S SURVIVAL TEETERS ON A KNIFE'S EDGE

The biggest problem the offshore wind industry faces is that it is simply not economically viable. Though costs vary with factors such as location, water depth and distance to shore, most agree that offshore wind remains far too costly compared to alternatives, such as coal, nuclear, gas and onshore wind. Even in the UK, which produces more offshore wind power than the rest of the world, the government's push for it has come at an alarming cost. For example, the Thanet wind farm in the North Sea will generate electricity at a cost per megawatt hour (over its 25-year life) at a stomach churning 170 Euro; this is 80 Euro more per megawatt hour than the cost of coal and natural gas and 60 Euro more than nuclear, UK Energy Research Centre (UKERC), a government think tank, calculates.

Meanwhile, the European Commission has warned that European businesses and consumers would face at least 20 years of rising electricity bills with prices jumping by more than 100 % if a large share of energy production came from renewable sources, including offshore wind. Though offshore wind has fared relatively well in many of the recent austerity-driven cuts to renewables funding, it is far from assured that politicians will be able to continue pushing for such a costly option as their coffers run dry and their constituents' wallets become ever more stretched. This is why players all along the value chain of the offshore wind industry will have to work harder than ever to make their economics work, even without subsidies.

THE PROBLEM: OFFSHORE WIND POWER IS FAR FROM ECONOMIC

Cost per megawatt hour:



Offshore wind energy



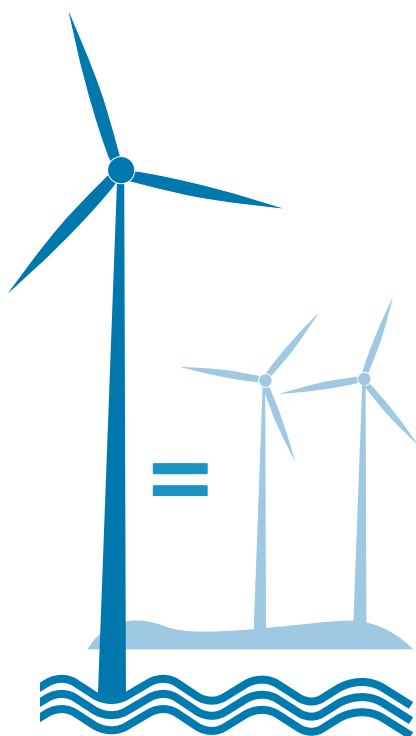
Nuclear energy



Coal/Natural Gas

Source: UKERC

COSTS FOR OFFSHORE WIND CAPACITY ARE TWICE AS HIGH AS ONSHORE



3. THE SOLUTION: A COLLABORATIVE APPROACH

Offshore wind projects are a complex business depending on many diverse players getting their part of the puzzle in place at the right time so that construction can happen within a narrow window of optimum wind and oceanic conditions. And for every meter a wind turbine moves further out to sea to capture better wind conditions and escape the disapproving eyes of local opponents, the project becomes more costly and fraught with risk. Delays and cost overruns have plagued almost every offshore wind project since the birth of the industry. Ending a vicious cycle of miscommunication, blame shifting and stubbornness among involved players that causes many of these problems must become the industry’s priority number one.

Such changes will have to happen all along the value chain, from origination to development, construction, operation and maintenance. Improving project economics will require integrated solutions, strong project management and a much closer alignment of those involved.

Offshore wind operators need to look at the lifetime cost and risks of a project. But there is a hitch: Today no one company is willing to assume the full project risk or even consider and price it. To manage these unappealingly high risks and reduce costs, companies will have to foster close collaboration and develop a mechanism by which they jointly mitigate and share the risk. Such agreements will have to come early in the design stages of a project and happen along the entire chain of players, including, operators, turbine manufacturers, and logistics and construction companies.

IMPROVEMENTS REQUIRED TO REALIZE OFFSHORE WIND POTENTIAL

- Intensified research and development to improve reliability, facilitated through shared industry databases of offshore operating conditions and experiences.
- Strengthened supply chains; sufficient purpose-designed installation vessels and harbour space; improved installation strategies.
- New generations of turbines and sub-surface structures fundamentally designed for the marine environment with minimum operations and maintenance requirement.

Source: IEA

"Reducing interfaces is a key issue in the sector. No single developer carries out a project the same way, but a common thread that runs through all these offshore wind projects is the large number of interfaces," the commercial director of a wind industry supplier said. To reduce those interfaces – or to at least minimize their negative impact – the offshore

wind industry would be wise to adopt a stronger EPC contracting model. The EPC contract – which is widely used for complex infrastructure projects, including oil and gas – calls for one contractor to take the overall responsibility for designing the installation, procuring the materials and constructing the project, often subcontracting the work. As an operations manager of a major utility company points out: "Offshore wind parks need a single point of contact, in an EPC contractor, because they are complex infrastructure projects with very different dynamics, customers and risks compared to onshore wind parks. Multi-contractual situations, where one company contracts out to different firms, lead to inefficiency and complexity. [...] If you do it all under one roof in one company, you are able to reduce the complexity issues in coordinating all those different companies."

But so far, precious little has happened in that direction, especially when compared with the early days of the offshore oil and gas industry.

Another way to reduce or optimize the number of interfaces involved in the construction of a wind farm is for larger companies, such as turbine makers, to buy – or acquire part ownership of – smaller players that provide a related service. Siemens, the turbine maker, recently took a stake in A2SEA, a supplier of installation services for offshore wind farms. Meanwhile, strategic alliances, in which various players bring their different technological expertise and experience together, help smooth offshore projects by ironing out many potential wrinkles before the project gets too far underway. Gamesa, the Spanish turbine maker, and Northrop Grumman Shipbuilding, the US company, recently formed such an alliance to develop innovative offshore technology. Some alliances are project specific, such as that of Iberdrola Renovables, the renewables arm of the Spanish utility, and AREVA Wind, the offshore wind subsidiary of France's nuclear company, which partnered in order to compete for the French offshore wind farm tender currently under way.

Such examples show that offshore wind is at the start of a paradigm shift and companies are beginning to realize that they will maintain, rather than lose, their competitive edge only by cooperating and sharing know-how and experience. As the going gets tough, the major players in the industry will therefore need to hone their ability to cooperate and integrate. Specifically, they will need to develop a superior business model to provide seamless solutions across the value chain. Meanwhile, smaller specialist companies will need to choose with whom they align themselves and how far they are willing to share their expertise, data and technology to make sure they are not left behind.

Only then will the offshore wind industry become strong enough to fulfill the huge demand of the coming decades and be able to deliver its services at an acceptable cost and risk. The stakes are high. If the industry fails to grow up and seize its opportunity, the impact will be felt in company board rooms and as far away as the melting ice sheets of the Himalayas and the drying plains of Africa.

IF YOU HAVE ANY FURTHER QUESTIONS,
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