European offshore wind power: a world leader

By European Wind Energy Association

Wind turbines have been turning in European seas since 1991, when the first offshore turbines were grid connected off the coast of Denmark. That was 23 years ago, and since then incredible progress has been made across the continent. At the end of June 2014, 7,343 MW of offshore wind power capacity was providing power to Europe — spread across 73 wind farms (with a total of 2,304 turbines) in 11 countries, capable of producing 27 TWh of electricity. That's enough to meet the needs of over seven million households — or the entire population of the Netherlands.

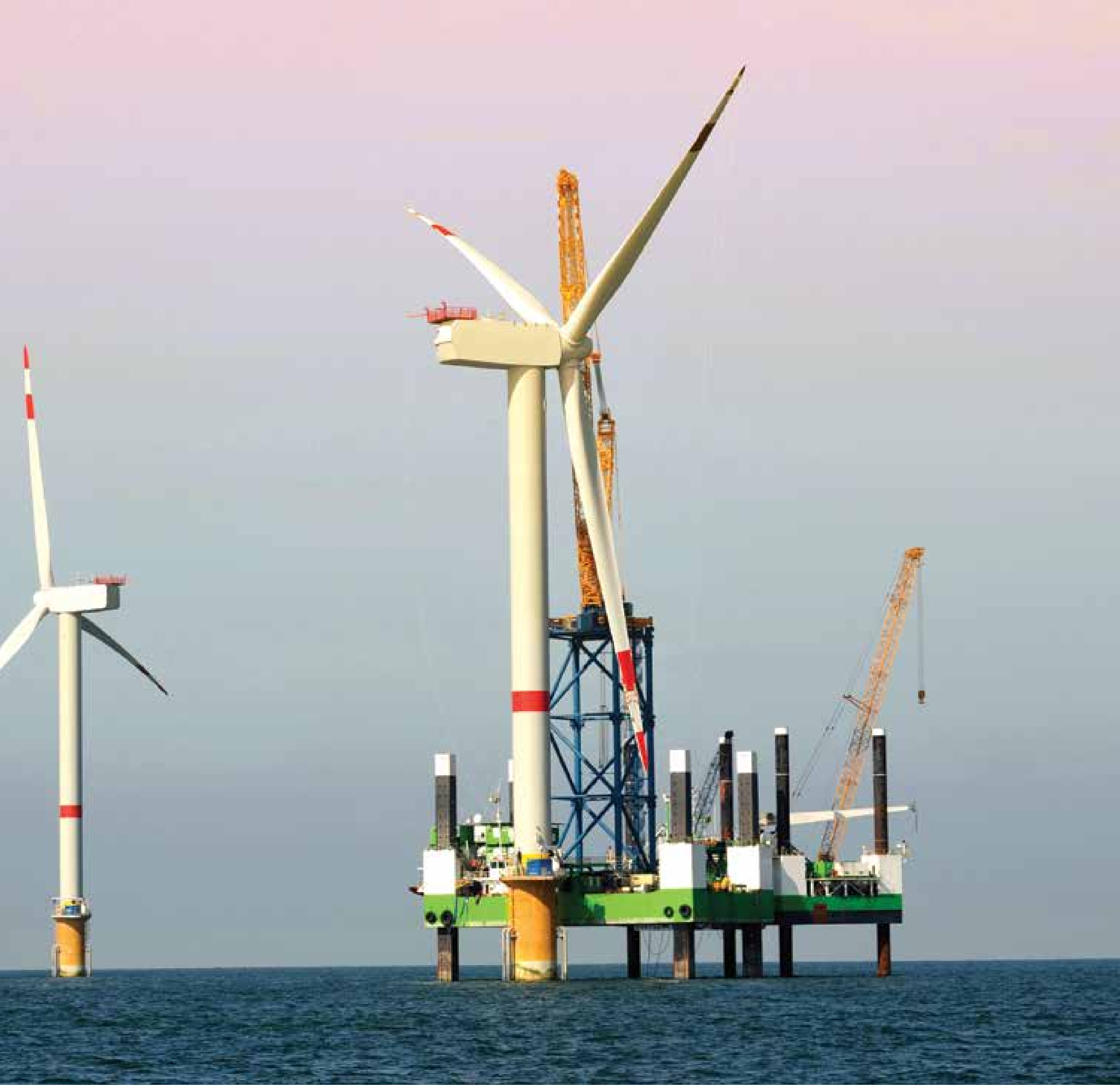
Offshore wind is one of Europe's fastest growing maritime sectors — by 2020 offshore wind could total 27.8 GW, meeting 3.5 percent of EU electricity demand or 102.2 TWh. The sector's clear advantages of stronger, more consistent winds blowing at sea, and the fact that it does not put pressure on onshore sites — will continue to propel its growth, but the path to strong growth is not obstacle free.

Present state

In recent years wind energy in Europe has been buffeted by the economic crisis. According to The European Wind Energy Association's latest statistics published this summer, during the first half of 2014 European offshore experienced a relative slow-down — new offshore capacity installations were down 25 percent compared to the same period the previous year. From January to July, 224 wind turbines were fully grid connected in the UK, Belgium, and Germany; 233 foundations were installed in 13 wind farms in Germany, the UK and Belgium; and 282 turbines were installed in eight wind farms in the same three countries. Meanwhile, preparatory work started at the 600 MW Gemini wind farm off the coast of the Netherlands.

The sector's contraction may well continue into 2015 and 2016, depending on the outcome of political negotiations at EU level on climate and energy legislation for 2030. The EU is currently in the throes of setting a new agenda for Europe's climate and energy policy, following on from Europe's ambitious and legally-binding target of meeting 20 percent of the continent's energy needs with renewable energy by 2020.

In order to ensure that healthy growth continues in the latter part of this decade, and to ensure that offshore wind energy plays its role in meeting the EU's competitiveness, security, renewable and climate objectives, the industry needs longer-term visibility. An ambitious deal on the climate and renewable energy targets for 2030 — set to be agreed this October by EU Heads of State — would send a strong and positive signal of confidence to investors.



Needs for 2030

2020, the expiry date of the current EU renewable energy target, is just five years away. And yet, the EU wind energy sector would benefit from policy certainty that stretches way into the future. EWEA believes that Europe needs a strong target of at least 30 percent renewable energy by 2030 — and that that target should be legally binding at national level.

Offshore wind energy is an industry that creates jobs, reduces fossil fuel imports and one in which Europe is a world leader with huge export opportunities. The offshore wind sector currently employs 78,211 people, and this is expected to rise to 119,029 in 2020, according to

ALSO IN THIS SECTION:

Heading into Deeper Waters

Today's offshore wind turbines stand in water depths of up to 50 meters. But that's where it stops. Current offshore turbine and structure designs are not economically viable beyond 50 meters — but much of the Mediterranean and Atlantic basins are deeper than that even relatively close to shore.

That means there is an awful lot of wind blowing over European seas and oceans that has yet to be harnessed. But new designs are now being developed and tested which could open up deep waters to the wind energy industry.

The energy produced from turbines in waters over 50 meters deep in the North Sea alone could meet the EU's entire electricity consumption four times over, according to EWEA's "Deep Water" report published in July 2013.

These turbines would not only be able to supply vast amounts of free — and emissions free — electricity to Europe, they would create an export opportunity for Europe, which already leads the world in offshore wind energy.

The report found that the first deep offshore wind farms could be installed and grid connected by 2017. However, it also warns that this technology is at a very early stage of development and much more research is needed before the designs become commercially viable. Setting ambitious EU-wide climate and energy targets for 2030 would help drive such growth.

Currently, there are two full-scale grid connected offshore wind turbines on floating substructures: Hywind (developed by Statoil, with a 2.3 MW Siemens turbine, installed in Norway's North Sea in 2009) and Windfloat (installed off the Portuguese Atlantic coast in 2011, developed by Principle Power and EDP, using a 2 MW Vestas wind turbine).

In addition to the two full-scale deep offshore turbines at the end of 2012, there are three grid-connected experimental floating substructures and around 35 deep-water designs under development worldwide. Of all 40 projects identified, either grid connected systems or under development, 27 (more than 60 percent) are located in Europe, in nine countries: Denmark, France, Germany, the Netherlands, Norway, Portugal, Spain, Sweden and the UK. Four (10 percent) are in the U.S. and nine (23 percent) in Japan.

the European Wind Energy Association's figures. When it comes to setting an economically and environmentally ambitious agenda for Europe, we hope that EU leaders will think in the same forward-looking direction that the offshore sector is travelling in.

But it's not just political certainty that will move the sector into the future. The costs of offshore technologies need to become more competitive — and considerable investment in research and development in turbines, supply chains, grids, operations and maintenance is needed to help achieve cost reductions. Improved wind forecasting methods could also help make offshore wind farm development cheaper. Bringing down the costs of offshore wind power — and getting the industry to work together — will be a central tenet of the EWEA OFFSHORE 2015 conference to be held in Copenhagen next spring.

Financing challenge

While political uncertainty is probably the greatest challenge facing offshore wind energy, there is yet another factor. The European offshore wind energy industry needs to attract between €50 billion and €69 billion over the next seven years to meet a target of 25 GW of offshore wind power.

On a European level, funding has been available. Power producers have so far been the main investors in offshore wind using their balance sheets. As the scale of investment grows, new entrants are becoming active in different aspects of project development. Engineering, procurement construction and installation companies, wind turbine manufacturers, oil and gas companies and corporate investors are already investing in offshore wind.

Moreover, innovative funding structures are now being used. The role of development banks and Export Credit Agencies has also been significant in attracting commercial lenders to the sector.

A driving force

Offshore wind energy in Europe is generally said to be 10-15 years behind its onshore counterpart. But, if it can overcome the political, economic, and financial obstacles, it can mirror the success of onshore wind power. Offshore wind can cut our dependence on fossil fuels, provide clean power and create sustainable jobs, together with onshore wind energy. Moreover, offshore wind has the power to turn-around areas in decline across Europe — especially those where shipbuilding was once a major employer.

Offshore wind is developing fast - at this moment in time the mass rollout of the next generation of offshore wind turbines is beginning to take place. And yet, the sector's growth in the coming years hinges on the level of ambition that will be set by the EU's leaders in the 2030 climate and energy package this autumn. Europe's decision-makers need to capitalize on Europe's first mover advantage and maintain the offshore wind momentum.

Next year, EWEA will host EWEA OFFSHORE 2015 in Copenhagen. Running from March 10–12, the event is set to attract thousands of offshore wind energy players from Europe and beyond. The buzz topic is set to center on how the offshore wind industry can think bigger on reducing the costs of wind energy across the entire supply chain. Meanwhile, the huge exhibition halls of the Bella Center will showcase the latest developments in the industry, and the 24 conference sessions will debate the very latest issues affecting the sector.

For more information, visit www.ewea.org/offshore2015.

Industry at Large

Summer offshore progress heats up leading into Offshore WINDPOWER 2014

Every year, fall seems to be a good time to take inventory on progress in the offshore segment of the U.S. wind energy industry. That's largely because the approaching end of the year (always a popular time to look back) coincides with the American Wind Energy Association's annual Offshore WINDPOWER Conference & Exhibition. Offshore WINDPOWER 2014 takes place Oct. 7-8 in Atlantic City, New Jersey.

While steady progress has been made throughout 2014, the immediate run-up to U.S. offshore wind energy's marquis event of the year has included a flurry of activity in the offshore arena. Let's take a look at what's taken place just in the last few months for an industry segment that has yet to start construction on its first project here in the U.S. but is clearly getting closer to doing so.

Block Island gets final federal approval

Last month offshore wind energy developer Deepwater Wind received a key federal approval needed to build its Block Island Wind Farm, a 30 MW project that's among those in the most advanced stages of development in the U.S.

Granting the approval for the project, which is to be located off the Rhode Island coast three miles from Block Island, was the U.S. Army Corps of Engineers, the lead federal permitting agency for the wind farm.

Earlier this year, Deepwater selected Alstom as the project's turbine supplier and long-term maintenance and service provider, and received delivery of the project's 15 wind turbine blades from the turbine manufacturer.

Offshore construction is expected to begin next summer, with the wind farm slated to go online in 2016, according to Deepwater.

Maryland lease auction winner

In August the U.S. Department of the Interior (DOI) and Bureau of Ocean Energy Management (BOEM) announced that U.S. Wind Inc., a unit of Italy's Renexia, is the provisional winner of the auction for Maryland's offshore wind lease areas. U.S. Wind's winning bid of approximately $8.7 million for both lease areas came after 19 rounds of bidding. In addition to U.S. Wind, SCS Maryland and Green Sail Energy also participated.

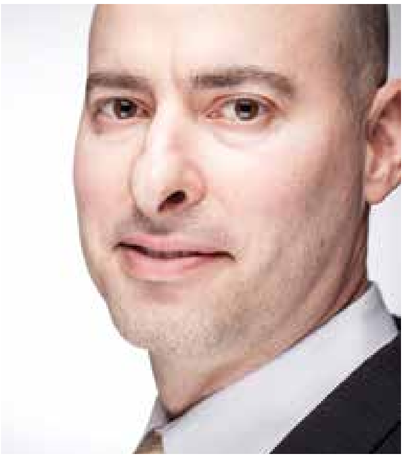
Following completion of a 30-day anti-trust review of the auction by the Department of Justice, U.S. Wind has a preliminary term of one year in which to submit a site assessment plan to BOEM for approval. U.S. Wind will have up to four and a half years following that approval in which to submit a construction and operations plan for another approval.

The Maryland lease auction follows two similar federal auctions in 2013—one for a development area off the coast of Virginia and another for an area off Rhode Island and Massachusetts.

More lease auctions planned

DOI and BOEM are still not finished with offshore lease auctions. In June, DOI, BOEM and Massachusetts Governor Deval Patrick announced plans to auction 742,000 acres offshore of Massachusetts for wind energy development. The proposed area is the largest in federal waters and will nearly double the area available for offshore wind energy projects in the U.S.

The following month, in July, DOI and BOEM announced plans to auction 344,000 acres offshore of New Jersey for wind energy development. BOEM proposes to auction the area as two leases: the South Lease Area (160,480 acres) and the North Lease Area (183,353 acres).



By Carl Levesque
The American Wind Energy Association

DOE Innovative Offshore Wind Energy Project winners

DOE took the occasion of AWEA's WINDPOWER 2014 Conference & Exhibition in May to make another significant announcement, unveiling the three winning offshore projects for Phase 2 of its Advanced Technology Demonstration Project Initiative.

The winners, chosen from a group of seven projects that comprised the initial phase of the program, are now eligible to receive up to an additional $46.7 million each to advance their projects, all of which are focused on next-generation offshore technology ranging from floating turbines to twisted jacket foundations. The winners include projects from Dominion Virginia Power, Fishermen's Energy of New Jersey, and Principle Power of Washington. All three projects use direct-drive turbines.

Offshore wind foundations: Research needs and innovation opportunities

By Domniki Asimaki
California Institute of Technology

"The U.S. offshore wind industry should adopt transformative design solutions for fixed foundations that build infrastructure resilience to domestic hazards, such as hurricanes, while minimizing the manufacturing, deployment and operational cost."

This was the overarching theme that emerged from a recent workshop on Research Priorities for Offshore Wind Foundations, sponsored by the Georgia Tech Strategic Energy Institute May 22, 2014 in Atlanta, Georgia. The goal of the workshop was to promote discussion and develop consensus between academia, industry and funding agencies on two basic questions: are international standards appropriate for the design of offshore wind fixed foundations in the U.S., and if not, what are the research and development initiatives that, if pursued in this realm, can have significant impact on the growth of the domestic offshore wind industry?

Despite the diversity of expertise and interests reflected in the presentations, invited participants, representing industry, academia, and funding organizations from the United States, the United Kingdom, Germany, and Denmark, unanimously recognized that although regulations are in place for the first generation of U.S. offshore wind farms, novel design concepts targeting cost reduction are necessary to establish offshore wind as a competitive resource in the U.S. energy market. To that end, advancing our technical understanding in the realm of seabed-foundation interaction, and accordingly refining design regulations, is an important step.

The need for design refinements can be traced back to the fundamental goal of design standards, which is to ensure that resistance is larger than the applied loads. The offshore wind industry, however, whose towers differ substantially from oil platforms in terms of loads and resistance, has adopted foundation design protocols of oil and gas installations but has selectively addressed only some of the characteristic differences of the two industries, and what's more, has done so independently of each other. This has led to offshore wind foundation standards that lack an overall design philosophy, and have large built-in uncertainties in the characterization of loads and resistance — wind speed, wave height, wave kinematics and slam forces, steel and soil stiffness and strength, and soil-foundation interaction — uncertainties that are, in fact, disproportionately larger than the narrow window of performance requirements of offshore wind installations.

One could argue here that uncertainties notwithstanding, these standards have been successfully implemented and tested by the wind industry in Europe for 20 years. Still, long-term data on the performance of Europe's offshore wind installations is lacking. European installations are also founded on shallower waters and often-stiffer soils, and are not designed to withstand the impulsive gusts, and breaking and slamming wave forces, characteristic of U.S. hurricanes. At the same time, the opportunities to learn from failure case studies of operating wind farms in Europe are limited, since such data are almost always proprietary. Still, published data from experimental farms have shown significant variation in the design and performance of installed towers. For example, in 1994, when one of two instrumented turbines of the offshore farm Lely in the Netherlands showed 35 percent error in the estimated eigenfrequencies compared to measurements, the source of error was traced back to code deficiencies in soil characterization and in foundation design. Although standards have advanced since, not least because of the experience gained through instrumentation of offshore installations, regulations that have so far worked in Europe are not guaranteed to work for the site conditions and environmental loading of U.S. installations.

When asked to identify pressing needs in research and development, the workshop participants identified challenges relating to the foundation geometry: offshore wind foundation dimensions exceed the experience range of the oil and gas industry, and extrapolating current practice to larger sizes could introduce unintended effects. Unresolved issues were also identified in the realm of resistance to serviceability loads: the behavior and possible degradation of soil strength under millions of cycles of combined dynamic loading from the wind turbine and waves is not well described in the current standards. How does the soil-foundation-tower system behave when subjected to millions of loading cycles? Does it stabilize or fail, and what are the parameters that determine the performance regime in each case? The issue of extreme load characterization was also prominently featured: extreme loads from breaking waves are shown to frequently drive the overall design, and should thus be explicitly accounted for in U.S. design standards through appropriate load factors for severity and recurrence, equivalent to the design standards of API in the Gulf of Mexico. Lastly, research needs in site characterization were identified, calling for standardized procedures that will enable spatial variability of soil properties to be quantified and accounted for in design.

The list of research needs and priorities serves as a reminder that as the industry evolves, greater efforts should be prioritized to refine foundation design models for U.S. offshore wind installations. Addressing the challenges identified through systematic and constructive research will improve characterization of loading and resistance uncertainties, which will, in turn, enable the industry to develop performance standards focused on reducing the associated risk. Although these efforts will help building infrastructure resilience, however, they will not alone reduce cost drastically enough to impact the competitiveness of offshore wind in the U.S. energy market. Drastic cost reduction will likely require a paradigm shift in the logistics of U.S. offshore wind, from one-off fabrication to high volume manufacturing procedures, which include high volume chains, standardized on-site manufacturing, availability of jack-ups and installation vessels, along with the associated changes in harbor capacities. As engineers, we tend to rely heavily on established standards. To that end, the most important take-home message of the workshop was that in the realm of offshore wind foundations, diverging from the status quo and the path of regulatory least resistance, and supporting research, experiments and pilots while moving forward with deployment, can help develop a new path forward for the industry.

This article summarizes the collective thoughts of a large group of individuals: Domniki Asimaki and Kevin Haas from Georgia Tech, organizers of the workshop; Giovanna Biscontin from the University of Cambridge, Cambridge, United Kingdom; Brent Cooper from Ocean and Coastal Consultants, Charleston, South Carolina; Dan Dolan from MMI Engineering; Will Hobbs from Southern Company, Atlanta, Georgia; Kerstin Lesny from University of Duisburg-Essen, Germany; Torben Lorentzen from FORCE Technology, Copenhagen, Denmark; to Mary Hallisey Hunt from Georgia Tech; Ralph Nichols from the Savannah River National Laboratory; Daniel O'Connell from the Bureau of Ocean Energy Management, Brian O'Hara from the Southeastern Coastal Wind Coalition, Raleigh-Durham, North Carolina; and Glenn Rix, Geosyntec Consultants. Support for the workshop was provided by the Georgia Tech Strategic Energy Institute; the organizers are very grateful for the leadership of the institute's director Timothy Lieuwen and for the funding opportunity that made this workshop possible.

— Source: EDF EN Canada

REPORT: U.S. OFFSHORE WIND MARKET GAINING TRACTION

DOE/Navigant study shows that 14 projects are in advanced stages of development, representing a potential 4.9 GW of capacity

The Energy Department has released a report showing progress for the U.S. offshore wind energy market over the past year, including two projects that have moved into the initial stages of construction, and 14 projects that are in the advanced stages of development– together representing nearly 4,900 MW of potential offshore wind energy capacity for the United States. Further, this year's report highlights global trends toward building offshore turbines in deeper waters, using larger, more efficient turbines, increasing the amount of electricity that can be delivered to consumers.

This year's U.S. Offshore Wind Market and Economic Analysis, produced by the Navigant Consulting, builds on past reports by providing additional information on offshore wind's potential to increase U.S. electricity capacity, create jobs, and outlines policy developments that are influencing the offshore wind market. This report, along with the Energy Department's ongoing offshore wind research and development (R&D) efforts, and recently announced advanced technology demonstration projects, are part of the Energy Department's national offshore wind strategy that supports the development of a suite of tools and advanced engineering prototypes that will assist offshore wind project developers and industry stakeholders.

The report's key findings include:

- Fourteen U.S. projects, representing approximately 4.9 GW of potential capacity, can now be considered in advanced stages of development, meaning they have either been awarded a lease, conducted baseline or geophysical studies, or obtained a power purchase agreement. The report: Two of the United States' most advanced projects — Cape Wind and Deepwater's Block Island project — have moved into their initial stages of construction.

- Three of these advanced stage projects — Fishermen's Energy, Dominion, and Principle Power — were selected to receive up to $46.7 million each from the Energy Department for the final design and construction of their Advanced Technology Demonstration Projects off New Jersey, Virginia and Oregon. These projects will demonstrate the use of innovative foundations and advanced turbines that will provide valuable cost and technical data to the offshore wind community.
- Globally, offshore wind projects continue to trend farther from shore into increasingly deeper waters while increased turbine sizes and hub heights have contributed to higher reported capacity factors.
- Globally, the average capital cost for offshore wind projects completed in 2013 fell 3.7 percent per kWh from 2012, with an additional decrease expected in 2014, while total project installation costs have fallen 6 percent since 2011.
- The shift to more distant locations and larger capacity turbines, along with the goal of reducing tower top mass, has driven continued innovation in drivetrain configurations, with an increase in the deployment of direct-drive and medium-speed drivetrains expected to accompany the deployment of the next generation of 5 to 8 MW turbines.
- The Bureau of Ocean Energy Management (BOEM) has continued to make steady progress on its initiative to facilitate siting, leasing and construction of offshore wind energy projects on the Atlantic Outer Continental Shelf. In 2014, BOEM announced additional competitive lease sales for renewable energy off Massachusetts, Maryland and New Jersey.

RESEARCH BUOYS TO GATHER VITAL DATA AT OFFSHORE DEMO SITES

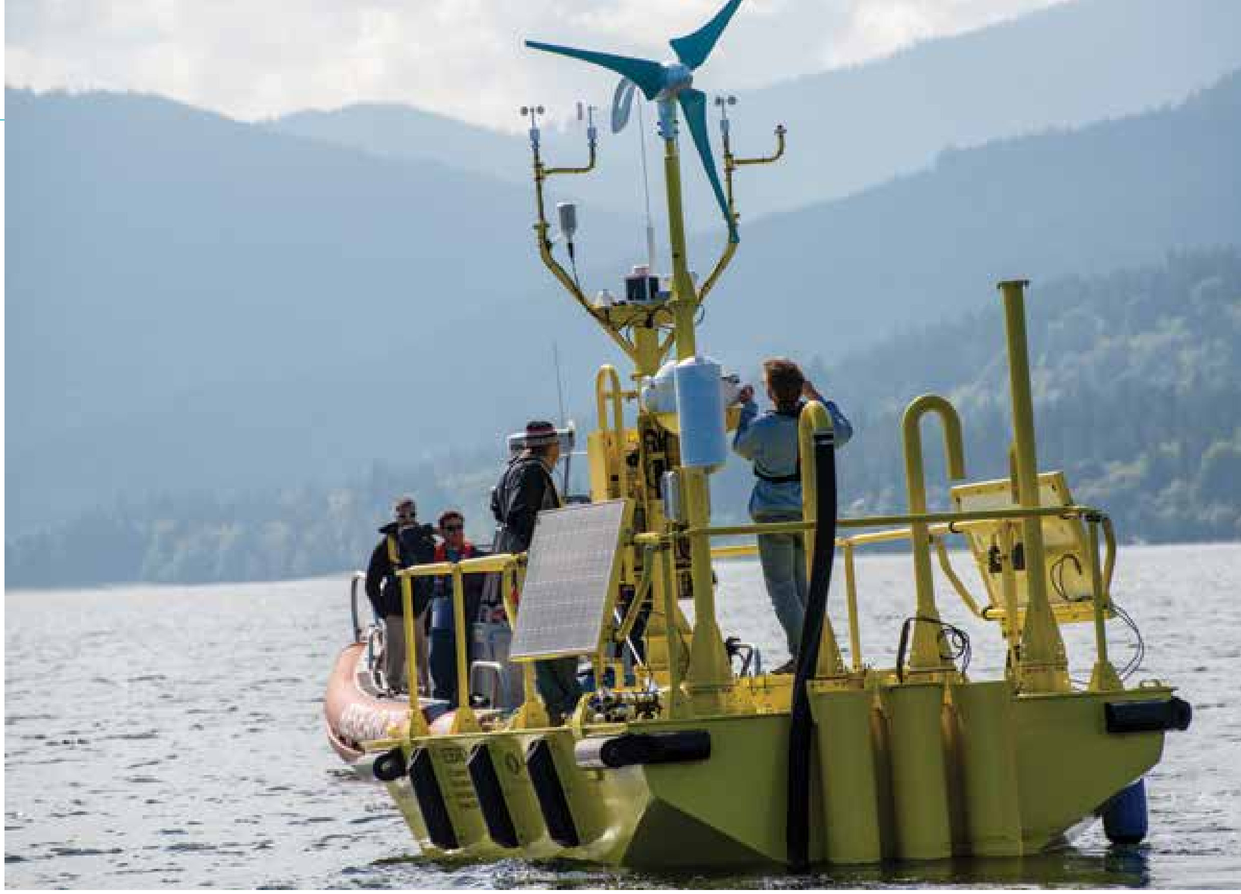
Pacific Northwest National Laboratory launches meterological and oceanographic equipment to gain a better understanding of power generation potential off the coasts of Oregon and Virginia

Two massive, 20,000-pound buoys decked out with the latest in meteorological and oceanographic equipment will enable more accurate predictions of the power-producing potential of winds that blow off U.S. shores.

The bright yellow buoys — each worth $1.3 million — are being commissioned by the Department of Energy's Pacific Northwest National Laboratory in Washington state's Sequim Bay. Starting in November, they will be deployed for up to a year at two offshore wind demonstration projects: one near Coos Bay, Oregon, and another near Virginia Beach, Virginia.

"We know offshore winds are powerful, but these buoys will allow us to better understand exactly how strong they really are at the heights of wind turbines," said PNNL atmospheric scientist Will Shaw. "Data provided by the buoys will give us a much clearer picture of how much power can be generated at specific sites along the American coastline — and enable us to generate that clean, renewable power sooner."

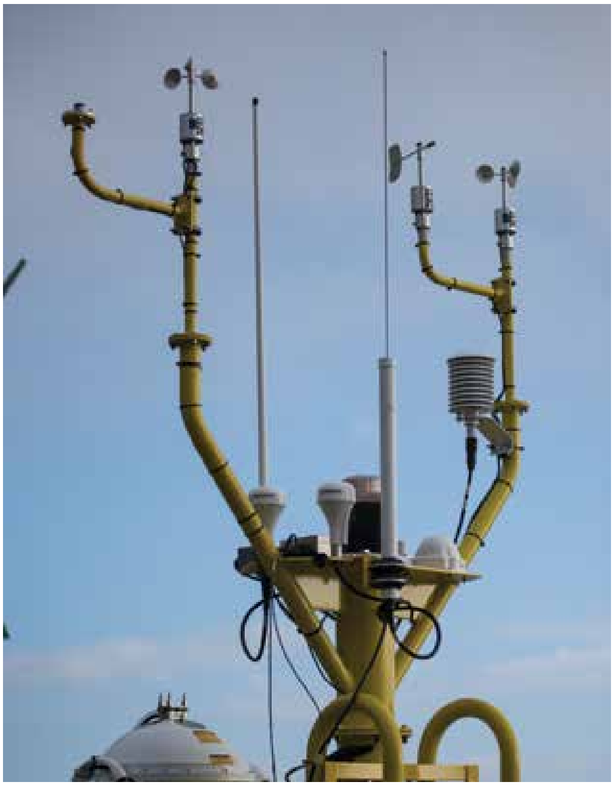
Offshore wind is a new frontier for U.S. renewable energy developers. There's tremendous power-producing potential, but limited information is available about ocean-based wind resources. DOE's Office of Energy Efficiency & Renewable Energy



purchased the buoys to improve offshore turbine performance in the near term and reduce barriers to private investment in large-scale offshore wind energy development in the long term. The buoys were manufactured by AXYS Technologies, Inc., in Sidney, British Columbia.

A recent report estimated the U.S. could power nearly 17 million homes by generating more than 54 GW of offshore wind energy, but more information is needed. Instruments have long been sent out to sea to measure winds on the ocean's surface, but the blade tips of offshore wind turbines can reach up to 600 feet above the surface, where winds can behave very differently.

The buoys carry a bevy of advanced instruments, including devices called lidar, which is short for light detection and ranging, to measure wind speed and direction at multiple heights above the ocean. Other onboard



instruments will record air and sea surface temperature, barometric pressure, relative humidity, wave height and period, and water conductivity. Subsurface ocean currents will also be measured with acoustic Doppler sensors.

All of these measurements will help scientists and developers better understand air-sea interactions and their impact on how much wind energy a turbine could capture at particular offshore sites. The data will also help validate the wind predictions derived from computer models, which have thus far relied on extremely limited real-world information.

PNNL is operating and managing the buoys for DOE. Researchers working from PNNL's Marine Sciences Laboratory in Sequim, Washington, will conduct initial tests on the custom-made buoys in Sequim Bay and near the Dungeness Spit along the Strait of Juan de Fuca, a channel of water between Washington state's Olympic Peninsula and British Columbia's Vancouver island.

— Source: Pacific Northwest National Laboratory

Offshore wind forecast to reach 40 GW globally by 2020

Analyst: Advantages of offshore wind expected to boost its overall share of the wind power market

With more countries utilizing offshore wind potential, the global offshore wind power market is expected to increase more than fivefold from 7.1 GW in 2013 to 39.9 GW by 2020, representing a Compound Annual Growth Rate (CAGR) of 28 percent, according to research and consulting firm GlobalData.

The company's latest report states that the global offshore wind energy space registered substantial growth between 2006 and 2013, rising from 0.9 GW in 2006 to 7.1 GW in 2013, at a higher CAGR of 33.9 percent. Of this, 1.6 GW came online in 2013, driven mainly by the UK, Germany, Denmark and Belgium.

Offshore wind is now expected to become one of the largest renewable power market segments by 2020. The UK, Germany and China will contribute significantly towards this, thanks to a number of projects currently in the planning and construction stages.

"Offshore wind power is increasingly being explored for its high yield, due to stronger and more consistent winds compared to onshore, and the scope that this provides for the construction of large-scale projects," said Swati Singh, GlobalData's analyst covering power generation. "An additional benefit is the fact that future offshore wind power technology development will ensure a decline in the average cost per megawatt, although overall project costs are expected to rise in countries with wind farms planned in deeper water and further from the shore."

According to Singh, the main obstacles that will hinder market growth are environmental concerns, as well as the lack of skilled personnel and sophisticated technology catering to offshore requirements.

"Despite these barriers, GlobalData expects offshore wind's share in the global wind power market to climb from 2.2 percent in 2013 to 6.1 percent by 2020, as more countries eye the advantages of this renewable energy technology," the analyst concludes.

— Source: GlobalData

UMaine celebrates first anniversary of its VolturnUS floating wind turbine with signing of further DOE grant

U.S. Sen. Susan Collins and U.S. Rep. Michael Michaud welcomed top officials from the U.S. Department of Energy (DOE) to Castine on September 5 to celebrate a successful year of the VolturnUS floating wind turbine deployed off Castine.

"This anniversary is another great day for our state, the university and its many partners, and for the advancement of clean, renewable energy for our nation," said Collins. "This is a remarkable achievement and confirms my belief that the most innovative and dedicated wind energy researchers in the world are working right here in Maine."

Michaud said the VolturnUS wind turbine is an incredible project and a great example of the type of forward-thinking ideas that can strengthen our economy in the years to come and define Maine as a leader in innovative technologies.

"The UMaine team has done incredible work to get not just VolturnUS up and running, but many other promising initiatives as well. I look forward to continuing to partner with them on advancing these projects that will strengthen Maine's economy," he said.

In addition, as part of the event, DOE Assistant Secretary for Energy Efficiency and Renewable Energy David Danielson signed a $3.97 million cooperative research agreement with UMaine, of which is $3 million in DOE funding and $970,000 in cost share, to continue the design and engineering work of the full-scale VolturnUS floating hull.

The federal officials were joined by representatives from the University of Maine, Maine Maritime Academy and Cianbro, who discussed highlights of the yearlong deployment off the coast of Castine. VolturnUS, a one-eighth scale model of a 6-MW floating wind turbine with more than 50 sensors on board, has been successfully operating and collecting data related to design capabilities for more than a year, including throughout the Maine winter.

Among the data highlights:

- The VolturnUS 1:8 successfully withstood 18 severe storms equivalent to 50-year storms, and one 500-year storm.
- The maximum acceleration measured was less than 0.17 g for all 50- and 500-year storms, which matched numerical predictions.
- The maximum tower inclination angle measured was less than 7 degrees in all 50- and 500-year storms, and these numbers matched predictions.

The VolturnUS floating turbine is a patent-pending technology developed at the University of Maine Advanced Structures and Composites Laboratory by UMaine and Cianbro personnel. In June 2013, it became the first grid-connected offshore wind turbine deployed in the Americas, and the first floating turbine in the world designed using a concrete hull and a composites material tower to reduce costs and create local jobs. The turbine is a 1:8 geometric scale test program to prepare for the construction of a larger 6 MW floating turbine. The project brought together more than 30 organizations as part of the DeepCwind Consortium, led by UMaine and funded through a competitive DOE grant and industry contributions.

— Source: Advanced Structures & Composites Center, The University of Maine

Siemens to perform grid connection and supply turbines for Dudgeon offshore project in the UK

Siemens has received an order for the turnkey delivery of the grid connection for the Dudgeon offshore wind farm. The customers are the Norwegian utilities Statoil and Statkraft, which are jointly implementing the wind farm off the coast of the UK. Siemens will supply the entire power transmission system, including the two transformer substations — one onshore and one offshore — for the 402-MW project. Siemens had previously received an order in August to deliver 67 wind turbines in the new 6-MW class as well as to maintain the wind farm. The grid connection is scheduled to be completed by the end of 2016, and the installation of the wind turbines is expected to begin in early 2017. With a transmission capacity of 402 MW, Dudgeon will supply climate-friendly energy for over 410,000 British homes.

"This order marks a milestone for us. Dudgeon will be our tenth grid connection project using AC technology," says Tim Dawidowsky, CEO of the Transmission Solutions Business Unit within Siemens' Power Transmission Division. "To date, we have installed nine connections using AC technology with a total transmission capacity of more than three gigawatts, transporting enough electricity to supply three million households with wind power. As a result, we have established ourselves as the clear market leader not only in offshore wind turbines but also in grid connections." Siemens is also installing five DC grid connections with cable lengths of up to 200 kilometers off the coast of Germany in the North Sea. This technology ensures efficient power transmission in wind farms situated at a great distance from the shore. The Dudgeon wind project is being build 32 kilometers north of Cromer, a city in the north of Norfolk County. The cable run extends 42 km offshore and another 47 km onshore.

The scope of supply for the grid connection covers all necessary components, such as the offshore transformer substations which convert the wind power to 132 kilovolts (kV), as well as the onshore station which converts the electricity into 400 kV for feeding into the transmission grid.

— Source: Siemens

DNV GL and partners issue recommended practice for offshore HVDC projects

DNV GL, together with STRI (the Swedish Transmission Research Institute) and ten industry players developed a methodology for technology qualification of offshore HVDC technologies through a joint industry project.

As offshore wind farms are being built farther from the coast and more offshore oil and gas installations are powered from shore, there will be an increasing need for long-distance underwater power transmission in the years to come.

Use of high-voltage direct current (HVDC) transmission allows power transmission through cables over longer distances and higher capacities compared to what is feasible when using AC transmission, and will hence often be the preferred solution for long-distance power underwater transmission.

However, to date operational experiences with offshore HVDC transmission technologies are very limited and there is a lack of relevant standards, guidelines and recommendations for stakeholders to rely on. The immature nature of offshore HVDC technologies causes uncertainties and increased risk exposure for stakeholders and makes the projects complicated and costly.

As a means to manage the technology risks associated with offshore HVDC transmission projects, DNV GL and STRI have developed a recommended practice on technology qualification of offshore HVDC technologies through a joint industry project with ten industry players. The new recommended practice is based on DNV GL's methodology for technology qualification, which has been used extensively for managing technology risks in the oil and gas industry for more than a decade.

Technology qualification is a method for providing evidence that technical equipment will function within specified operational limits with an acceptable level of confidence, both for suppliers and buyers of the relevant equipment.

In order to accurately incorporate feedback from all major stakeholders during the testing process, this Joint Industry Project partnered with major industry players including: ABB, Alstom Grid, DONG Energy, Elia, Europacable, Scottish Power, Statkraft, Statnett, Statoil, Svenska Kraftnät and Vattenfall.

— Source: DNV GL