The establishment of the offshore wind industry with supply chain, grid connection and installation of the wind parks at sea requires the efforts of all parties involved.

Photo: DOTI/Matthias Ibeler

"We must all work together"

Offshore wind energy is a great opportunity for the United States. But players have to act quickly to build up the new industry sector.

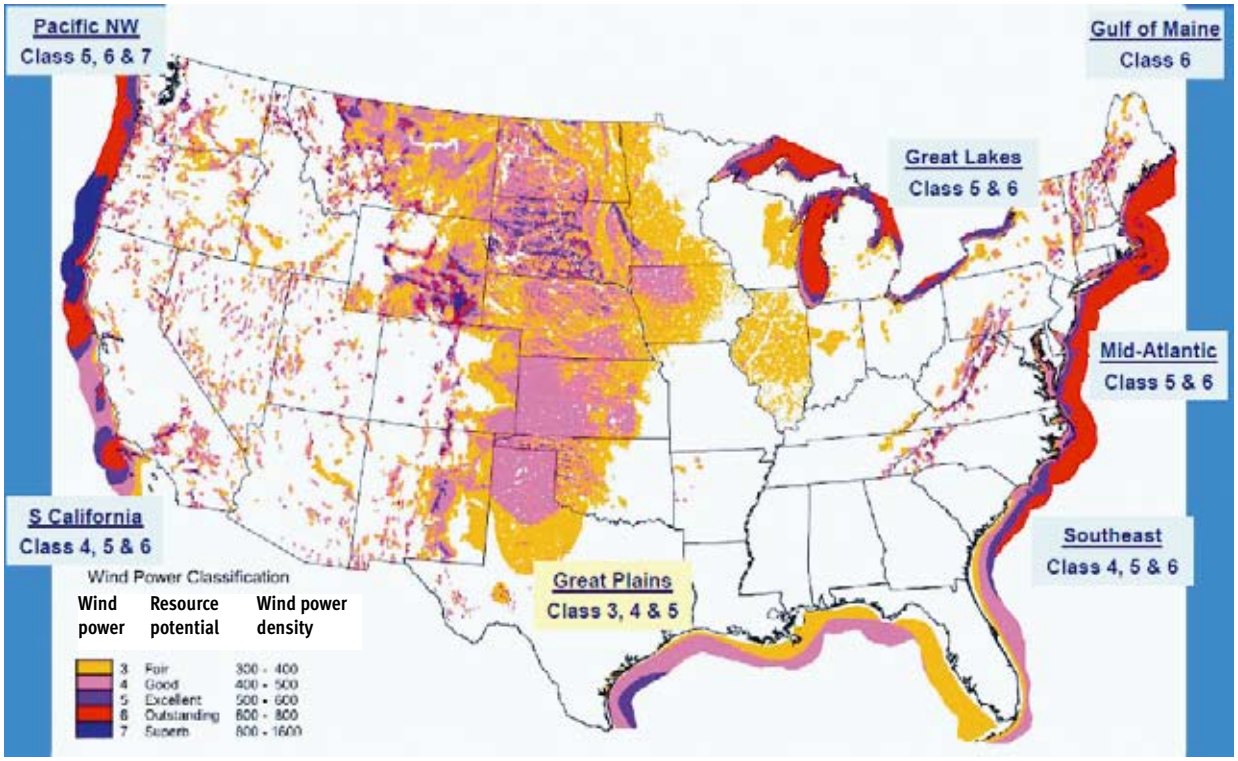
Offshore wind energy has the potential to provide the US with 54 GW of electricity by 2030 and to power the densest populations in the US with reliable, clean energy, emphasized speakers at the Offshore Wind Power conference, which took place in February in Philadelphia, Pennsylvania. Industry and states now need to overcome policy, financing, infrastructure and transmission barriers to make this a reality.

The first offshore wind contract in the US was signed between Delmarva Power and Bluewater Wind, Delaware, for 450 MW and additional projects are planned all along the East Coast, reported keynote speaker Delaware Governor Jack Markell. In addition, Governor Martin O'Malley in Maryland announced that the Maryland's Board of Regents and the Department of General Services recently approved 55 additional MW from the Bluewater Wind project in Delaware. What's more, Massachusetts Governor Deval Patrick announced that the 468 MW "Cape Wind" offshore wind project is negotiating for a long-term power purchase agreement with the National Grid utility. In addition, New York is moving ahead with its request for proposals for a project off of Long Island. Overall, the states of New Jersey, Delaware, Maryland, and Virginia have a collective goal of installing 13,464 MW of offshore wind by 2030 with 37 potential offshore wind farms.

Reinvigorating production sites

Many see offshore wind as a more attractive option than trying to move wind from onshore Midwest power plants to the East Coast, speakers said. "Republicans and Democrats alike in state houses across the East Coast are coming to realize what we have understood for a few years: that offshore wind

USA: wind resource map



Excellent perspective: the offshore wind energy potential at the US East and West Coast and in the Great Lakes is immense. Graphic: US Department of Energy, National Renewable Energy Laboratory (NREL)

provides an incredible economic and environmental opportunity," stated Markell. Offshore wind can reinvigorate manufacturing on the East Coast in ways that can reduce the trade deficit, promote energy independence, and reduce greenhouse gas emissions. These are all state and federal goals, said Dennis Duffy, Vice President of Regulatory Affairs, Cape Wind, Massachusetts.

In spite of the potential to meet state clean energy targets, jump-starting a new offshore wind industry will take a collaborative effort that involves more than just developers and state governments, speakers said. It must include the participation of all stakeholders in the supply chain. "To launch a new industry will take more than just a few projects," predicted Markell. "We must all work collaboratively to build the market demand, to build the supply chain, and to build the infrastructure necessary to grow." Despite Delaware's advances, states will not get abundant offshore wind energy by working alone, Markell said. In addition to forming new partnerships, speakers identified some other major hurdles the industry must overcome, including obtaining financing for expensive projects, infrastructure and supply chain limitations, transmission constraints, and existing policy regimes.

Powering the East Coast

Conference speakers argued that offshore wind can solve one of the most pressing issues facing the US energy industry: powering the densely populated and space-constrained East Coast, from Massachusetts to Virginia, with reliable, clean energy. Offshore wind energy provides a more competitive solution than using large wind farms in the Midwest, speakers said. However, in order to deliver energy to the dense East Coast population, states in between would have to join together and build a transmission corridor capable of delivering large amounts or power. "This will not be cheap or easy," stated Robert Mitchell, CEO, Trans-Elect, Maryland.

Alternatively, the eastern mid-Atlantic could be powered by offshore wind energy, which has several advantages. Offshore wind is located very close to major load centers. Wind energy can be harnessed during the day when there is higher demand. And the industry will provide jobs where the majority of people are located, said speakers. There are 64 GW of offshore wind potential off the coast of four densely populated eastern states: New Jersey, Delaware, Maryland, and Virginia, said Mitchell.

Building costly transmission lines to carry energy from the Midwest is expensive, but so is upgrading the existing Eastern transmission grid to carry the additional offshore wind energy load. However, it would not be as expensive as transmitting wind from the Midwest, said speakers. It would cost US$ 415 million to upgrade the grid in order to add 350 MW of new offshore wind capacity to the system, predicted Mitchell. With New Jersey, Delaware, Maryland, and Virginia aiming to install 13,464 MW of offshore wind by 2030,

only the first three or four farms could connected to the existing grid without requiring transmission upgrades, reported Mitchell. "But beyond that, there will have to be major system upgrades which will be costly for developers," expects Mitchell.

Backbone transmission grid

These costly upgrades will make offshore wind projects harder to finance in the future. That's because projects will get even more expensive and riskier for banks to invest in. To address this problem, Mitchell proposed that states build a backbone transmission grid from Virginia to New Jersey capable of carrying large energy loads. "The backbone system builds up the grid's capacity in order to accelerate the development and economic benefits of offshore wind," said Mitchell. However, project developers don't want to wait for it to be finished before they can connect their projects to the grid. In order to get offshore wind projects connected as quickly as possible, Mitchell argued for getting the backbone project started as soon as possible.

Not only would offshore wind provide for less expensive transmission upgrade costs than onshore wind from the Midwest. It would supply the East Coast with energy during peak hours, said speakers. "Offshore wind is not necessarily stronger, but the value of on-peak hours is much higher," explained Duffy. Onshore wind from the Midwest only produces energy for 10 % of the time during on-peak hours because the winds blow at night. Offshore winds blow 40 % of the time during peak hours – four times more often than onshore wind energy. This can help alleviate peak energy flows and balance out the grid, said Duffy.

7,500 jobs per year

In addition to providing on-peak energy, offshore wind has the potential to provide jobs for the densely populated East Coast, which makes more sense than providing jobs in the sparsely populated Midwest, said speakers. In the US, building 500 MW of offshore wind energy each year could create approximately 7,500 jobs per year, estimates Mitchell. "We don't know how many jobs the offshore wind industry could actually create, but we know it will be significant," said Mitchell. In the European Union, where the offshore wind industry is already established, the industry will provide 215,000 jobs by 2030, according to the European Wind Energy Association.

Offshore wind energy creates jobs because there are many parts to the supply chain. The industry includes manufacturing turbines and equipment, installation, construction, energy transmission, research and development and monitoring and testing. Most of that work is now done in Europe, but these fields are expected to grow in the US if the industry takes off.

Building up a supply chain

The cabling and transmission industry is one industry expected to grow, for example. However, the growth in such industries will pose some challenges. Joel Whitman, Director of Marketing & Strategy for Global Marine Systems, Essex, England, hopes that the cabling and transmission companies will make the entire installation and interconnection process more efficient. "Transmission cable installers do not want to be the bottleneck because of failed logistics," he said. It's possible for transmission cable installers to be the bottleneck because it takes so much planning for developers to account for all the variability involved in connecting offshore wind farms to the grid. The work requires a number of different types of vessels, depending on site characteristics.

First, developers use a group of vessels to install anchors on the seafloor. Then they use different kinds of vessels to string the cable through the anchors. Lastly, they use other vessels to install the turbines to the anchors. "There are often delays because of weather, rough seas, or vessel breakdowns," reported Whitman. He urged offshore developers to avoid making the many mistakes that European companies have made. "The true cost of installing cable is already known from projects in the EU, so do not waste time reinventing a planning process," said Whitman. Improving the efficiency of the cabling and installation process would reduce the up-front costs of producing offshore wind energy. Another way to reduce these costs is to move the supply chain to the US, conference speakers said. However, it's difficult to establish these industries before the offshore wind industry develops in the US.

Today most of the offshore wind technology – turbines, underwater AC cables, and vessels – are manufactured in Europe, where the market is. "European manufacturers have made it clear that they are not going to manufacture in the US unless there is significant demand to justify it," said Jeremy Firestone, Conference Chair and Professor of Marine Policy at the University of Delaware. This presents a chicken and egg problem: if US developers create a market, than European manufacturers will build factories here. But relying on European manufacturers while the market is developing will make offshore wind more expensive because it will be expensive to buy and ship European products.

"No need to reinvent the wheel"

Conference speakers agreed that US developers are interested in European products and practices largely because the European Union already has an offshore wind industry and has learned a lot in the process. "There is no need to reinvent the wheel," stated Firestone. Jerome Guillet, Dexia Credit Local, Brussels, encouraged conference attendees to mimic financing policies and procedures already proven

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to work in Europe. He argued that feed-in tariffs have ultimately reduced the price of energy for ratepayers in Europe. "When wind energy got above 5 % penetration, the reduction in price for consumers was larger than the increase in price of the feed-in tariff," said Guillet. Feed-in tariffs, like those in Germany and Spain, will help reduce the cost of offshore wind because they create economies of scale, explained Guillet. As an industry grows, every aspect of the supply chain becomes cheaper because of the higher quantity being produced. "Feed-in tariffs are a proven way to finance projects in the renewable energy sector and they are the cheapest even if it does not look like they are."

In addition to feed-in tariffs, another financing option employed in Germany is the use of low-risk public money from the government. The government is less willing to fund risky offshore wind projects, but more willing to fund banks that fund offshore wind projects, said Guillet. Public institutions can fund banks at low treasury rates with the stipulation that they can only use the money to lend to offshore wind projects at low rates. "This reduces the interest rate for offshore wind companies by 1 % or more and has a significant impact on the overall project cost," explained Guillet. The government basically takes a risk on the bank instead of taking a risk on the offshore wind project. This worked in Germany to promote onshore wind development, he said.

In addition to providing different types of funding, offshore wind companies can take steps to gain the confidence of banks. Guillet encouraged US companies to be fully prepared, with complete and detailed planning and risk analysis and environmental testing, before talking to banks about financing. Banks are doubly cautious about lending to offshore wind companies because it is a new market and requires large up-front capital expenditures. "In offshore wind, problems will happen," predicted Guillet. "What we are looking for as banks are not companies who tell us that they will not have problems, but companies who prove that they will be able to solve problems. This requires an experienced management team, risk analysis, and proper site testing," he said.

In spite of these financial challenges, several companies have already gained banks' confidence and obtained financing. For example, Deepwater Wind, New Jersey, has already obtained financing and secured agreements from many states for various offshore wind projects. The state of Rhode Island selected Deepwater Wind as its preferred offshore wind developer and is in the process of developing two offshore wind parks.

Floating turbines for deeper water

"We are projected to start deploying the turbines in 2012 and we have a power purchase agreement with the National Grid to take that power," reported Jim Lanard, Managing Director of Deepwater Wind. The other project, The Rhode Island Wind Farm, will have up to 130 turbines in federal waters further off the coast. New Jersey also selected Deepwater Wind and its partner, the Public Service Enterprise Group in New Jersey, to develop the state's first pilot offshore wind farm. In addition, the US Department of the Interior's Minerals Management Services (MMS) awarded Deepwater Wind two leases to develop meteorology towers off the coast of New Jersey on the outer continental shelf.

The MMS and offshore wind developers are already looking to develop offshore wind farms further out to sea where water is deeper. These waters require different technology – floating turbines – which have not yet been used commercially. Floating turbine technology is starting to become a more viable option, said Alla Weinstein, CEO of Principle Power, Washington. For example, Principle Power is working to develop a floating turbine technology

Principle Power is working to develop a floating turbine technology called WindFloat, for water depths of 50 m and more. The company is now planning a 150 MW offshore project in deeper water off the coast of Tillamook, Oregon, US West Coast.

Graphic: Principle Power

called the WindFloat. Right now all the wind farms in the world and those under consideration as the first wind farms in the US are in waters less than 50 metre deep and therefore do not require floating turbines.

"It is inevitable that the offshore wind industry will move to deeper water because of several advantages," said Weinstein at the conference. Offshore wind developers could go to deeper areas and open up offshore wind energy in other parts of the world. For example, the West Coast of the US only has suitable offshore wind sites in deeper water. Another benefit is that the environmental impact will be lower. Lastly, deeper water is usually further off the coast, so floating turbines would not obstruct ocean views, which is a major concern in parts of the Northeastern US, said Weinstein.

Principle Power is now planning a 150 MW offshore project off the coast of Tillamook, Oregon, which will likely be the first offshore wind farm on the US West Coast. "The site is ideal because there is a good transmission system to connect to the wind farm and there is strong community and regional interest in the project," reported Weinstein. Local businesses believe it will bring tourism and jobs to the region. By the end of the decade, floating turbines may become more commonplace along the West Coast of the US, she expects.

States and industry need to move quickly

Another type of offshore wind energy that will become more common is freshwater offshore wind, which the US has a lot of. Freshwater offshore wind is another option that could be developed in places like the Great Lakes, expects Timothy Ryan, President, Apex Offshore Wind, Virginia. "There is no threat of salt water corrosion and there is less severe weather on the Great Lakes," he said. However, there are hazards, including ice, which are unique to freshwater offshore wind developments. These challenges will be addressed with more research and development, said Ryan. "It is only a matter of time before the Great Lakes will provide offshore wind energy to the region," he said.

In order to make any kind of offshore wind a reality in the US, the states and industry need to move quickly to address the many challenges, speakers said. Industries, government and organizations must work together to do this. "Every day we delay is another day of dirty power," stated Markell.

Reid Smith, Lisa Cohn

Further information:
Apex Offshore Wind: www.apexwind.com
Bluewater Wind: www.bluewaterwind.com
Cape Wind: www.capewind.org
Deepwater Wind: www.dwwind.com
Delmarva Power: www.delmarva.com
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