



THE BUSINESS NETWORK FOR OFFSHORE WIND

U.S. OFFSHORE WIND MARKET REPORT & INSIGHTS 2020

MEMBERS ONLY

The Business Network for Offshore Wind's 2020 U.S. Offshore Wind Market and Insights offers an analysis of federal and state government activity to better understand how it may affect your business planning and the industry holistically. The federal government has turned its attention to the burgeoning industry to offer more regulation. Congress and federal agencies beyond the Department of Interior's Bureau of Ocean and Energy Management and U.S. Department of Energy are now affecting how the offshore wind industry will operate into the future. This report also discusses how some of the challenges facing offshore wind are being addressed.

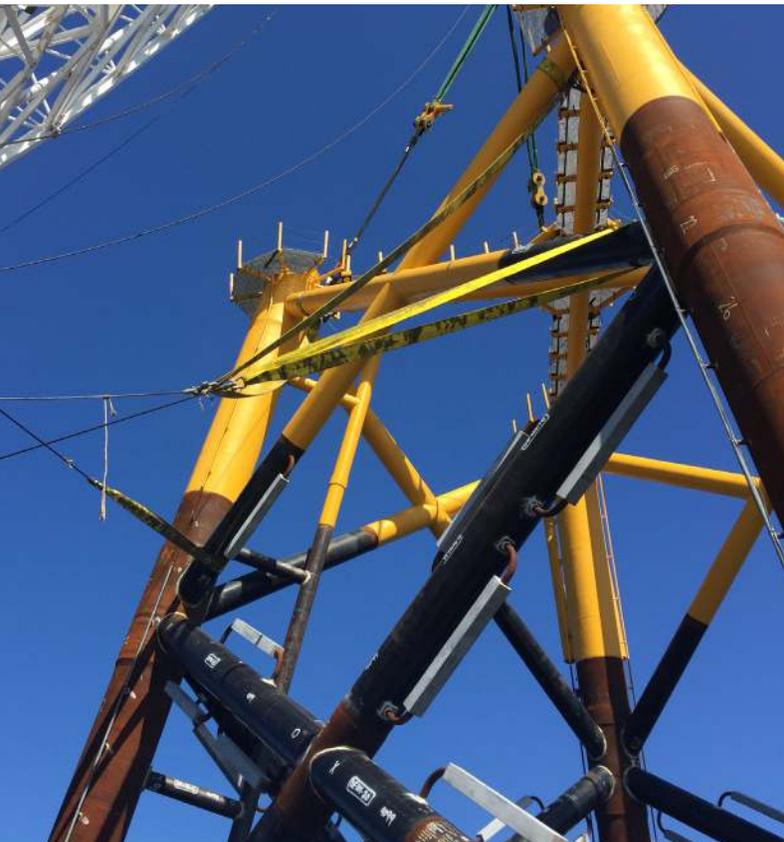
The health and safety of workers – whether onshore or offshore – are a paramount tenet within the industry. Particularly at this time, the offshore industry remains proactive in its response to the coronavirus epidemic, having put in place telework directives, eliminating unnecessary travel, and following government guidelines. As a result of these protocols, Europe has reported minimal disruptions to the supply chains and the 15 offshore wind projects in the U.S., remain in the planning and development stages.

It is too soon to know exactly how the global COVID-19 epidemic disruption will affect the U.S. offshore wind industry. Our main concern centers around the economic hardship a long-term shutdown and recession would place on secondary and tertiary U.S. suppliers. It is important to point out, however, that there is almost 10GWs of U.S. offshore wind supported with public sector financial mechanisms that will be a boost for local economies. If the White House wants to boost the economy, it doesn't have to look any further than the Department of Interior, which has the authority to approve massive infrastructure offshore wind energy projects and currently has four under review. The federal government must act now – today, not in December – and approve project construction and operation plans (COPs). U.S. small businesses will need work immediately following the containment of the coronavirus and next year may be too late to keep them solvent. The time to act on offshore wind at the federal level is now.

**Globally, offshore wind energy is truly an
unparalleled business opportunity.**

This report is focused on the U.S. offshore wind market, but it is important not to view the U.S. in isolation. Globally, offshore wind energy is truly an unparalleled business opportunity. The 2019 International Energy Agency (IEA) Offshore Wind Outlook projected that by 2040, at least \$1 trillion USD would be invested in offshore wind. If this level of investment is realized, offshore wind installations would comprise approximately 10 percent of all global renewable power plants. The IEA also estimated that, globally, offshore wind could generate approximately 420,000 terawatt-hours annually – this is more than 18 times the current global electricity demand.

A state-by-state examination of 2019 developments in the U.S. offshore wind market, including offshore wind capacity procurements by state governments, increases state offshore wind targets, project timelines, and the latest on industry activities, follows our market analysis.



Turbines Spinning in Federal Waters

The most significant U.S. offshore wind development in 2020 will be the commencement of operations of the first offshore wind turbines in federal waters. The importance of the Coastal Virginia Offshore Wind (CVOW) project, a small two-turbine, 12 megawatt fixed-bottom pilot installation, should not be overlooked. It represents a significant step in the evolution of the U.S. market. The CVOW project will:

1. Provide local supply chain experience;
2. Enhance federal, state, and local government understanding of how regulatory structures impact the offshore wind development process;
3. Expose areas requiring greater interagency coordination and communication; and,
4. Generate invaluable real-world data regarding turbine performance during East Coast hurricanes.

As the U.S. offshore wind industry progresses into the new decade, the CVOW project will serve as a living laboratory. It will also lead to a much larger 2,640 megawatt utility-scale offshore wind project to be built by Dominion Energy, an experienced U.S. utility with extensive U.S. regulatory expertise.

Dominion Energy: A U.S. Utility Offers a Different Development Approach

Dominion Energy’s 2,640 megawatt utility-scale offshore wind project presents a uniquely vertically-integrated framework that is not replicated elsewhere within the U.S. offshore wind market. Stated differently, Dominion – an onshore “wires” (i.e. utility) company will serve as: (1) offshore wind leaseholder, (2) project developer and operator, and (3) electricity off-taker. By contrast, all other U.S. offshore wind projects are currently owned, developed, and will be operated by third-party private developers that enter power purchase agreements with the off-taking onshore electricity distribution companies. It will be interesting to

see how the two differing offshore wind business models progress through the 2020s, which are sure to be a booming decade for American offshore wind.

In support of this project, members of the Senate and House of Virginia voted to approve Senate Bill 998. If enacted, this measure would allow Dominion Energy to recover all costs of offshore wind projects with a rated capacity “not less than 2,500 megawatts and not more than 3,000 megawatts, along with electrical transmission or distribution facilities associated therewith” provided the utility has begun construction before 2024, or has a plan for the facilities to be in service by 2028.

Utility companies like Dominion Energy recover costs for the electricity generation and transmission projects they undertake by including a charge on the electricity bills paid by end users (i.e. residential, commercial, industrial customers). Speaking generally, this is no different than cost recovery associated any other utility-owned generation or transmission asset. As noted above, Dominion’s unique business model for this offshore wind project – constructing, operating, and recovering costs – differs from the business model of all other U.S. offshore wind projects. The complexities of electricity rate design are beyond the scope of this report. Nonetheless, it is worth noting that Virginia’s cost recovery mechanism for this project differs from the Offshore Renewable Energy Certificate/Credit model utilized in Maryland, New Jersey, and New York.

The cost recovery bill measure must be passed by the State Legislature and signed by Governor Ralph Northam to become law.

White House Acts on Offshore Wind

Released in February 2020, Vineyard Wind’s updated federal permitting review timeline coincides with this Administration’s proposed 2021 budget, which allocates nearly \$27 million to offshore renewable energy, a \$5 million increase over last year’s

budget.¹ These actions indicate that the White House, through the budgeting process, is addressing known resource constraints inside of BOEM. It also suggests that the Administration understands the importance of permitting wind energy areas and that delays would impact future lease bids. BOEM has not made any official statement with respect to the precise timing of future federal offshore wind leasing activities, but it appears unlikely that any auctions for additional Wind Energy Areas will be conducted until a Record of Decision is issued for the Vineyard Wind final Environmental Impact Statement (EIS).

BOEM has indicated they will continue to review Vineyard Wind’s EIS as quickly as possible, but they have given themselves until the end of the year to meet their schedule. The Record of Decision for Vineyard’s final Environmental Impact Statement (EIS) is due December 18, 2020. Although this project decision has been pushed to the latter portion of 2020, the public release of a revised permitting schedule is a very positive step. It provides much-needed transparency into the federal decision-making process, which will help foster greater regulatory certainty, and enable the continued growth of the U.S. offshore wind industry.

Once the Record of Decision for Vineyard Wind’s EIS has been issued, decisions on the other projects with construction and operations plans (COPs) under review should follow in a more timely manner. Seven COPs have been submitted in total.

In January 2020, the White House Council on Environmental Quality announced a restructuring of the regulations implementing the National Environmental Policy Act (NEPA). A cornerstone of U.S. federal environmental law, NEPA requires:

- Federal agencies to complete an EIS when they propose projects or other federal actions that significantly affect the quality of the human environment;
- A consideration of different reasonable alternatives

¹ Note that Congress could also increase the budget through the federal appropriations process.

to the proposed infrastructure project or federal action (including taking no action); and

- Transparency and opportunities for public input.

The proposed NEPA changes include eliminating the need for consideration of a project’s “cumulative impacts,” and modifying the manner in which greenhouse gas emissions and climate impacts are analyzed. Offshore wind facilities are considered large infrastructure projects, but it remains unclear whether or how the new NEPA rules will impact U.S. offshore wind projects. The Business Network is continuing to monitor these proposed regulatory modifications.

Government Accountability Office: Jones Act-Compliant Vessels

The Government Accountability Office (GAO), a non-partisan investigative arm of Congress, is conducting work regarding Jones Act-compliant vessels required to support offshore wind energy projects. The study is in response to a mandate in the National Defense Authorization Act of 2020 (NDAA). Preliminary findings will be reported to Congress in June.

Specifically, NDAA requires GAO to provide to Congress:

1. An inventory of vessels to install, operate, and maintain emerging offshore energy infrastructure;
2. A projection of existing vessels needed to meet such emerging offshore energy needs over the next 10 years;
3. A summary of actions taken or proposed by offshore energy developers and producers, the U.S. domestic shipbuilding industry, and U.S. coastwise qualified operators to ensure sufficient vessel capacity in compliance with laws; and
4. A description of potential benefits to the U.S. maritime and shipbuilding industries and U.S. economy associated with the use of qualified vessels to support offshore energy development.

This increased focus upon the vessel needs of U.S. off-

shore wind projects signals that Congress is awakening to the industry’s significant economic development prospects, and that federal resources are beginning to be mobilized to meet that demand. The U.S. offshore wind industry needs appropriate port infrastructure and vessels, in both the short and longer term. The maturation of domestic U.S. offshore wind vessel, maritime, and port industries will provide jobs for Americans and will aid in continuing to drive down U.S. offshore wind project costs.

We believe 2020 will be the year of the offshore wind vessel. Additional crew transfer vessels (CTVs) and service operation vessels (SOVs) orders will follow during 2020-21 as projects in New York, New Jersey, and Virginia advance through the development and permitting processes. Forecasts suggest 50-60 CTVs and 4-8 SOVs must be built in the next 5 - 6 years to service the projected offshore wind pipeline. The designs of U.S. SOVs and CTVs will be tailored to fit project parameters and budget, so there may not be a one-size-fits-all solution.

Federal Energy Regulatory Commission (FERC)

In December 2019, the Federal Energy Regulatory Commission (FERC) issued what some commentators have described as its most consequential decision. FERC regulates, among other things, electricity transmission and market operations. The ruling in question directed PJM Interconnection (PJM) – a regional transmission organization (RTO) serving Virginia, Maryland, Delaware, New Jersey, nine other states, and the District of Columbia – to expand the Minimum Offer Price Rule (MOPR) as it relates to PJM’s Reliability Pricing Model (PJM’s capacity market). Capacity markets are used by wholesale electricity market operators, like PJM, to ensure long-term grid reliability and future electricity supply. This FERC ruling has direct implications for offshore wind projects in states that are part of PJM (Maryland, New Jersey, Virginia, Delaware, and northeastern portions of North Carolina).



Essentially, FERC’s decision directs PJM to create new market rules that require resources subject to the MOPR – like offshore wind and other renewable energy projects – to bid into PJM’s capacity auctions at or above a price floor that is fixed by PJM. Stated differently, FERC wants PJM to rewrite its capacity market rules to artificially force renewable electricity generators to bid at a higher price than they otherwise would.

Many PJM states view the FERC decision as improper federal interference with state clean energy policy objectives. FERC has been flooded with rehearing requests, and some states including Maryland and New Jersey have hinted they are considering pulling their utilities out of PJM’s capacity market entirely. Legal challenges to this ruling are expected.

The Business Network is continuing to investigate the potential impacts of the MOPR ruling as it applies to offshore wind projects. There has been widespread reaction to this ruling, as it impacts a broad (some would say excessively broad) range of renewable energy tech-

nologies. PJM has filed a Request for Rehearing/Clarification with FERC. The Network encourages interested parties – particularly offshore wind developers with a PJM Queue Position – to stay abreast of developments, and to remain engaged in PJM’s stakeholder process. More information can be found at PJM Inside Lines.

Offshore Grid and Transmission Planning

Grid and transmission planning is also key to ensuring the steady growth of the U.S. offshore wind industry in the long-term. It is fairly well-settled that the first several gigawatts of offshore wind projects will be connected to the onshore grid via generator lead line (a/k/a proprietary or direct radial) transmission. However, multiple states – namely, Massachusetts New Jersey and New York – have commenced their examination of shared (i.e., open access) transmission configurations for future offshore wind installations. These proposed shared transmission solutions will enable multiple offshore wind projects to transport their electricity to shore via fewer, but higher capacity, high voltage direct current (HVDC) export cables.

FEDERAL

All currently proposed U.S. offshore wind projects utilize proprietary transmission configurations. In other words, each offshore wind project has its own individual transmission infrastructure, which is constructed by the same developer that constructs the offshore wind turbines (the generation assets). For this reason, to date, BOEM has been the lead federal agency on offshore wind transmission.

However, Anbaric, a third-party offshore transmission developer, is spearheading shared transmission alternatives in Massachusetts, New Jersey, and New York. In each state, Anbaric proposes an “OceanGrid” solution that would transmit the electricity from multiple offshore wind projects to shore. BOEM retains regulatory responsibility for approving the offshore construction of an OceanGrid. However, in February 2018, FERC approved Anbaric to conduct an “open season” bidding process for offshore wind developers to connect to the OceanGrids. The Busi-

ness Network anticipates, and will continue to monitor, the future evolution of the complex regulatory ecosystem governing offshore wind transmission infrastructure.

MASSACHUSETTS

Even as early as its first Section 83C offshore wind solicitation, the result of which was the Vineyard Wind 1 award in 2018, Massachusetts required developers to include proposals for expandable, open-access offshore transmission facilities. During March 2020, the Massachusetts Clean Energy Center (MassCEC) and Department of Energy Resources (DOER) jointly hosted a stakeholder meeting regarding Massachusetts transmission considerations. Additionally, the New England States Committee on Electricity (NE-SCOE) requested that ISO-NE study the transmission system and wholesale market impacts associated with several offshore wind energy integration scenarios by 2030 and 2035; results of this analysis are expected soon.

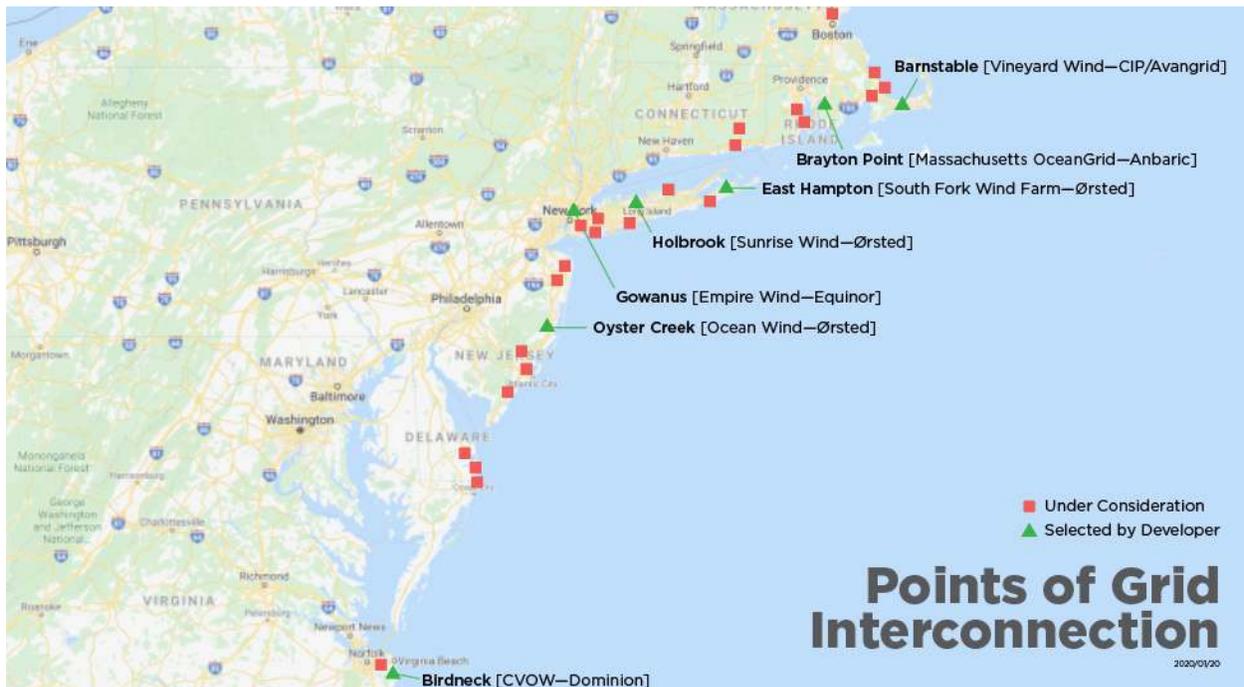
NEW JERSEY

New Jersey has also begun to explore its offshore wind transmission options. During 2019, the Board of Public Utilities (BPU) held two transmission-focused stakeholder meetings. The first, a roundtable held at Princeton University, was convened to solicit input from transmission stakeholders to inform the Offshore Wind Strategic Plan, which remains under development as of March 2020. In November 2019, the BPU conducted its second transmission meeting, a technical conference with a series of panel discussions examining the following:

- Shared transmission solutions and associated cost allocation frameworks that other U.S. and international jurisdictions have employed to interconnect geographically remote generation facilities;
- The technical requirements and constraints associated with these solutions; and,
- Whether New Jersey’s legal and regulatory framework is suited to these solutions.

Grid Interconnection Points

Interconnections for offshore wind projects were identified in 2019. Below is a map identifying grid interconnections points.



Additionally, during early 2020, New Jersey modified the language of the Offshore Wind Economic Development Act to expand the definition of “qualified offshore wind project,” rendering an “open access offshore wind transmission facility” eligible to receive ORECs. The legislation grants BPU the authority to conduct future transmission-only competitive solicitations. This sets the stage for a shared transmission arrangement, like Anbaric’s proposed OceanGrid.

NEW YORK

The New York Public Service Commission Order permitting New York’s Phase 1 offshore wind solicitation specifically identifies a backbone transmission system as a primary consideration for Phase 2. NYSERDA’s recent petition to commence Phase 2 confirms this, though NYSERDA has observed that the lack of additional leasing by the Bureau of Ocean Energy Management (BOEM) in the New York Bight Wind Energy Area (WEA) has required adjustments to their ongoing study of offshore transmission configurations.

It is imperative that collaborative approaches for grid and transmission solutions be developed on both coasts in order to justify the billions of dollars of investments necessary for

establishing a manufacturing and local supply chain.

Otherwise, there is a real risk that the continued expansion of the U.S. offshore wind industry will be stymied by an inability to integrate the electricity generated offshore into the onshore grid. The Business Network will continue to engage with grid and transmission stakeholders in all offshore wind-interested states on this critical issue.

U.S. Offshore Wind Project Costs Continue to Decline

Notwithstanding the uncertainty it may cause with respect to a Jones Act vessel, increasing turbine size is a key driver of cost declines observed in European offshore wind projects. As individual turbine capacities expand, a reduction occurs in the number of turbines that must be installed in order to reach the same overall project MW size.

The proof of the declining cost trend is well-documented. In January 2018, NYSERDA released a Policy Options Paper analyzing multiple proposed variations of New York’s Offshore Renewable Energy Certificate (OREC)



structure. The Empire Wind and Sunrise Wind projects, awarded in 2019, have an average all-in development price of \$83.36 per megawatt-hour, with an expected average OREC cost of \$25.14. These prices are 40 percent less than those projected in the January 2018 Policy Options Paper, released barely one year earlier.

New Jersey's Ocean Wind project has an all-in development price of \$98.10 per megawatt-hour, with a leveraged net OREC price of \$46.46 per megawatt-hour. Note that New York and New Jersey's respective OREC structures vary slightly, but the prices between states are nonetheless fairly consistent.

Continuing the downward cost trend, Mayflower Wind recently announced that its contracted price is \$58 per megawatt-hour, a new record for U.S. offshore wind. This places Mayflower Wind's price below the \$84.23 per megawatt-hour original price cap for Massachusetts' second offshore wind solicitation (a legislative requirement that has since been amended). Similarly, Park City Wind in Connecticut has not made its price public, but it has been described as "lower than any other publicly announced offshore wind project in North America."

This declining price trend suggests that the American offshore wind industry is paralleling the European experience, where prices have consistently, and often dramatically, fallen over time. For instance, in September, the United Kingdom's third Contracts for Difference (CfD) auction saw record low offshore wind auction prices (approximately \$50 per megawatt-hour). As compared to prior auction rounds, prices dropped approximately 30 percent (relative to the second CfD auction in 2017), and 66 percent (relative to the first CfD auction in 2015).

Congress – Federal Investment Tax Credit

Though offshore wind project costs continue to decline, these projects still require substantial up-front investment with additional costs and time needed to build the local supply chain and infrastructure. U.S.

offshore wind developers have traditionally relied upon the Investment Tax Credit (ITC). Last year, Congress finally recognizes that offshore wind needed its own Investment Tax Credit (ITC), a stand-alone financial mechanism that was separate from incentives for land-based wind. The renewable energy tax credit extenders package passed at the end of 2019 did not include the distinct 30 percent Offshore Wind Investment Tax Credit proposal. The Investment Tax Credit is a one-time credit against the investment cost of a qualified energy facility. However, the production tax credit applicable to all wind projects was extended for one year. Unlike the ITC, the production tax credit (PTC) is a volumetric, per kilowatt-hour tax credit that is traditionally selected by onshore wind developers. Through a legislative quirk, offshore wind developers can still elect to receive a discounted ITC (approximately 18 percent, called "PTC as ITC").

An offshore wind developer that spends 5 percent of project costs (the "safe harbor" provision) can still qualify for the 18 percent discounted PTC as ITC. For suppliers, this means that offshore wind developers still seeking to capitalize on the discounted ITC may procure equipment during 2020, even if certain project approvals remain pending. For example, the Mayflower Wind project contracted for its offshore substation design, fabrication, and delivery without a finalized power purchase agreement with Massachusetts utilities, and without even having submitted a COP to BOEM. Other developers may elect to follow this course of action as well.

2020 will see a renewed push for the tax credits. The tax code remains the most effective federal policy tool for helping the offshore wind industry continue to reduce costs. Iowa Republican Senator and Finance Committee Chairman Grassley has said he is open to negotiations that put clean energy tax credits back on the congressional agenda in the coming months. Given the acrimony in Washington, D.C. and the impending Presidential election, it is unlikely that any serious movements on a tax extender bill will happen before December 2020. However, the offshore wind industry should continue the momentum it gained in 2019 with the extension of

the PTC and continue to make its own needs known to Congress and federal agencies.

Federal and State Workforce Development

A greater emphasis will be placed on understanding the skills and capability requirements of an offshore workforce as well as developing educational and training programs. States, educational institutions, and private developers have already been taking action to meet workforce needs. Additional worker training programs specific to core aspects of offshore wind development are also anticipated in 2020.

U.S. Senators Tom Carper (D-Del.), Ed Markey (D-Mass.), Susan Collins (R-Maine), and Sheldon Whitehouse (D-R.I.) introduced the “Offshore Wind Jobs and Opportunity Act.” If enacted, this legislation would provide up to \$25 million in federal grants to help colleges, universities, unions and non-profits educate “a new generation of offshore wind workers.” The bill remains with the Senate Committee on Energy and Natural Resources.

East Coast states are taking action to prepare training and education programs to meet this future demand:

- **MARYLAND-** for fiscal year 2020, the Maryland Energy Administration (MEA) created a \$1.2 million Offshore Wind Workforce Training Program, which provides grant funding to create offshore wind training centers.
- **MASSACHUSETTS-** the Port of New Bedford is working on a new waterfront offshore wind training facility. In May 2019, \$721,500 in total grant funding was awarded to six academic institutions, including Massachusetts Maritime Academy, to establish offshore wind training and development programs.
- **NEW YORK-** New York State Advisory Council on Offshore Wind Economic and Workforce Development was established to meet New York’s offshore wind workforce needs. The Offshore Wind Training Institute and Community and Workforce Benefits

Fund represent a combined \$23 million investment in offshore wind workforce development. Additionally, NYSERDA is receiving direction from the Jobs and Supply Chain Technical Working Group regarding use of an additional \$10 million earmarked for offshore wind workforce training.

- **RHODE ISLAND-** in April 2019, Gov. Gina Raimondo announced a \$4.5 million pledge from Ørsted and Eversource to support offshore wind workforce development in Rhode Island.

Public Sector R&D and Private Innovation Tackling Challenging Issues

BOEM is continuing to work closely with the State of California and the Department of Defense (DoD) regarding offshore wind lease siting off the Central Coast. The DOE is spearheading the Radar Interference Mitigation Working Group to facilitate an exchange of information between the offshore wind industry, radar experts, and federal agencies, and to discuss research needs for offshore wind development that may impact sensitive radar systems.

The National Offshore Wind R&D Consortium (R&D Consortium) awarded its first grants to R&D projects focused on optimizing plant performance, reducing foundation cost, innovations for anchoring/mooring floating offshore wind turbines, reducing transmission and distribution cost, and mitigating risk.

In January 2020, Ørsted announced its intention to site its U.S. Innovation Hub in Providence, Rhode Island. This facility, located in the CIC Providence workspace, will enable Ørsted to find U.S.-based companies that are developing advanced solutions to spur the next generation of offshore wind projects. Intended to serve as an initial point of contact for any American companies interested in contracting with Ørsted, the Innovation Hub will host regular meetings, gatherings, bi-monthly open-door days, and, for pre-qualified participants, quarterly pitch days.



BLOCK ISLAND OFFSHORE WIND FARM—COURTESY OF DEEPWATER WIND

Stronger Together: Regional Collaboration

States along the East Coast are working cooperatively as a result of the federal leasing process, and to aggregate offtake commitments into a larger regional market. The Gulf of Maine stakeholder process involves Maine, Massachusetts and New Hampshire. The Governors of Connecticut, Massachusetts, and Rhode Island meet regularly to discuss offshore wind. It seems likely that this cooperation will be extended to Maine and New Hampshire as the federal leasing process moves forward. A Northeast offshore wind hub is taking shape, with Connecticut anchoring activity with a deep-water port and unobstructed access to the sea. This five-state region appears to be forming its own offshore wind cluster.

New York and New Jersey continue to move forward with the largest offshore wind programs. The states coordinate on topics related to federal leasing and offshore wind siting. New Jersey serves on New York's Fishing and Environmental Technical Working Groups and has been engaged in the development of the Responsible Offshore Science Alliance (ROSA) and other regional science entities. The Port Authority

of New York and New Jersey, a unique interstate agency, has explored supporting the offshore wind industry through marine terminals and ports. Informally, New York and New Jersey also have integrated common themes and emphasis within their RFPs and supply chain development, creating consistency between the two largest offshore wind markets in the U.S.

BOEM has combined the planning and leasing process for the WEA located offshore Wilmington, North Carolina, and the "Call Areas" located offshore South Carolina to follow a similar regional model observed further north. Recognizing that the offshore wind industry has evolved in recent years, moving forward, BOEM will work with both North and South Carolina using a regional model to plan and analyze potential future offshore wind leasing in the Carolinas. Additionally, the Commonwealth of Virginia has expressed interest in identifying additional WEAs for potential future offshore wind leasing. Virginia and Dominion's bold, utility-owned strategy to support and develop offshore wind positions the Commonwealth as a Mid-Atlantic hub for offshore wind. Virginia Governor Northam has publicly stated that he wants to cooperate for a Mid-Atlantic OSW hub.

States will always compete with each other for economic development, but it is clear that states understand they are stronger together if they cooperate – particularly in the development of offshore wind. To that point, states will collectively work together to push the federal government on offshore wind project permitting and additional offshore wind leasing. States have increased Renewable Portfolio Standards (RPS), and the closing of power plants has made building offshore wind projects a necessity for many East Coast states. In 2020, expect to see Governors and Congressional delegations taking a more active role in pushing the Department of Interior to explain delays and use the federal appropriations process to push the Department forward.

Market Moving Quickly

The speed at which the U.S. offshore wind market is moving extends beyond just setting State procurement goals and commitments. State governments are working to quickly respond to offshore wind industry challenges. A year ago, States were not discussing shared or open access grid and transmission, few workforce development programs were in place, and there was no coordinated national research program to leverage public and private sector resources.

As the industry continues to accelerate, engagement with commercial fishermen will remain crucial. During 2019, offshore wind developers in the Northeast cluster formed a unified voice and jointly proposed, to BOEM and U.S. Coast Guard, a uniform grid layout across the Massachusetts-Rhode Island Wind Energy Area. The Coast Guard's January 2020 Port Access Route Study concurs with this proposed layout. Fishermen have advocated for larger transit lanes, which could be seen as a negative, but the fact that a dialogue is taking place at all is very positive progress. It is also encouraging to see the developers of different Massachusetts-Rhode Island Wind Energy Area leases unifying with respect to array configurations.

Looking ahead, East Coast states will continue aggres-

sive off-take programs, and several additional gigawatts will be procured during 2020. New York was first out of the gate — in January 2020, the New York State Energy Research and Development Authority (NYSERDA) petitioned the New York Public Service Commission to authorize the issuance of New York's Phase 2 offshore wind solicitation, which will seek 1,000 to 2,500 megawatts.

The speed at which the U.S. offshore wind market is moving extends beyond just setting State procurement goals and commitments.

In neighboring New Jersey, Governor Phil Murphy had previously called upon the state's Board of Public Utilities to consider issuing 1,200 megawatt solicitations in 2020 and 2022, but has since increased New Jersey's offshore wind target to 7,500 megawatts. New Jersey recently announced its proposed offshore wind solicitation schedule through

2035. The state's next solicitation, for 1,200 megawatts, will open by September 2020.

Maryland's Clean Energy Jobs Act of 2019 directed the state Public Service Commission to open an application period for Round 2 offshore wind projects on January 1, 2020; the PSC has not yet made available any RFP document. It is also possible that Connecticut, Massachusetts, Virginia, and/or Rhode Island may procure additional offshore wind capacity during 2020. In addition, Massachusetts and Virginia have proposed legislation to increase their offshore wind goals to 6,000 megawatts and 5,200 megawatts, respectively.

On the West Coast, California's complicated energy policy landscape will continue to make offshore wind challenging. However, the next few years could see Oregon and Washington State enter the offshore wind game in a more serious way.

Attract The Next Generation

In the next four to six years, U.S. developers expect to manufacture, construct and install over 9,000 megawatts of offshore wind. It is imperative that we begin to attract the next generation of workers into the industry. The industry should invest in new U.S.-based talent, which includes providing new hires experience in Europe. This experience can be brought back to the U.S. In an answer to this call, universities and colleges on the East Coast are creating offshore wind degrees, certificates, or course programs, often with the guidance of European experts. But the industry needs more programs in every state and proactive outreach measures as it competes for talent with other sectors.

Conclusion

The U.S. offshore wind market system remains highly fragmented. The Federal government leases, permits, and regulates offshore wind projects installed beyond three miles off the U.S. coast.² Meanwhile, states enact market policy creating demand for offshore wind generation capacity. The two levels of government do not always mesh. In 2020, expect the fragmentation between the two systems to gain attention and become increasingly more apparent. To bridge these gaps, the offshore wind industry must make its own economic and environmental arguments for why the two systems of government must more closely coordinate.

2020 is the year “the rubber hits the road” for U.S. offshore wind.

Many of the major advancements for offshore wind won't materialize until the end of 2020, when BOEM will make its announcement on the Vineyard Wind 1 EIS decision and next round of lease auctions. In the meantime, the industry and government must focus on the details of establishing this industry, especially on the East Coast. These include:

- Address gaps in workforce development
- Build secondary and tertiary supply chain capacity to meet low-cost pricing pressures
- Gain greater clarity concerning the complex and evolving regulatory structure that governs U.S. offshore wind projects, including impacts of the Jones Act, FERC rulings, NEPA rule revisions, and more practical items, like U.S. employment laws.

2020 is the year “the rubber hits the road” for U.S. offshore wind.

² For Florida, Texas, and Puerto Rico, this boundary is 9 miles offshore.





BURBO BANK OFFSHORE WIND FARM—COURTESY OF ØRSTED

THE BUSINESS NETWORK FOR OFFSHORE WIND

U.S. OFFSHORE WIND ACTIVITY REPORT

Compiling data from the Business Network’s Supply Chain Database and Registry, ninety-four companies have self identified that they have received supplier contracts, and have worked on, or are working on, one or more of the U.S. projects. Below is a sample of the contracts taken from public sources.

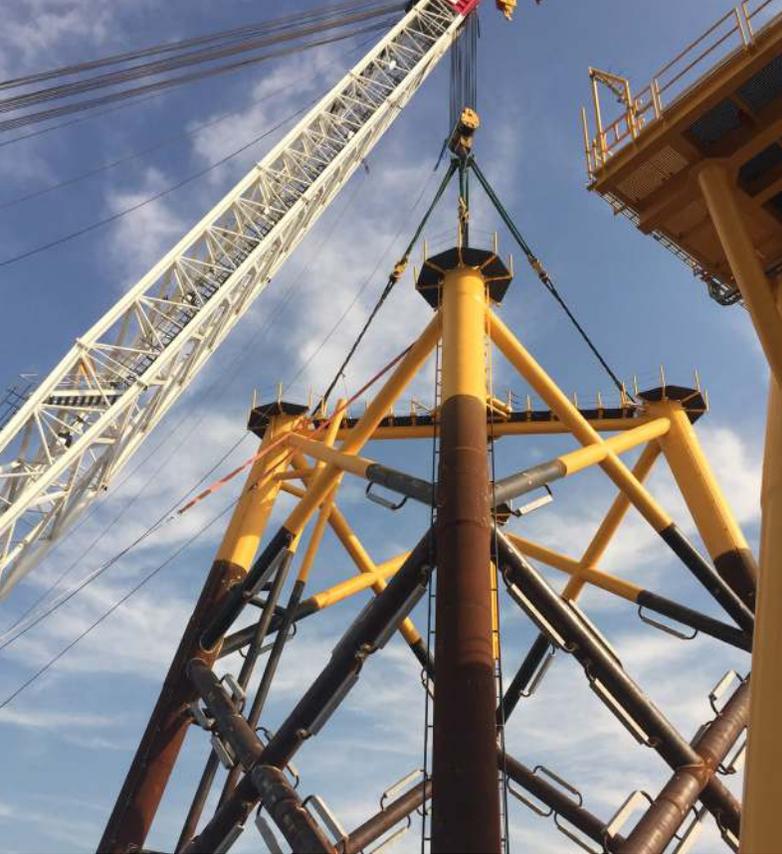
PROJECT	STATE	DEVELOPER	SERVICE/PROVIDER
Vineyard Wind 1	MA	Avangrid & CIP	MHI Vestas–turbines; SIF–foundations; Bladt Industries, Semco, ISC Engineering–substation; Prysamian–cables; Windar Renovables–tower
Bay State Wind	MA	Ørsted & Eversource	Nexans–cables
Mayflower Wind	MA	EDP-R & Shell	Hellenic–cables; Bladt, Semco, ISC Engineering–substation
Constitution Wind	CT	Ørsted & Eversource	TBD

DEVELOPERS CHART (CONTINUED)

PROJECT	STATE	DEVELOPER	SERVICE/PROVIDER
Revolution Wind	RI	Ørsted & Eversource	Siemens Gamesa-turbines; Rutgers University-acoustic monitoring (several Ørsted sites); Senesco Marine-CTV
Revolution Wind	CT	Ørsted & Eversource	Siemens Gamesa-turbines; ThayerMahan-wildlife monitoring
Park City Wind	CT	Avangrid & CIP	Marmon Utility-Kerite cables
South Fork	NY	Ørsted & Eversource	Siemens Gamesa-turbines
Empire Wind	NY	Equinor	Prysmian-cables; Gravity Based Structure (GBS) foundations Albany area
Sunrise Wind	NY	Ørsted & Eversource	Siemens Gamesa-turbines
Ocean Wind	NJ	Ørsted & PSEG	EEW-foundations; GE-turbines (12MW); EGS-surveys
MarWin	MD	US Wind	Gulf Island, Maritime Applied Physics, Strum Contracting-metoccean tower
Skipjack	MD	Ørsted	GE-turbines (12MW)
Dominion CVOW	VA	Dominion/Ørsted	Siemens Gamesa-turbines; L.E. Myers-electrical design
Kitty Hawk	NC	Avangrid	TBD
Not Assigned to Project			Atlantic Wind Transfers-2 CTVs
Not Assigned to Project			Welcon & Marmen-towers & foundations (U.S. factory)



HYWIND—COURTESY OF EQUINOR



Project Timelines

Without question, 2019 was overall a positive year for U.S. offshore wind. Nonetheless, the permitting delays associated with Vineyard Wind 1 have caused slippage in that project's schedule. Vineyard expects commercial operation to commence during 2023. U.S. Wind's MarWin project has also not yet installed its meteorological monitoring mast for its Maryland project.

2019 Manufacturing Advancements

In 2019, the offshore wind industry made significant strides in turbines, cables, and vessels that will be key factors in developing the U.S. supply chain.

This year saw the first 12 megawatt GE Haliade-X nacelle roll off the assembly line in Saint-Nazaire, France, and a test installation of the machine in Rotterdam, Netherlands. Blade testing also began in Boston in August.

Siemens Gamesa announced that its SG 10.0-193 DD 10 megawatt turbine will be available in 2022, and already has several projects interested in using it.

Danish manufacturer Welcon and Canadian fabricator Marmen announced an agreement to build offshore wind turbine towers and foundations in a factory based in the northeastern U.S.

Ever-expanding turbine size has been identified as a key factor in driving down offshore wind project costs. Moreover, the pace of development in turbine technology is remarkable, as the Haliade-X provides a 50 percent increase in per-unit power output relative to the 8 megawatt machines introduced in 2016.

On the cables front, Aker Solutions modified an array cable manufacturing line in their Alabama facility to support offshore wind. A few states away, Nexans stated that its Charleston, South Carolina facility will be prepared to manufacture offshore wind export cable in 2020. In Connecticut, the Park City Wind project contracted Marmon Utility in Seymour, Connecticut for use of its Kerite line of cables.

Regarding vessels, in 2019 two different Rhode Island shipyards received orders for the construction of three crew transfer vessels (CTVs):

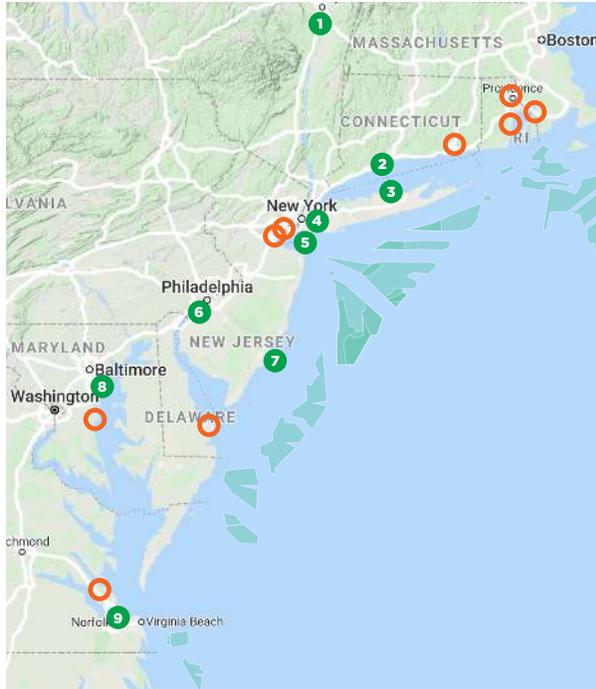
- Ørsted hired Senesco Marine to build a CTV in its North Kingstown, Rhode Island shipyard.
- Atlantic Wind Transfers placed an order for two Chartwell 24 CTVs built locally at Blount Boats in Warren, Rhode Island. Delivery is expected in 2020 and 2021.

In addition, Vard Marine of Canada announced that its design for a new Service Operation Vessel (SOV) had been approved by ABS as "a suitable vessel for small wind parks in a harsher environment."

Supplier Contracts Signed

Nothing signals supply chain development like signed contracts with suppliers, and 2019 saw the execution of a number of significant agreements along the U.S. East Coast.

OFFSHORE WIND PORT ACTIVITY



Ørsted selected GE’s 12-megawatt Haliade-X turbine for use on the Ocean Wind and Skipjack projects, while its other projects committed to Siemens Gamesa turbines. The company also signed an MOU for “everything from environmental monitoring and seabed surveys, to offshore operations and maintenance, to real estate and construction consulting” with ThayerMahan of Groton, Connecticut. Ørsted also contracted with Rutgers University for acoustic monitoring, and will use Nexans cables on several of their U.S. projects.

For the New Jersey Ocean Wind 1,100 MW project, Ørsted will work with the German firm EEW to site a factory for steel foundations in the Paulsboro, New Jersey area, and will use EGS for surveys.

In Virginia, Dominion Energy selected Siemens Gamesa Renewable Energy as its turbine supplier. L.E. Myers performed the electrical design for the Coastal Virginia Offshore Wind (CVOW) project.

The industry’s first utility-scale project, Vineyard Wind 1 in Massachusetts, selected MHI Vestas turbines and SIF foundations.

Also in Massachusetts, Mayflower Wind has inked an agreement with Bladt and Semco to fabricate and deliver the project’s 800 megawatt offshore substation, which will be designed by ISC. The wind farm is using Hellenic subsea cables from Greece.

Equinor’s Empire Wind project in New York chose Prysmian cables and has committed to using Gravity Based Structure (GBS) foundations that will be manufactured in the Albany, New York area.

U.S. Port Redevelopment

From Massachusetts to Virginia, the layout of the East Coast supply chain is starting to take shape as states, cities and developers make investments.

In Massachusetts, the New Bedford Marine Commerce Terminal has an agreement with the Vineyard Wind 1 project for 18 years at \$6 million per year. In February, 2020, the President of Mayflower Wind, John Hartnett, said that he anticipates the New Bedford Marine Terminal will be a “primary site for construction,” including staging and assembly. Brayton Point is being converted from a former coal power plant to an offshore wind energy center by Anbaric, and Vineyard Wind supplied a \$50,000 grant to the Fall River Redevelopment Authority (FRRDA) to study the potential future use of a property that lies within the Fall River Waterfront Urban Renewal Plan area.

Rhode Island continues to develop Quonset Business Park/Davisville, which was used to stage the Block Island wind farm. More funding is on the way, as Ørsted and Eversource have committed to investing \$40 million in improvements to Quonset and the Port of Providence. Governor Gina Raimondo’s proposed FY2021 budget includes an additional \$20 million investment earmarked for upgrades to Davisville.

Connecticut made major progress this year. Vineyard Wind's Park City project will partner with McAllister Towing to redevelop the 18.3 acre Barnum Landing waterfront industrial property in Bridgeport for future foundation transition piece steel fabrication and final outfitting. The project also plans to site its operations and maintenance (O&M) facility in Bridgeport.

Meanwhile, in Connecticut's port city of New London, Ørsted, Eversource, the Connecticut Port Authority, and Gateway announced a commitment of \$157 million for the redevelopment of the State Pier.

Ports in New York's Capital District committed to offshore wind activity during 2019, showing that even inland American ports can capitalize on this growing domestic clean energy industry. Heavy-lift contractor, Mammoet, executed an agreement with the Port of Coeymans Marine Terminal, which is located on the Hudson River approximately 100 miles north of New York City. The agreement permits Mammoet access to the Coeymans 400-acre marine terminal for storage, load-in/load-out, local barge supply, heavy lift operations, and other purposes.

Earlier in the year, New York State dedicated \$200 million to revitalize its port infrastructure. Other New York ports that may see offshore wind activity include the Homeport Pier, Staten Island's Arthur Kill Terminal and Long Island's Port Jefferson.

In his State of the City speech for 2020, New York City Mayor De Blasio pledged to invest \$57 million in the South Brooklyn Marine Terminal to help support offshore wind development.

In New Jersey, Ørsted's Ocean Wind project committed to revitalizing the Paulsboro area. There is speculation that a state-wide ports funding program will be announced during 2020.

Maryland's Tradepoint Atlantic site, in Baltimore, has long been considered the state's top location for offshore wind development. In July, Ørsted announced a \$13.2 million investment at Tradepoint that falls within its

Other New York ports that may see offshore wind activity include the Homeport Pier, Staten Island's Arthur Kill Terminal and Long Island's Port Jefferson.

plans to invest \$200 million into Maryland. Ørsted's staging center plans to use 50 of the 3,300 acres to receive, assemble, and transfer turbine components to build the Skipjack Wind Farm.

Virginia, which also took some major steps forward on offshore wind energy, announced a 2020 budget which would include Virginia's first Office of Offshore Wind and up to \$40 million to upgrade

the Portsmouth Marine Terminal to secure new investments in the offshore wind supply chain.

In January, the Portsmouth Marine Terminal and Ørsted announced an agreement for an initial lease of 1.7 acres at the Portsmouth Marine Terminal through 2026, with options to expand to 40 acres. If fully executed, the agreement could be worth nearly \$13 million in lease payments and \$20 million more in investment for cranes and other improvements. Those investments would prepare the site for preassembly, staging and loading of wind turbines for Ørsted's projects.

U.S. Offshore Wind Capacity Procurements Grow

An addition of 7,056 megawatts were procured in 2019, making it an incredible year for the U.S. offshore wind industry. Four states (Connecticut, Massachusetts, New Jersey, and New York) were awarded financial mechanisms (PPAs or ORECs) via competitive solicitation processes. In Virginia, utility Dominion Energy committed to constructing a 2,640 megawatt facility, which is the largest single proposed offshore wind installation in the United States. In Maine, the 12-megawatt, two-turbine Aqua Ventus floating pilot project was approved by the state Public Utilities Commission.

PORTS WHERE OSW ACTIVITY HAS BEEN DECIDED UPON

STATE	PORT OR STAGING AREA
Massachusetts	New Bedford
New Jersey	Paulsboro (Steel foundations) Atlantic City (O&M)
Maryland	Tradepoint Atlantic (Staging)
New York	Coeymans (Concrete foundations) South Brooklyn Marine Terminal (O&M) Port Jefferson (O&M) Homeport Pier (Staging)
Virginia	Portsmouth (Staging)
Connecticut	Bridgeport (Fabrication, Staging, O&M) New London
Rhode Island	Quonset Business Park/Davisville

PORTS WHERE OSW ACTIVITY IS BEING CONSIDERED

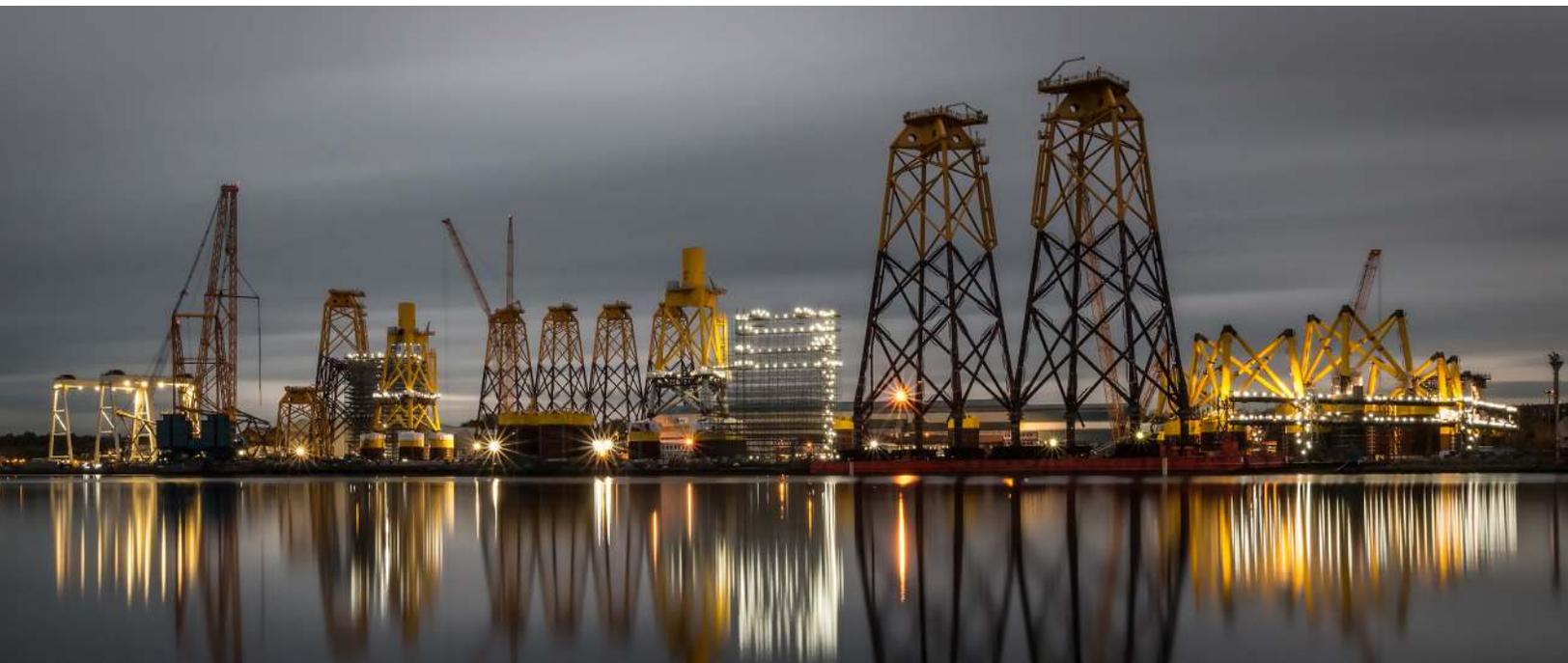
STATE	PORT
Rhode Island	Providence
Massachusetts	Fall River, Brayton Point
New Jersey	South Amboy
New York	Arthur Kill Terminal

State Commitments Continue to Drive Market Growth

States continue to address escalating climate change by increasing their renewable portfolio standard (RPS) mandates and raising “carve-outs” for offshore wind energy. In the past year, Rhode Island raised its RPS to 100 percent by 2030, and Maryland and other states have or are passing legislation that sets ambitious RPS goals for 50 percent clean energy by 2030 and 100 percent by 2050 (see table). States cannot meet these ambitious targets or replace coal, natural gas and nuclear generation without a utility-scale clean energy solution like offshore wind.

The overall size of the U.S. offshore wind market expanded during 2019 as states increased their individual offshore wind capacity goals. New York nearly quadrupled its goal to 9,000 megawatts by 2035, and New Jersey more than doubled its own target to 7,500 megawatts by 2035. Both Connecticut and Maryland passed legislation during 2019 to increase their offshore wind targets. Connecticut seeks 2,000 megawatts by 2030, while Maryland will procure at least an additional 1,200 megawatts by 2030.

BEATRICE OFFSHORE WIND FARM—COURTESY OF SMULDERS



The below table illustrates the considerable growth (the U.S. offshore market table) of total state government commitments to offshore wind between 2018 and 2019.

US OFFSHORE WIND MARKET PIPELINE

PROJECT	ST	SIZE	DEVELOPER
Vineyard Wind	MA	800	CIP/Avangrid
* Mayflower	MA	804	EDPR/Shell
Block Island	RI	30	Ørsted
Revolution Wind	RI	400	Ørsted/Eversource
Revolution Wind	CT	300	Ørsted/Eversource
* Park City Wind	CT	804	CIP/Avangrid
South Fork	NY	130	Ørsted/Eversource
* Sunrise Wind	NY	880	Ørsted/Eversource
* Empire Wind	NY	816	Equinor
Skip Jack	MD	120	Ørsted
MarWin	MD	248	US Wind
Coastal VA OSW	VA	12	Dominion
* Dominion Energy	VA	2,640	Dominion
Icebreaker	OH	30	LeedCo
* Maine Aqua Ventus	ME	12	UMaine
* Ocean Wind	NJ	1,100	Ørsted
TOTAL		9,126	

* Projects awarded a financial mechanism during 2019 (7,056 MW Total 2019 Capacity Addition)

STATE RENEWABLE PORTFOLIO STRATEGY (RPS)

STATE	RPS GOAL
Maine	80 percent Class 1 by 2030; 100 percent by 2050
Massachusetts	35 percent Class 1 by 2030
Rhode Island	100 percent by 2030
Connecticut	40 percent Class 1 by 2030
New York	70 percent by 2030; 100 percent by 2040
New Jersey	50 percent by 2030; 100 percent by 2050
Maryland	50 percent Class 1 by 2030; 100 percent by 2040
Virginia	30 percent by 2030; 73 percent by 2035; 100 percent by 2050
North Carolina	12 percent by 2021
California	60 percent by 2030; 100 percent zero carbon by 2045
Hawaii	40 percent by 2030; 100 percent by 2045

State 2019 Activity Recap and Future Plans

GULF OF MAINE MAINE

Late 2019 and early 2020 saw Maine and New Hampshire advancing their offshore wind ambitions for floating offshore wind installations in the Gulf of Maine.

Maine Governor Janet Mills has continued to demonstrate a keen interest in offshore wind since taking office. During November, pursuant to a legislative directive passed earlier in the year, the Maine Public Utilities Commission (PUC) approved the two-turbine, 12 megawatt Aqua Ventus floating offshore wind demonstration project. VoltturnUS – a floating concrete semi-submers-

ible hull designed by the University of Maine’s Advanced Structure and Composites Center – will be used for each of the two 6 megawatt turbines. This project has been supported in part by DOE funding.

In her 2020 State of the State address, Governor Mills announced her intention to travel to Scotland to investigate their floating offshore wind activity. This overseas trip by Governor Mills confirms the changes in attitude towards offshore wind that is taking place in Maine. In 2010, Equinor originally considered deploying a test floating project in Maine, and even negotiated a power purchase agreement with the Maine Public Utilities Commission. However, in 2013, former Maine Governor Paul LePage ordered the state PUC to reopen negotiations, resulting in Equinor’s withdrawal from Maine and redirection towards deploying the Hywind Scotland project, the world’s first fully operational floating wind farm. Maine is expected to announce major offshore wind developments in July 2020.

NEW HAMPSHIRE

New Hampshire Governor Chris Sununu signed Executive Order 2019-06, establishing four advisory boards to inform the state’s offshore wind program. These boards will focus on:

- Fisheries, endangered species, and environmental impacts;
- Workforce, economic development, and supply chain;
- Existing offshore industries; and
- Siting, transmission, and infrastructure.

The executive order also directs various New Hampshire state agencies to collaboratively study greenhouse gas reductions, port infrastructure, transmission, and supply chain operations associated with offshore wind activities in New Hampshire.

Additionally, in January 2019 Governor Sununu requested that the Department of the Interior’s Bureau of Ocean Energy Management (BOEM) establish an Intergovernmental Renewable Energy Task Force for the Gulf of Maine. This ambition was realized by the end of 2019. In December, BOEM convened the first meet-

STATE OFFSHORE WIND COMMITMENTS

STATE	2018	2019
Virginia	12	2012*
Maryland	368	1568
Delaware	0	0
New Jersey	3500	7500
New York	2400	9000
Connecticut	250	2000
Rhode Island	400	400
Massachusetts	3200	3200
New Hampshire	0	0
Maine	12	12
Ohio	30	30
North Carolina	0	0
South Carolina	0	0
California	0	0
Hawaii	0	0
TOTAL MW	10,161	25,722

* will increase to 5200MW

ing of the Gulf of Maine Task Force at the University of New Hampshire in Durham. The meeting brought together stakeholders from Maine, Massachusetts, and New Hampshire to discuss the unique challenges and opportunities presented by floating offshore wind projects deployed in the Gulf of Maine. The Business Network was present for this standing-room-only meeting, and offered public comments in support of the clean energy and economic benefits that both Maine and New Hampshire will reap by moving forward with offshore wind deployment. Moreover, the Gulf of Maine can and should seize the opportunity to serve as a proving ground for floating offshore wind technology that can be exported to California and the rest of the world.

MASSACHUSETTS

In August 2019, BOEM announced that it was delaying the issuance of Vineyard Wind’s final environmental impact statement (EIS). Based on input from stakeholders and other federal agencies, BOEM determined that the deployment of offshore wind capacity along the East Coast was greater than what was outlined in Vineyard’s draft EIS. BOEM then initiated a supplemental and more robust cumulative impacts analysis. This augmented analysis will include: (a) offshore wind projects that have been awarded a state-level financial mechanism but have not yet submitted Construction and Operations Plans to BOEM; and (b) scenarios based on expected state offshore wind procurements. The outcome of this expanded analysis is scheduled for release on December 18, 2020. The delay resulted in Vineyard 1 stating that it would push its start of operations from 2022 to 2023.

Despite BOEM’s decision to delay the issuance of Vineyard Wind’s EIS, Massachusetts pressed on and successfully conducted its second offshore wind solicitation. In October, the 804 megawatt Mayflower Wind project – a joint venture of Shell and EDP Renewables – was selected as the winner of the second solicitation during 2019. The combined output of the Vineyard Wind and Mayflower Wind projects represents approximately 12 percent of Massachusetts’ annual energy demand, clearly demonstrating offshore wind’s potential to drive significant and rapid decarbonization of a state’s electricity generation fleet. In January 2020, Mayflower Wind selected Bladt Industries and Semco Maritime to fabricate and deliver the project’s offshore substation.

On January 10, 2020, Mayflower Wind executed final contracts with Massachusetts electricity distribution companies. In February, Mayflower Wind and the Massachusetts utilities announced that electricity generated by the wind farm will cost \$58 per megawatt-hour and the company estimates its project will provide the state with a total economic benefit of nearly \$2.5 billion.

Finally, in his 2020 State of the State address, Governor Charlie Baker committed the Commonwealth to

net-zero greenhouse gas emissions by 2050, and Massachusetts has proposed legislation to increase its offshore wind target to 6,000 megawatts.

RHODE ISLAND

In her 2020 State of the State address, Rhode Island Governor Gina Raimondo committed Rhode Island to serving 100 percent of its in-state electricity needs via renewable generation by 2030, a nationwide first. Executive Order 20-01 directs the state Office of Energy Resources to (a) conduct economic and energy market analysis in support of this goal, and (b) provide Governor Raimondo, by the end of 2020, with a specific and implementable action plan to achieve this goal. Given Rhode Island’s history as an offshore wind innovator, this increased demand for renewably generated electricity, and Governor Raimondo’s continued interest, we see offshore wind continuing to play a key role in Rhode Island’s energy transformation over the next decade.

CONNECTICUT

The June 2019 enactment of new offshore wind legislation (Public Act No. 19-71 – “An Act Concerning the Procurement of Energy Derived from Offshore Wind”) committed Connecticut to procuring 2,000 megawatts of offshore wind capacity before the end of 2030, equivalent to approximately 30 percent of Connecticut’s in-state electricity consumption. Connecticut also convened a Commission on Environmental Standards, and sought public comment regarding fisheries and environmental issues related to offshore wind development.

In August, Connecticut released its finalized request for proposals seeking up to 2,000 megawatts of offshore wind capacity. This RFP was informed by public input on a draft circulated in July, and this finalized solicitation was historic for Connecticut, because it was the state’s first dedicated solicitation exclusively to the procurement of offshore wind electricity generation capacity. Connecticut’s previous offshore wind procurements, which took place in 2018, were the result of technology-neutral “zero carbon” solicitations.

In December, Connecticut selected Vineyard Wind’s 804 megawatt Park City Wind project. This is the larg-

est purchase of renewable energy in Connecticut history, and represents approximately 14 percent of the state’s total electricity usage. The company anticipates using a turbine with a capacity of no less than 14 megawatts, which is larger than any commercially available machine.

Auspiciously, the addition of Park City Wind, the final offshore wind project awarded during 2019, elevated the total capacity of offshore wind projects under development in U.S. waters to more than 9 gigawatts as we entered 2020.

NEW YORK

New York entered 2019 with quite a splash, as Governor Andrew Cuomo nearly quadrupled New York’s offshore wind target to 9,000 megawatts by 2035. This was followed in July 2019 by New York announcing the largest renewable energy procurement in American history, with 816 megawatts awarded to Equinor’s Empire Wind project, and 880 megawatts awarded to Sunrise Wind (Ørsted and Eversource).

In August, the New York Power Authority released a report, entitled “Offshore Wind – A European Perspective,” focused on European transmission planning schemes and factors contributing to the declining costs of European offshore wind power installations. The study identified several elements that were instrumental to these outcomes:

- Scale and robust competition provide the most effective path to low-cost wind power;
- The offshore transmission model selected is dependent upon numerous physical and non-physical considerations, including geography;
- Coordination and incentive alignment between all parties is critical regardless which model is chosen;
- Visible long-term planning of the onshore and offshore grids improves coordination and lowers cost; and
- International cooperation between European states helps achieve resource flexibility, maximizes the advantages afforded by transmission infrastructure planning, and spurs economies of scale.

Although initial phases of U.S. offshore wind projects

will be individually interconnected to the onshore grid via direct radial generator lead lines, the solution becomes less clear beyond approximately 10 gigawatts. Opinions differ widely on the issue of transmission planning, but one thing is certain: if a transmission backbone is a desired solution, it is never too early to begin meaningful planning. This is applicable to all states interested in offshore wind deployment, not just New York. It is not sufficient to “wait and see” or “wait and hope” that enough currently-operating power plants in coastal regions retire during the 2020s to permit individual interconnection of every planned offshore wind facility.

In October, New York announced and released the finalized contracts executed between NYSERDA and the two bidders (Equinor and Ørsted/Eversource) selected in New York’s first offshore wind solicitation. NYSERDA also released “Launching New York’s Offshore Wind Industry: Phase 1 Report,” which was a filing to the New York State Department of Public Service analyzing the outcome of New York’s first offshore wind solicitation.

The combined all-in development costs of the two projects procured during New York’s first offshore wind solicitation are \$83.36 per megawatt-hour, with an expected average OREC cost of \$25.14 per megawatt-hour. This OREC price is approximately 40 percent lower than that which was projected in NY-SERDA’s 2018 Offshore Wind Policy Options paper, this outcome provides further support for the declining cost trend in U.S. offshore wind projects. The two projects are expected to result in:

- Approximately \$3.2 billion in combined economic benefits across New York State;
- 1,600 direct new jobs;
- \$85 million investment to support New York port development and technological innovation.

Also of note, bids for this solicitation were received and selected from offshore wind projects located on lease areas ranging from New Jersey to southern New England. Based on the geographic diversity and lower-than-ex-

pected OREC costs, the NYSERDA report describes New York's first offshore wind solicitation as garnering the most competitive response of any American offshore wind procurement to date.

New York has carried its offshore wind ambitions into the new year. In his 2020 State of the State address, Governor Cuomo expanded the \$175 million Workforce Development Initiative with two programs aimed at supporting offshore wind. First, the Offshore Wind Training Institute will receive \$20 million in funding from NYSERDA, the State University of New York (SUNY) system, and the New York State Department of Labor; it will be housed at the SUNY Stony Brook and Farmingdale campuses on Long Island. The second program will make a \$40 million investment (when combined with prior commitments, a total investment of \$100 million) over the next five years to train 40,000 clean energy workers across New York State, including veterans and other priority groups.

Finally, following Governor Cuomo's 2020 address, NYSERDA announced its intention to conduct New York's second offshore wind solicitation – seeking at least 1,000 megawatts, and possibly significantly more – during 2020. It is clear that New York is making a concerted push to become a focal point of the American offshore wind sector.

NEW JERSEY

New Jersey set the bar high when it awarded the 1,100 megawatt Ocean Wind project to Ørsted in June 2019. This installation has the distinction of being – by capacity – the largest single offshore wind project in U.S. waters to be awarded ORECs. Ørsted has selected EEW to provide foundations from a port facility located in Paulsboro, and plans to site Ocean Wind's O&M facility in Atlantic City.

In August, Governor Murphy signed Executive Order No. 79, which established the Wind Innovation and New Development Institute (WIND Institute). The WIND Institute will serve as “a clearinghouse for education, research, innovation, and workforce training

related to the development of offshore wind” in New Jersey and the Northeast. The Executive Order created a Council made up of gubernatorial advisors and representatives from various state agencies, including the Economic Development Authority, the Board of Public Utilities, the Department of Environmental Protection, the Department of Labor and Workforce Development, and the Department of Education.

In November, New Jersey pushed its offshore wind ambitions to the next level. Governor Murphy signed Executive Order No. 92, which more than doubled New Jersey's offshore wind target to 7,500 megawatts by 2035. This is enough electricity to power about 3.2 million New Jersey homes. To put this in context, as of July 1, 2018, the U.S. Census Bureau estimated that New Jersey had approximately 3.6 million housing units. The Executive Order also highlighted the Economic Development Authority's recently launched Technical Assistance Program, which was created to help New Jersey companies identify and develop the skills needed to succeed in growing the offshore wind industry.

New Jersey also conducted key stakeholder engagement activities during 2019. During the first quarter, the New Jersey Board of Public Utilities, with the assistance of its Offshore Wind Interagency Task Force partners, convened a diverse range of topical experts for six roundtable discussions, which were intended to inform the development of New Jersey's Offshore Wind Strategic Plan. The roundtable topics included:

- Environmental protection
- Commercial and recreational fisheries
- Wholesale energy markets
- Transmission
- Supply chain and workforce development
- Ports and harbors

Later in 2019, New Jersey built upon these roundtable discussions. During November, the Board of Public Utilities conducted an offshore wind transmission stakeholder meeting, where the relative benefits, risks, advantages, and challenges of direct radial and backbone transmission configurations were discussed. Similarly, the

Department of Environmental Protection established an Environmental Resources Offshore Wind Working Group, which includes representatives from commercial and recreational fisheries, conservation organizations, maritime industry, and fisheries councils.

As of January 2020, New Jersey's Offshore Wind Strategic Plan remains under development. A draft version of New Jersey's Energy Master Plan was released during 2019 (prior to Governor Murphy's announcement of the revised 7,500 megawatt offshore wind goal), and the final EMP was presented by Governor Murphy in January.

Finally, legislation enacted in January 2020 expanded New Jersey's statutory definition of "qualified offshore wind project" to include an "open access offshore wind transmission facility." Although the legislation does not mandate an open access transmission network, it is significant inasmuch as it renders such transmission facilities eligible to receive offshore renewable energy certificates (ORECs) under New Jersey's offshore wind statutory scheme.

MARYLAND

The Maryland General Assembly gave final approval to the Clean Energy Jobs Act. Both House and Senate chambers provided veto-proof margins: 95-40 in favor in the House and 31-15 in the Senate. The legislation supports Maryland's offshore wind industry, with incentives for a minimum of 1,200 megawatts of ocean-based, renewable, power.

The Maryland Public Service Commission (MD PSC) published an RFP to hire a consultant for evaluating Offshore Renewable Energy Credit (OREC) applications. According to state governments, the PSC should be ready to receive applications as soon as March or April.

Simultaneously, MD PSC has requested input and held a hearing for public comment on turbine selection related to the Skipjack and U.S. Wind offshore wind projects. The Network has submitted comments and oral testimony on behalf of its members. The MD

PSC issued Notices that it will hold an evidentiary hearing on the turbine sizes of the Skipjack and U.S. Wind projects. The Notices state the applicants should propose dates for the respective hearings once the turbine selection is final.

VIRGINIA

In July 2019, Dominion Energy commenced onshore construction associated with the CVOW project. The project is expected to get "steel in the water" in May 2020.

Virginia clearly recognizes the opportunity presented by offshore wind, and Governor Northam demonstrated that by signing Executive Order Number 43 in September. Later that fall, Dominion Energy announced that it would build a 2,640 megawatt offshore wind project, the overall largest proposed offshore wind farm in the U.S. Located on the offshore wind lease area adjacent to the CVOW research lease and comprised of three 880 megawatt phases, this project would be operational by 2026.

The Commonwealth of Virginia's budget for 2020 created the Commonwealth's first Office of Offshore Wind, and commits \$40 million to redevelop and upgrade the Portsmouth Marine Terminal. Governor Northam's 2020 State of the Commonwealth address further highlighted that offshore wind will bring thousands of advanced manufacturing jobs to Hampton Roads, in addition to other supply chain and logistics opportunities.

The Virginia Clean Economy Act creates a state renewable energy portfolio system (RPS) program, which will require that 30 percent or more of Virginia's electricity comes from clean energy by 2030 and that 73 percent comes from clean sources by 2035. By the year 2050, the Act requires that 100 percent of Virginia electricity will be clean – a goal Governor Northam advocated for during his election campaign. Notably, the legislation also includes a 5.2 gigawatt offshore wind commitment, one of the country's highest targets. The bill passed both Chambers. It is expected to be signed into law by Governor Northam in March or April 2020.

NORTH CAROLINA

North Carolina Governor Roy Cooper spent the majority of 2019 wrangling with state legislators to include \$300,000 of the state's \$25 billion budget for a study of North Carolina's potential to manufacture, ship, and service offshore wind projects. North Carolina's Clean Energy Plan, released in October, specifically identifies offshore wind as a considerable driver of in-state economic opportunities. By November, despite ongoing legislative resistance, Governor Cooper announced that the studies would move forward with alternate funding.

At an event co-hosted by the Business Network for Offshore Wind, Governor Cooper stated that "there will be no more moratoriums on wind farms – on- or offshore – in North Carolina."

CALIFORNIA

With the passage of SB100 – which sets California's renewable electricity goals at 50 percent by 2026, 60 percent by 2030, and 100 percent carbon-free by 2045 – offshore wind's importance along the West Coast has increased. The California Public Utilities Commission (CPUC), with input from stakeholders and other state agencies, including the California Energy Commission, (CEC) is currently undertaking the Integrated Resource Planning process, which evaluates and ensures that publicly owned utilities in California have sufficient resources to (a) cover anticipated electricity demand, (b) comply with greenhouse gas emissions reduction targets, and (c) adhere to other energy policy requirements. The Business Network is continuing to work to ensure that offshore wind has a prominent place in California's strategy for achieving the clean energy objectives outlined in SB100.

In October 2019, the University of California Berkeley Labor Center released a report entitled "California Offshore Wind: Workforce Impacts and Grid Integration." It observed that offshore wind presents a significant opportunity to create thousands of high-wage unionized jobs. However, these jobs are predicated upon California establishing:

- Fixed offshore wind procurement targets; and
- Comprehensive policies guaranteeing that economic benefits associated with offshore wind accrue in-state.

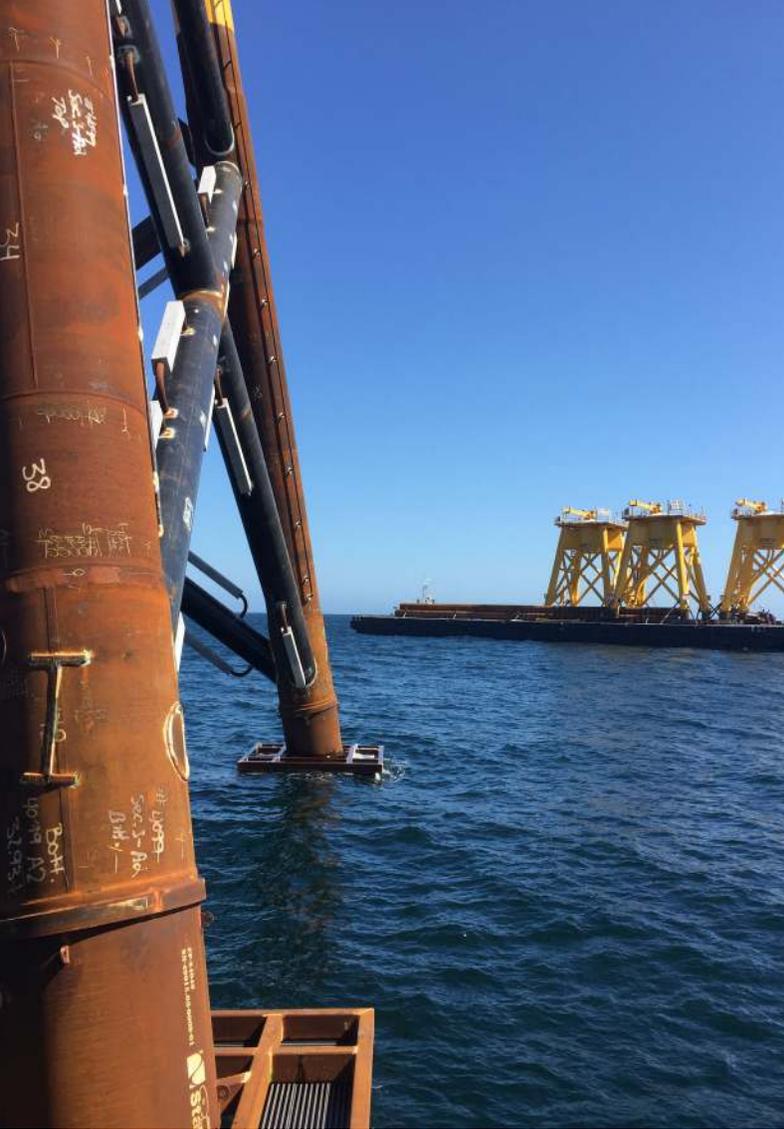
By contrast, the report noted that, if California takes a piecemeal approach, it is likely that less jobs and economic benefits will remain in-state.

Deep waters immediately off California mean that offshore wind projects must be deployed on floating platforms, unlike the fixed-bottom foundations that will be utilized for the foreseeable future along the East Coast. However, renewable electricity generated by offshore wind installations presents unique benefits to California.

First, the high penetration of in-state solar generation results in a daily electricity demand profile commonly called the "duck curve." Essentially, during the afternoon hours, the sun begins to set, which decreases solar generation just as many Californians are returning home after work (i.e., increased demand). This dip in generation and coincident spike in demand necessitates a rapid ramp-up of significant quantity of generation assets, which places stress on generation assets and the grid alike. Wind patterns off the California coast lead to a production profile that helps offset the duck curve. Moreover, deployment of offshore wind in California will reduce the need for imports via long-distance overland transmission of electricity generated by onshore wind facilities in other Western states.

Stakeholder input on three Call Areas (Humboldt, Morro Bay, Diablo Canyon) was sought throughout 2019, with the U.S. Department of Defense (DoD) identifying portions of the Central Coast Call Areas (Morro Bay and Diablo Canyon) as incompatible with offshore wind energy development.

On February 3, 2020, the California Energy Commission released a summary of the discussions which the State has been participating in with the federal government and congressional, state and local elected leaders on the Central Coast of California to determine if there might be a path forward for the leasing of call areas off the coast. The conversations were initiated last summer after it was determined that the identified call area off of Diablo Canyon was not likely to be agreed to by the US DoD at this time. The new areas are north and south of the previously identified Morro Bay area. In addition there is a "discussion" area that



In addition to being able to provide public comment during the public outreach meetings the CEC will collect comments in the California Offshore Renewable Energy docket: <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-MISC-01>

The State of California and BOEM are now each seeking feedback from stakeholders with regard to the new proposed areas.

BOEM has indicated that it will continue to work with the State of California and other federal agencies as it evaluates a potential lease sale during 2020.

OREGON

In September 2019, for the first time in five years, BOEM conducted a meeting of Oregon’s Intergovernmental Renewable Energy Task Force. Following that meeting, in October, the National Renewable Energy Laboratory published the “Oregon Offshore Wind Site Feasibility and Cost Study.” NREL’s modeling revealed that Oregon floating offshore wind installations could achieve a levelized cost of electricity (LCOE) in the \$53 to \$74 per megawatt-hour range by 2032, with the LCOE of a hypothetical 600 megawatt commercial-scale project coming in at approximately \$63 per megawatt-hour.

HAWAII

2019 did not present any significant offshore wind developments in Hawaii. BOEM continues to work closely with state government, the Department of Defense, and other stakeholders to evaluate future leasing.

is within the National Marine Sanctuary limits over which BOEM does not have leasing jurisdiction.

The State and BOEM have initiated a process to receive input on the North and South areas from local, state, and federal agencies, tribal governments, stakeholders, and the public this spring. BOEM recently hosted a meeting of the Intergovernmental Taskforce by Webinar, a meeting in Big Sur for the Government agencies advisory committee on March 20th, 2020, a meeting of the National Marine Sanctuary Committee on April 17th, 2020 in Monterey, California. The dates and locations of the public input meetings have not been set but should commence in April. The State and BOEM will use current information and data, including but not limited to information on the California Offshore Wind Energy Gateway, as well as the public outreach process this spring to evaluate potential conflicts and constraints for developing offshore wind in the new North and South areas around the Morro Bay Call area.

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