US OFFSHORE WIND MARKET UPDATE & INSIGHTS

US OFFSHORE WIND CAPACITY GENERATION

The US Department of the Interior's Bureau of Ocean and Energy Management (BOEM), has auctioned 16 US offshore wind energy areas (WEAs) designated in federal waters for offshore wind development. Each area has been leased to a qualified offshore wind developer. The areas are located along the East Coast from North Carolina to Massachusetts and represent a total potential capacity of 21,000 Megawatts (MWs) of offshore wind power generation.

HISTORY OF BOEM AUCTIONS AND LEASES

YEAR	LEASE #	LESSEE	STATE	ACREAGE	BID	MW*	NEXT
2012	0482	GSOE I	DE	70,098	NA	NA	SAP
2013	0486	Deepwater Wind NE	RI/MA	97,498	$3,838,288	3400 TTL	COP
2013	0487	Deepwater Wind NE	RI/MA	67,252	$3,838,288	3400 TTL	FDR
2013	0483	VA Electric & Power Co.	VA	112,799	$1,600,000	2000	COP
2014	0490	US Wind	MD	79,707	$8,701,098	1450	COP
2015	0501	Vineyard Wind	MA	166,886	$166,886	See Below	FDR
2015	0500	Bay State Wind	MA	187,523	$281,285	2000 TTL	COP
2016	0498	Ocean Wind	NJ	160,480	$880,715	See Below	COP
2016	0499	EDFR Development	NJ	183,353	$1,006,240	3400 TTL	SAP
2017	0512	Equinor Wind US	NY	79,350	$42,469,725	1000	COP
2017	0508	Avangrid Renewables	NC	122,405	$9,066,650	1486	SAP
2018	0519	Skipjack Offshore Energy	DE	26,332	Assigned	NA	SAP
2018	0520	Equinor Wind US	MA	128,811	$135,000,000	1300	EXEC
2018	0521	Mayflower Wind Energy	MA	127,388	$135,000,000	1300	EXEC
2018	0522	Vineyard Wind	MA	132,370	$135,000,000	1500	EXEC

*Reading volumes, some earlier estimates of capacity likely used different calculations. In all cases, capacity calculations should be considered estimates.

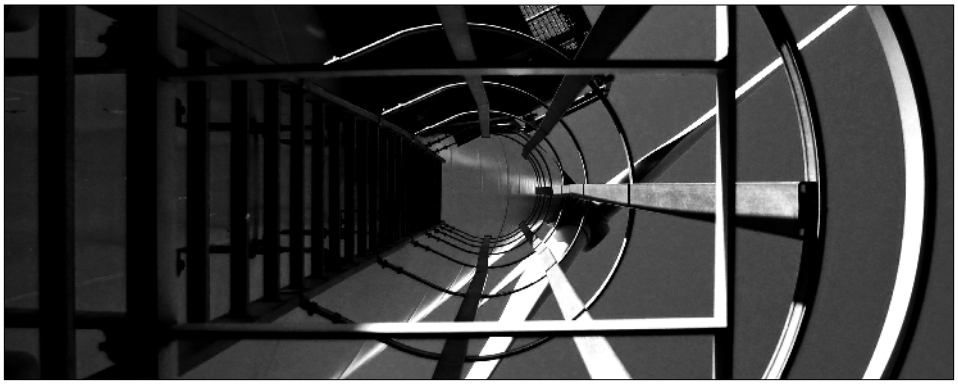
EXEC—Lease Execution
SAP—Site Assessment Plan
COP—Construction & Operations Plan
FDR—Facility Design Report

STATE	2018	2019
VIRGINIA	12	12
MARYLAND	366	366
DELAWARE	0	0
NEW JERSEY	3500	3500
NEW YORK	2400	9000
CONNECTICUT	250	250
RHODE ISLAND	600	600
MASSACHUSETTS	3200	3200
NEW HAMPHIRE	0	0
MAINE	12	12
OHIO	30	30
NORTH CAROLINA	0	0
SOUTH CAROLINA	0	0
CALIFORNIA	0	0
HAWAII	0	0
TOTAL MW	**10370**	**16970**

MARKET GROWTH

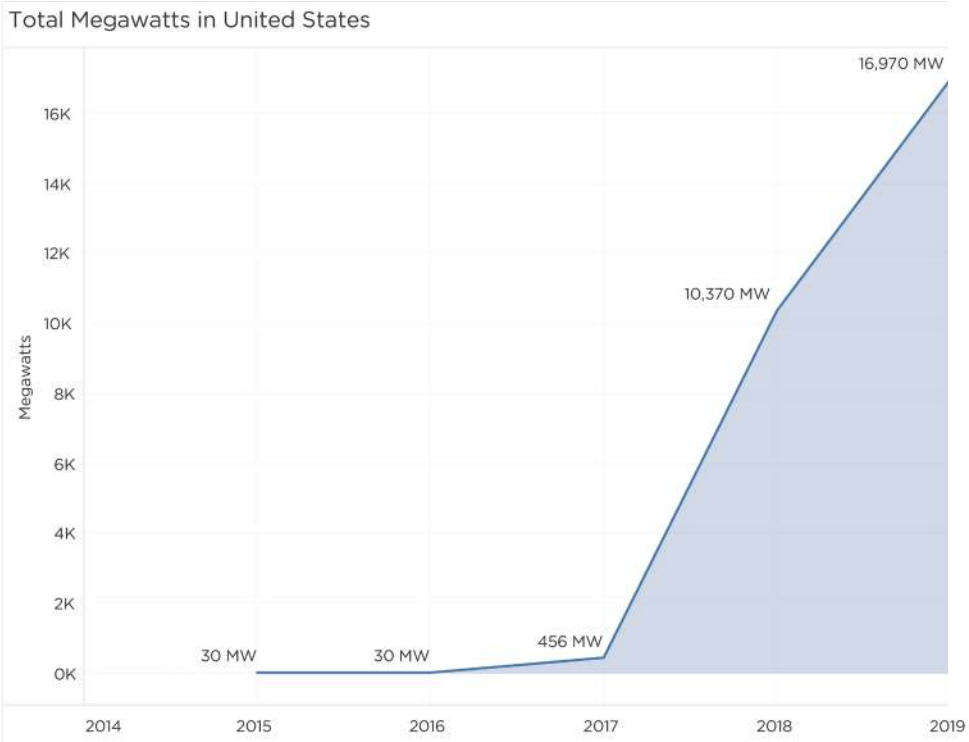
The US Offshore Wind market currently stands at 16,970 MWs and is a subset of the total US potential generation capacity. The market is defined as the amount of offshore wind electricity that could be produced by a state-supported financial mechanism. In the US these financial mechanisms are usually either a power purchase agreement (PPA) or an offshore renewable energy credit (OREC).

In January 2019, New York announced more than a three-fold increase in its commitment to support the development of offshore wind from 2,400 MW to 9,000 MW. This jolted the US market with a 64% increase in market size.



MORE THAN $1B SPENT ON THE US OSW MARKET

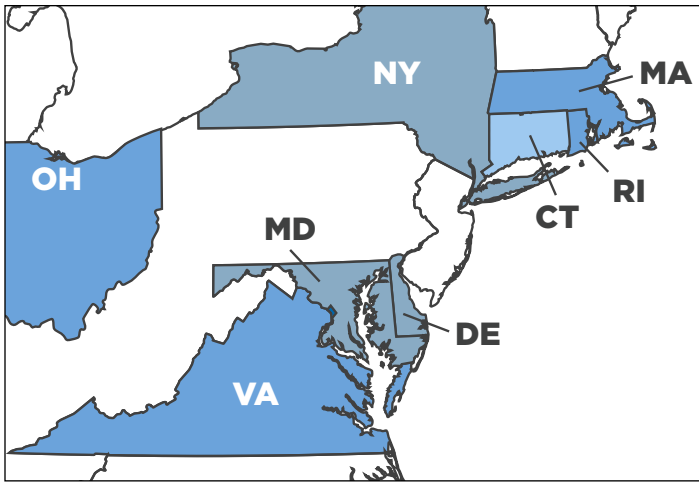
Remarkably, nearly $1 billion was spent on US offshore wind lease rights and projects in the last quarter of 2018. In October of 2018, Ørsted acquired Deepwater Wind's portfolio of lease rights and projects with government backed financial mechanisms for $510 million. In December, three Massachusetts leases were won at a total cost of $405M collectively. Equinor paid $135M, Mayflower Wind, a joint venture of Shell and EDPR, paid $135M, and Vineyard Wind (a joint venture from Copenhagen Infrastructure Partners and Avangrid Renewables) paid $135.1M. This set a new record for US offshore wind lease auctions. Further, French utility giant EDF, in a joint venture with Shell also bought US Wind's lease rights in New Jersey for an undisclosed amount in the fourth quarter of 2018. The US offshore wind sector is experiencing significant investments from major European utilities and oil & gas companies now dominating the US Offshore wind market.



1800 MWs INSTALLED BY 2023

To date, six commercial-scale projects and two demonstration projects comprise the US offshore wind project pipeline, which totals close to 1,800MWs. These eight projects have received a state-supported financial mechanism—either a PPA or OREC. Developers emphasize that all eight projects will be constructed, installed and operating by 2023.

In May of 2019, New York will announce the winner of its first 800 MW RFP. In July of 2019, New Jersey will announce the winner(s) of its 1,100 MW competitive process. These two states will add 1,900 MWs to the project pipeline bringing the US offshore wind project pipeline to almost 4,000 MWs. Progress is expected to continue as Massachusetts intends to release its second RFP for at least 800 MWs no later than June 30, 2019.



by 2023

PROJECT		STATE	SIZE (MW)
VINEYARD WIND	CIP/Avangrid	MA	800
REVOLUTION WIND	Ørsted	RI	400
REVOLUTION WIND	Ørsted	CT	200
SOUTH FORK	Ørsted	NY	150
SKIPJACK	Skipjack	MD/DE	120
US WIND	US Wind	MD	246
COASTAL VA OSW	Dominion	VA	12
ICE BREAKER	LeedCo	OH	30

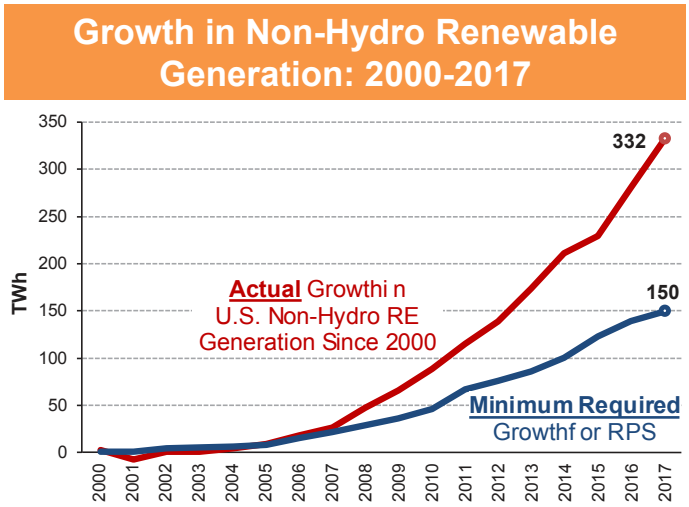
STATES DRIVE MARKET CREATION

Unlike the solar or onshore wind market, where corporate PPAs are fueling market growth, states are driving the creation and growth of the US offshore wind market. Governors remain committed to the COP–21 Paris Climate Agreement and view offshore wind as a clean energy utility-scale solution that can address climate change goals while simultaneously rapidly driving economic development.

Recent climate change studies have added a new sense of urgency to the need for rapid transition to clean energy solutions. The states have committed to the development of 16,852 MWs of offshore wind by 2035 can be seen to have two common main policy drivers: increasing their renewable portfolio standards (RPS) and establishing offshore wind carve-outs. According to Berkeley Lab's US Renewables Portfolio Standards Annual Status Report, approximately half of all growth in US renewable electricity generation and capacity since 2000 is associated with state RPS mandates. Within the Northeast, Mid-Atlantic and West, all the regions driving the US offshore wind market have RPS policies that continue to play a central role in supporting renewable energy growth.

In 2018, California, Connecticut, Massachusetts and New Jersey revised their RPS legislation and significantly raised their RPS goals. In addition, NJ and NY added new or increased offshore wind carve-outs. Last year, California also made a careful and deliberate transition with the passage of Senate Bill (SB) 100 by the state legislature, which set targets for the state, the world's fifth largest economy, to be 100% carbon-free electricity by 2045. In general, most States have met their interim RPS targets in recent years, with only a few exceptions reflecting unique, state-specific policy designs.

Courtesy of Lawrence Berkeley National Laboratory / US Renewable Portfolio Standards—2018 Annual Status Report



Notes: Minimum Growth Required for RPS excludes contributions to RPS compliance from pre-2000 vintage facilities, and from hydro, municipal solid waste, and non-RE technologies. This comparison focuses on non-hydro RE, because RPS rules typically allow only limited forms hydro for compliance.

MARKET INSIGHTS:

Industry Expenditures

Present estimates suggest US East Coast offshore wind development will reach a minimum of 10,000 MWs by 2030. Investments between $50B–$70B will be spent to build out the current market of 10–16 GWs. Assuming the average nameplate capacity turbine for the US market is 9.5 MW, going forward, the US will require at least 1050–1800 foundations, transition pieces and turbines to be installed in the coming decade.

FEDERAL ROLE

The Trump Administration's support of an "Above All Energy Strategy" which includes offshore wind, has streamlined regulatory processes. Administrative actions coupled with annual lease auctions have helped the sector stay on course and grow.

In April 2018, the Trump Administration publicly stated, "offshore wind, grid and transmission, and manufacturing" are infrastructure programs. In an effort to promote infrastructure development, Executive Order 13807 and a separate action list issued by the White House Council on Environmental Quality (CEQ) reforms the National Environmental Policy Act (NEPA). The executive order established the "One Federal Decision" policy, which provides that major infrastructure projects should have a single lead federal agency, a single record of decision and that all authorizations for construction of major infrastructure projects should be completed within 90 days. The executive order defines "major" projects as those "for which multiple authorizations by federal agencies will be required to proceed with construction."

NEW COMPANIES STRENGTHEN THE US MARKET

The US has unique characteristics and regulatory challenges. Shell's entry into the US market brings decades of experience working within the US regulatory system and stakeholder engagement strategies to the industry. Shell has strong relationships with the US O&G supply chain which in turn could help projects be built faster and for less costs.

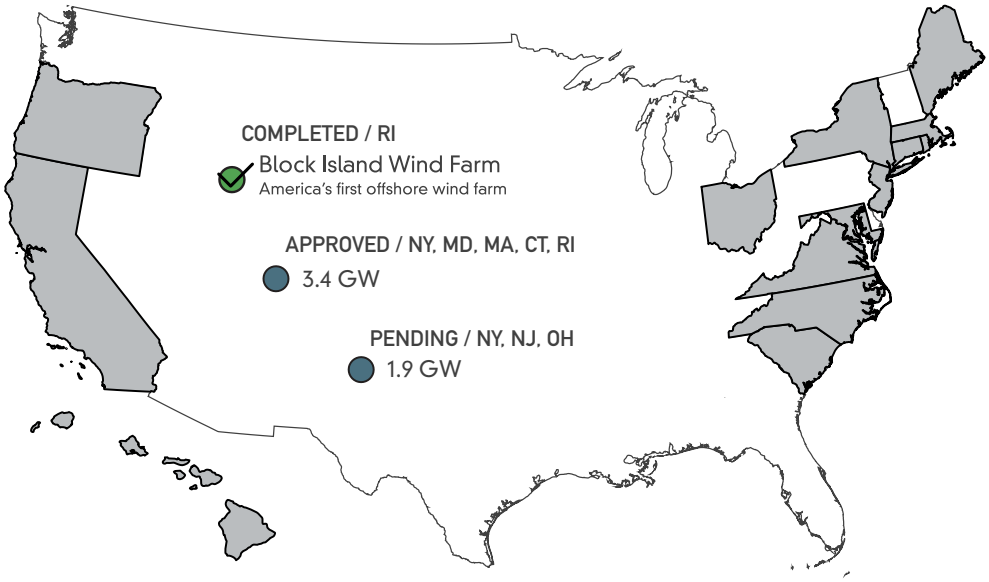
The recent announcement by Eversource to pay $225 million for a 50 percent interest in two of Ørsted offshore wind projects off the coasts of Massachusetts and Rhode Island illustrates that the offshore wind industry is more than peaking the interest of major US utilities. New York Power Authority, PSEG and Dominion Energy are increasing their activity in offshore wind. The entry of US based utilities into the US offshore wind sector, may help guide states as they grapple with the important choices between clean energy and fossil fuel infrastructure in the next few years.

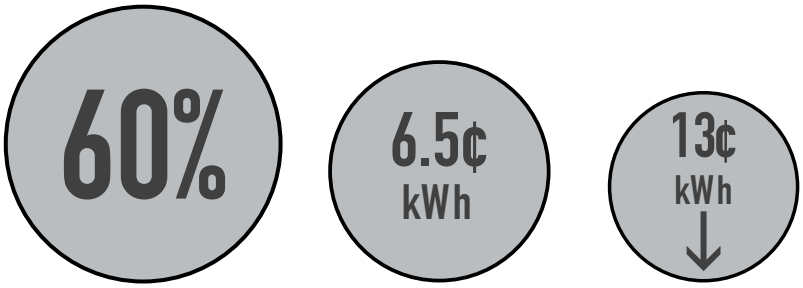
COSTS TREND DOWNWARD

In May 2017, Maryland announced it was providing financing for 268 MWs of offshore wind power at 13.5 cents/Kwh. This was significant in that it provided the first commercial scale project price point for the US market. It also signaled that the US is taking both lessons learned and the technological advances from Europe and applying them to the US market.

A year later, Massachusetts held its first solicitation for offshore power, which was won by Vineyard Wind, a partnership of Avangrid Renewables and Copenhagen Investment Partners (CIP) at a significantly lower levelized cost of energy of 6.5 cents/Kwh. This last price point includes anticipated components sourced mainly from Europe with associated high transport costs.

Later this year, following the New York and New Jersey Power Purchase Agreement announcements, the US market may experience supply chain advancements to help further shift contracted offshore wind electricity to lower prices. The increased confidence in the US offshore wind supply chain will result in a Jones Act Vessel solution which will help create lower costs for turbine installations—2019 could be the year in which an announcement is made for investments in a Jones Act Installation vessel as well as plans for some offshore wind component manufacturing in the United States—all of which will contribute to future lower contract prices for offshore wind generated electricity.





Reduction in energy costs for offshore wind since 2012

Massachusetts offshore wind price

Maryland offshore wind price

STATES WILL FOCUS ON INFRASTRUCTURE INVESTMENTS AND WORKFORCE DEVELOPMENT

Port infrastructure should and ultimately will be shared among states: States will have different port infrastructure to support a different part of the project and some states may not have offshore wind ports at all. A regional approach can be accomplished by creating a series of specialized ports along the eastern seaboard. By upgrading multiple ports along the East Coast the role of each port will be clearly defined and the ports can be used for the most appropriate stage of the project.

Unique and customized solutions for the offshore wind industry will give way to yet unknown spin-offs. For example: a secondary industry for the East Coast region is a marine logistics industry. With multiple developers and utilities involved in different states, logistics will be critical for coordinating the use of vessels and ports.

FLOATING OFFSHORE WIND

The Bureau of Ocean Energy Management (BOEM) is continuing to work on designating lease areas off California's Coast where floating offshore wind can meet the technological demands of the deep waters. Offshore wind must be a key component in the strategy to meet the ambitious goals of California's SB 100. There is already momentum in California with Redwood Coast Energy Authority, and support from several private companies, with the aim to have a floating offshore wind farm operational by 2024.

BOEM published a Call for Information and Nominations (Call) on October 19, 2018 to obtain nominations from companies interested in commercial wind energy leases within the proposed areas off central and northern California. The three California BOEM Call Areas were not located on the southern coast because of restrictions requested by the US Navy, and are shown here:

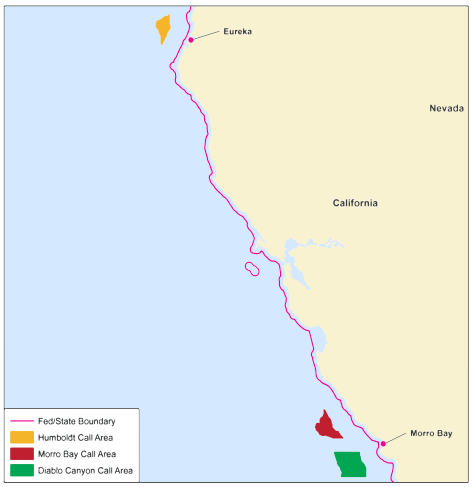


Image credit: BOEM

CHALLENGES

The relationship between offshore wind generation and grid connections for transmission might at first appear challenging. However, New York's announcement to increase its commitment of 2,400 MWs to 9,000 MWs of offshore wind power presents an opportunity for industry to mobilize and coalesce around the grid connection with transmission issue. In all likelihood, state and federal agencies will need to collaborate to coordinate offshore wind transmission to shore. The North East grid should be able to accept the first 1,000-4,000 MWs of power, but additional offshore wind new generation will require a coordinated transmission strategy.

By coordinating transmission, overall costs will be lowered. Projects located farther from shore will benefit from lower transmission costs if there is a connection point to a transmission line from an existing project.

Supply chain capacity is an issue. Offshore wind is a global market and much of the supply chain is international. US projects are competing against Asia and Europe and other emerging markets for resources. In the next four years, US developers are expecting to manufacture, construct and install over 4,000 MWs of offshore wind. Unlike Europe and its present way of doing business, the US has unique constraints and challenges requiring new partnerships and expertise to offer customized solutions for the US market. This requires businesses, organizations, government, academics all to work together to build capacity, and to provide collective expertise. The only way to build a robust, efficient competitive US base supply chain is through collaboration—which drives down costs and generates more competitively priced offshore-wind-generated electricity.

CONCLUSION

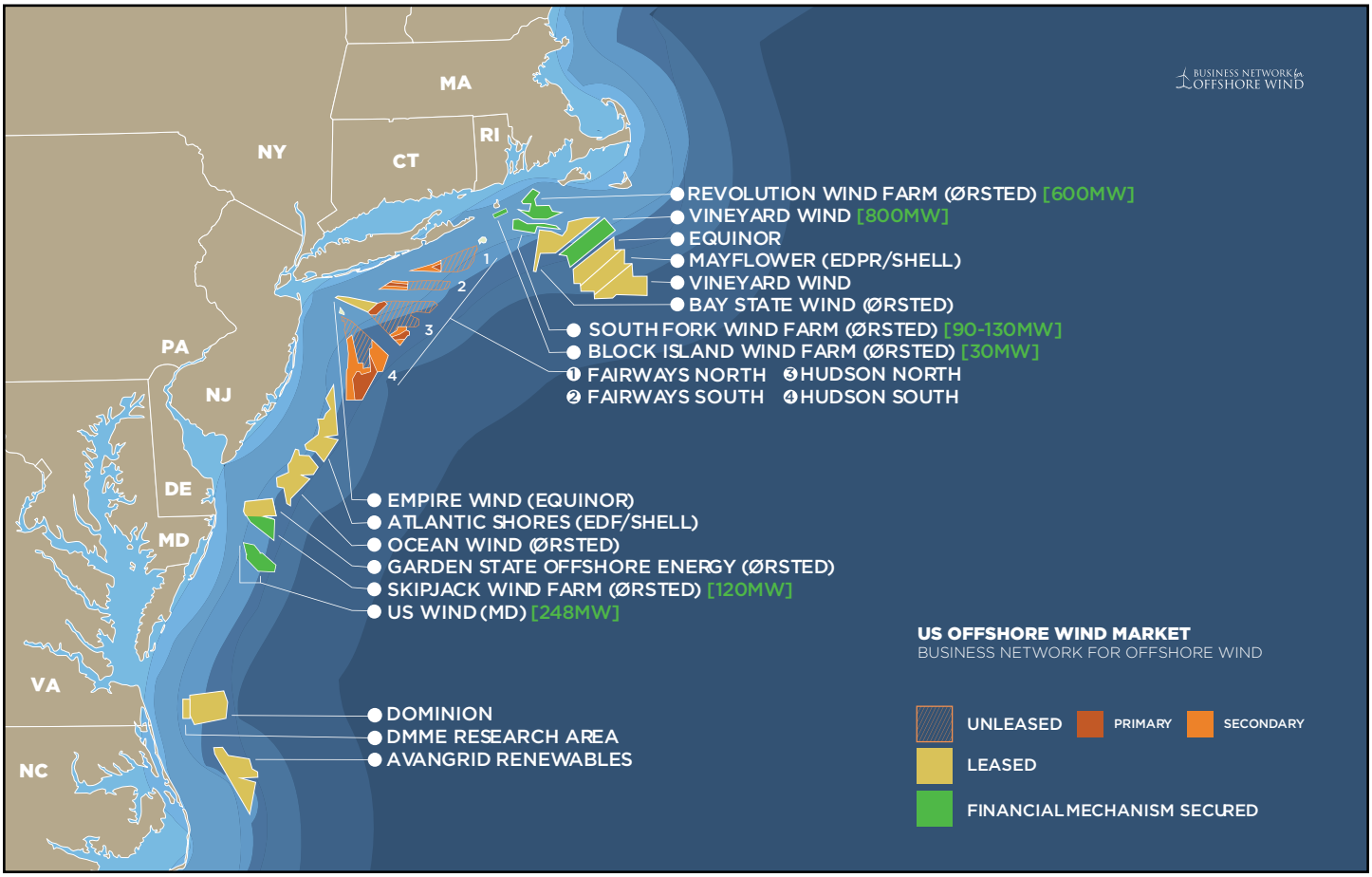
The US Offshore wind market is dynamic, and the outlook has never been better. The US is moving forward and seizing the opportunities provided by State polices to create an offshore wind energy marketplace.

With each large-scale procurement and commitment, the industry gains greater momentum. There is no looking back or slowing down, only rapid growth with developers and supply chain companies making more investments, local residents being trained and ports bustling with new activity.

In 2020, BOEM is scheduled to auction the New York Bight four new wind energy areas which will add a further 9,000 MWs of offshore wind generation. When these areas are leased, it will bring the total US capacity to 30,000 MWs.

According to IRENA, the world demand for offshore wind will increase by 500,000 MWs over the next three decades and the US is on track to contribute to a 1/5 of the world's market. Offshore wind is becoming fully embraced as a growing US economic engine and a critical part in the US energy mix. It is the next big industry with big opportunities.

To read the Market Insights section, your company must be a member of the Business Network for Offshore Wind. Members can access the entire briefing document on the Member Section of the Network website. To learn more about membership, please email: brandy@offshorewindus.org or call 443-652-3242.



ABOUT THE AUTHORS

The Business Network for Offshore Wind

This briefing paper was prepared by The Business Network for Offshore Wind (the Network), a national membership-based nonprofit solely focused on U.S. offshore wind energy and the industry's supply chain. The Network follows the market and its development on a daily basis and many of its 300 members are actively engaged in its development.

The Business Network for Offshore Wind (the Network) is a national membership-based nonprofit solely focused on U.S. offshore wind energy and the industry's supply chain. The Network is working hard to identify solutions to market challenges and build out the US Supply chain by delivering technical expertise and education, and partnering businesses.

You can learn more about this dynamic US market, its opportunities, submit your company information on the US Offshore Wind Supply Chain registry, and learn how to be a member at www.offshorewindus.org.

The Network looks forward to bringing the key industry leaders to New York City during the International Offshore Wind Partnering Forum, April 8–10th. With more than 45 technical and regulatory workshops, 10 networking events, and our exclusive WindMatch™ B2B matching tool—the IPF it is a the best starting point for entering the US Market.