## **U.S. offshore wind power sector dynamics**

**Analyst Presentation** 

Shashi Barla | 4 April 2019







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- Over 500 sector-dedicated analysts and consultants globally, including 75 specifically to power and renewables
- Located close to clients and industry contacts





## **About the Analyst**



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## Shashi Barla, Principal Analyst-Global wind supply chain and technology

## Wood Mackenzie Power and Renewables

Shashi leads Wood Mackenzie's Global Wind Turbine Technology and Supply chain practice. He is responsible for global wind turbine technology trends, supply chain trends, turbine OEM market share developments and product positioning strategies, global wind operations and maintenance trends and strategies, and supports on due diligence projects. Additionally, Shashi is responsible for developing Wood Mackenzie's technology and supply-related databases. Shashi renders his knowledge and expertise to Wood Mackenzie's research and consulting clients.

Shashi has a decade of experience in the global wind industry market intelligence, research and consulting. Shashi joined Wood Mackenzie in 2017, prior to Wood Mackenzie, Shashi was a global key account manager at LM Wind Power, Denmark, and has worked in various roles, primarily in the global market intelligence and strategy function at LM Wind Power. Before LM Wind Power, Shashi was an analyst at GlobalData plc in the wind market intelligence, research and consulting division.

U.S.	offshore	wind
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# **1.** Sector forecast and overview

#### woodmac.com

## 121GW of new offshore capacity or 18% of global total over the 10-year outlook

China more than tripled the amount of capacity it added YoY, contributing 38% of the record 4.3GW of offshore capacity grid-connected globally in 2018



Offshore top 20 markets: New capacity '19e-'28e



# US offshore wind sector to install more than 12GW through 2028

Carbon policies, state initiatives and improving economics fuel an 82% sector CAGR over the forecast period





# US offshore wind sector state-level overview (East Coast)



#### **Maine** (12MW\* | 5GW by 2030 [goal]) Significantly deeper coastal waters compared to the rest of the Northeast require floating wind installations, with an associated increase in costs. Relatively limited electricity demand and extreme transmission congestion in paths to demand centres farther south further disincentivize offshore development.

**Massachusetts** (800MW | 3.2GW by 2035 [goal]\*\*) Home to the largest and lowest awarded cost US offshore solicitation thus far, Massachusetts has several positive indicators for additional offshore development, including strong policy mechanisms, onshore transmission constraints, developed port facilities and access to multiple lease areas with above-average wind speeds.

#### **New York** (130MW | 2.4GW by 2030) The state with the most potential for offshore wind deployment within the forecast period, New York features coastal demand centres behind severe onshore transmission constraints and aggressive emissions policies that include carbon pricing in wholesale electricity markets. Access to lease areas is currently lacking, however.

**New Jersey** (none | 3.5GW by 2030) Home to the most ambitious state policy in 2010, offshore wind development froze through much of governor Chris Christie's terms and was revived in 2018 under a new administration, with a 3.5GW mandate that is again the highest in the country. If policies remain in place, their execution is supported by strong fundamentals.

Virginia (12-16MW | 2GW by 2028 [goal]) Virginia has taken significant steps towards developing an offshore wind policy framework in 2018, but it remains in its infancy and subject to future political changes. Full-scale installations are not expected until near the end of the outlook period.

Note: Unless otherwise indicated, mandates are binding. \*PPA under renegotiation. \*\*1.6GW by 2027 remains the only mandate in Massachusetts; H.4857 set a non-binding goal.

### Connecticut (300MW | none)

Like Rhode Island, Connecticut is small in size and electricity demand but has positioned itself as a "hitchhiker" on larger projects or solicitations in neighbouring states, boosting overall project scale and reaping cost savings. A zero-carbon energy RFP is underway but will likely award contracts to the existing Millstone nuclear facility.

### Rhode Island (400MW | none)

Home to the first operational offshore wind installation, Rhode Island policymakers are particularly supportive of the sector, and are attempting to position the state to provide onshore support facilities for the region. Although it is the best US state for offshore wind on an economic basis, it has little need for new capacity.

### Maryland (368MW | none)

A first-mover state with a local content policy focus, Maryland launched the first US large-scale offshore wind solicitations in 2017. The state has access to several lease areas, which helped push down pricing, and is a candidate for future bull-case solicitations given costs and need for congestion-bypassing generation.



### **State name** (contracted | offshore specific mandate)

 Clockwise from top left: policy framework, electricity demand, available lease areas/projects, emissions targets

🧭 Call area



Lease area



Strongest





## Market maturity projections

## Making up for 26 years of lost time, the US will rapidly ramp up its offshore wind capabilities in the next decade

Conditions	2018	2023e	2028e
Site availability			
Supply chain development			
Port and vessel availability			
Know-how and labour availability			
Insurance and financing			
Policy support			
Transmission availability			
Need for power			
Price fundamentals			

An example of the benefits of federal leadership, the Bureau of Ocean Energy Management (BOEM) leases federal waters for wind energy development, sufficient to install dozens of gigawatts of offshore wind.

With virtually no offshore wind-specific stateside industry to speak of, the US will take the better part of a decade to even reach a fraction of Europe's capabilities. This is not necessarily a deal-breaker; the US can leverage European resources to a degree and can create unique, US-specific solutions to overcome obstacles, albeit often at cost.

One of the first elements of the sector to localize, aggressive state involvement in worker training and domestic hiring practices will quickly yield a trained US labour pool, with the exception of specialized roles for supply chain elements not localized.

While underwriters and financing entities will grow more comfortable with the sector and contingency costs will fall, US offshore wind projects will always hold the risk of catastrophic damage from Atlantic hurricanes, particularly given recent climate patterns.

Reliance on state-level policymaking will remain a crutch; on a federal level, popular opinion precludes the costliest European policies currently assisting offshore wind.

Balkanized policymaking is a particular impediment to the development of "backbone" infrastructure, especially RTO-led possibilities, with any new offshore transmission-specific policies from the Federal Energy Regulatory Commission (FERC) unlikely before 2021. Onshore interconnection upgrade requirements are also often extensive.

Despite relatively weak load growth in the Northeast, demand remains strong in nascent Mid-Atlantic and Southeast markets like Virginia and the Carolinas, and high retirement expectations in New York will require significant capacity additions to fill the supply gap.

While LCOE will compare positively to Europe by the end of the forecast term, the US will remain disadvantaged on a net cost of new entry (CONE) basis given the lower wholesale market prices in the US. Carbon policies, whether state-level or national, are likely to close this gap, but not fully. The gap is lowest in Northeast winters, when offshore generation is highest and power prices spike on natural gas supply constraints.

# 2. Key sector dynamics



## Key sector drivers |

Investment tax credit

**BOEM** leasing

State initiatives

**Global interest** 

Battery storage

## **Key sector drivers | LCOE reductions**

Offshore wind LCOE by state, East Coast, 2018e to 2028e

## Current pricing counts on availability of EU resources; overreliance on them renders cost reductions unsustainable



US offshore turbine OEM market share forecasts 2020-2024e

woodmac.com



Contracted capacity additions

Uncontracted but forecasted capacity additions



# **Contrasting product moves on next generation offshore platforms**

Offshore Western turbine OEMs thrive on power uprates, while Chinese emphasise rotor upgrades



Next generation turbine projections for Western and Chinese turbine OEMs

Source: Wood Mackenzie



## US weighted average turbine rating will more than double in next 5 years

Turbine OEMs leverage the European platforms into the emerging US offshore market to benefit from economies



Source: Wood Mackenzie



## Key sector barriers | supply chain immaturity

Supply to migrate as long-term demand visibility solidifies and state-funded port upgrades break ground

<2021	2021 to 2025	2026+
Demonstration-scale	European-dependent development	Sustainable domestic supply
Demonstration-scale projects move without a domestic supply chain and reliance on – but limited access to – European resources.	European "imports" of installation vessels, know-how, component designs and equipment such as turbines, blades and substations are brought over wholesale and immediately brought to bear on LCOE. Labour is more evenly sourced between the US and Europe, expanding training opportunities.	A variety of manufacturers across the value chain produces blades, nacelles and other high-value components at competitive prices. Developers enjoy access to a fleet of specialized, Jones Act- compliant vessels including turbine installation vessels, crew accommodation and foundation installation vessels, an advanced installation port and staging area, as well as a deep and knowledgeable domestic labor pool

U.S. offshore wind

## China, UK and Germany will be large offshore manufacturing hubs due to market size

Onshore facilities will be leveraged for components not challenged by expensive logistics Offshore market cumulative installs 2018-2027e





## Key sector barriers | solving the supply chain challenge

A durable and capable supply chain is key to leveraging EU technological innovations and facilitating cost-out



## US local content potential by main component

Source: Wood Mackenzie NAPS tool



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