Virtual Tour NASEO Offshore Wind Transmission

Ørsted
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Ørsted Offshore: Global overview
25+ years of experience and unparalleled track record

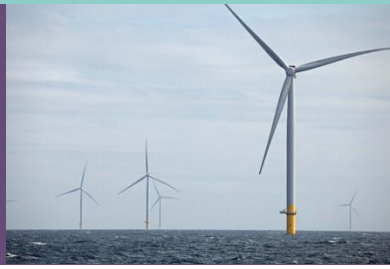
The global leader in offshore wind

- **6.8 GW** installed capacity
- **3.1 GW** under construction
- **1,500+** turbines spinning
- **26** offshore wind farms in operation

The world's first
Vindeby, 1991
5 MW

America's first
Block Island Wind Farm, 2016
30 MW

The world's largest
Hornsea 1, 2020
1.2 GW



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Overview

- Offshore wind represents the dawning of a new industry in the U.S.
- It has huge potential to achieve both economic and environmental goals
- Transmission challenges exist today, and may grow as the industry matures
- States and the federal government can set the stage for success

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Key Challenges

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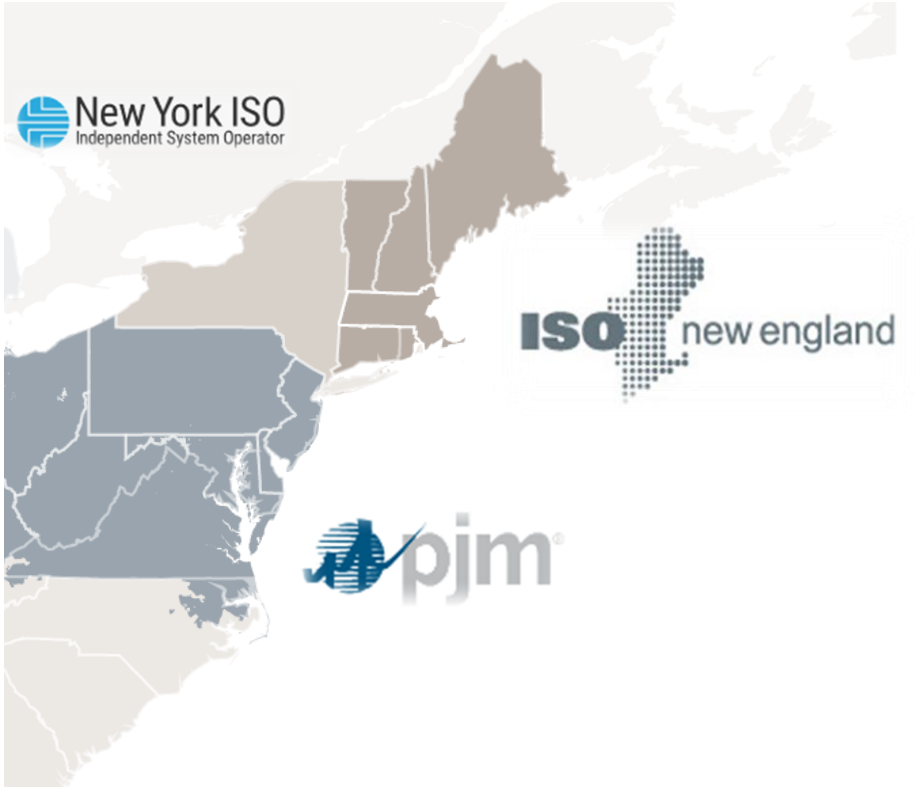
Key challenge: Finding electrical space to come ashore

- Power grid along the U.S. East Coast not designed to take large amounts of power from offshore
- Injecting offshore wind power can result in:
  - Congestion on transmission lines
  - Curtailment of clean power production

Key challenge: Finding electrical space to come ashore & wholesale markets

- Independent System Operators manage new generator interconnection process to maintain reliability
  - Slow and uncertain process
  - Projects moving in and out of queue result in delays and changing interconnection cost estimates
- Growing conflicts between wholesale market design and state energy policies



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Solutions & Opportunities

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Solutions & opportunities: Large-scale onshore power grid upgrades

- States should lead efforts to ensure the transmission grid is strong enough to support their offshore wind generation goals
  - Innovative cost sharing tools already exist (FERC Order 1000 Public Policy Transmission)
  - Some states, like NY, have been using this process to upgrade transmission to meet public policy goals

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Solutions & opportunities: Learn from the European experience

- Germany was an early adopter of a backbone offshore wind transmission system
- Unfortunately, construction delays left 8 completed wind farms unable to connect to the grid
- This backbone system was also plagued by cost overruns of about 90%
- As a result, German ratepayers were forced to cover about $1 billion in damages from 2012 – 2016

- Delays and ratepayer costs like this are unheard of in the UK, the world's largest offshore wind market
- In the UK, developers are responsible for designing and constructing transmission assets
- About 8 GW of OSW have successfully connected to the grid with none of the cost overruns and expensive delays experienced in Germany
- Now that points of interconnection are filling up, the UK is looking at new transmission solutions

Image source: New Jersey Offshore Wind Strategic Plan

Solutions & opportunities: Large-scale offshore power grid upgrades

- As space at points of interconnection become more limited, states should consider options for backbone transmission
- In order to avoid costly miscues that plagued the first European attempts the following will need to be addressed:
  - Develop revenue and risk allocation mechanisms to protect offshore wind developers from lost revenue in the event of backbone failures
  - Site backbone in locations that accommodate geographically diverse lease areas
  - Develop interconnection standards that can be factored into project design and cost in advance of project bids

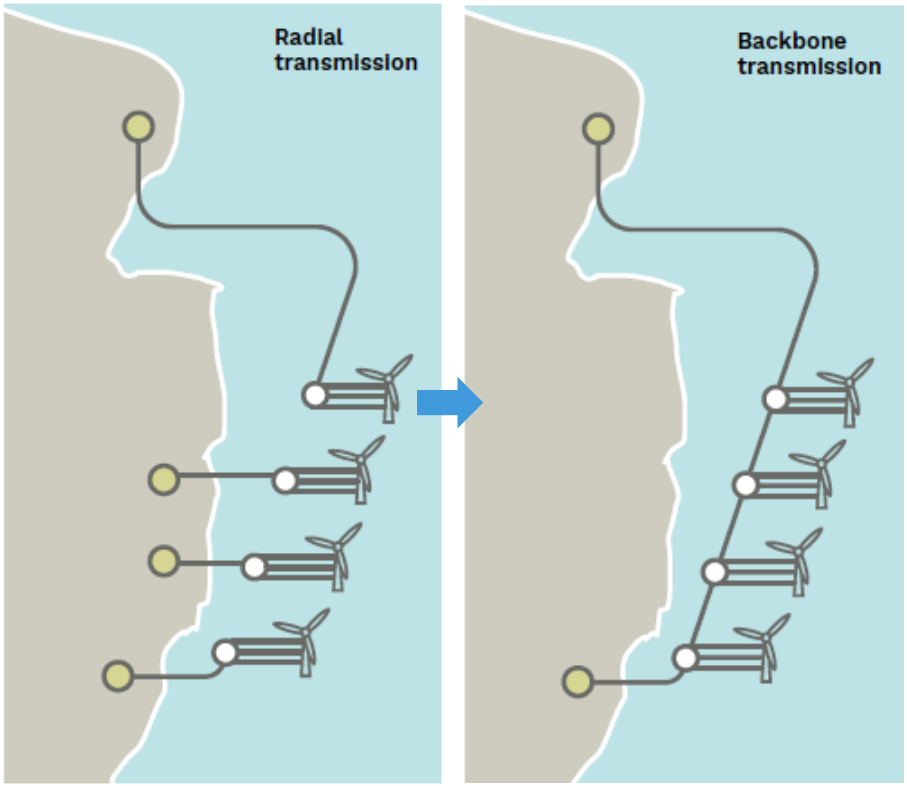

Image source: New Jersey Offshore Wind Strategic Plan

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Solutions & opportunities: Explore new ways to procure offshore power

- As states move forward with their offshore wind goals, consider new procurement approaches
  - States, working with ISO/RTOs can identify areas suitable to build offshore points of interconnection (POI)
  - These facilities could be procured and offshore wind developers could bid future projects to interconnect at sea, instead of on land
  - It is possible that a single offshore POI (or series of them) could serve multiple states, potentially saving onshore upgrade costs and reducing the cost for offshore wind

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Solutions & opportunities: Update wholesale market rules

- States should work together to ensure wholesale markets work for them
- Potential market reforms to help state's meet their clean energy goals include:
  - Removal of restrictions to revenues for offshore wind resources such as the PJM Minimum Offer Price Rule
  - Streamlining and fast-tracking interconnection review process for public policy generation and transmission projects
  - New cost allocation schemes for offshore wind interconnection upgrade costs
  - Revised interconnection queue and study processes to ensure timely studies and project deadlines

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Conclusion

- The solutions to the offshore wind challenges are not simple
- It will take time and there will be growing pains along the way
- The time is now to start this journey so we can help the states reach their critically important clean energy goals
- States need a real partner in the federal government to help streamline permitting and manage new lease area auctions
- Ørsted can be a valuable partner for the government as we chart a new energy course together

Thank you

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