Offshore Wind Summit

September 25, 30, and October 7, 2020

National Governors Association Center for Best Practices & The Embassy of Denmark
Electricity Market Structure & Transmission Grids- Introductory Remarks

Jessica Rackley, Energy & Environment Program Director, NGA Center for Best Practices
Thank You to our Sponsors

Orsted

SIEMENS Gamesa

Renewable Energy
Opening Remarks

Ralph Northam, Governor, Commonwealth of Virginia
Lessons from the EU Offshore Wind Sector

Ivan Pineda
WindEurope Public Affairs
Our members make wind energy work

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<th>400+ MEMBERS</th>
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<td>Wind turbine manufacturers</td>
<td>GE Renewable Energy, SIEMENS Gamesa, Vestas</td>
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<td>Wind farm developers</td>
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<td>Installation / logistics</td>
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<td>Research institutes</td>
<td>Catapult, Fraunhofer IWES, TU Delft, DTU</td>
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+ NATIONAL WIND ASSOCIATIONS
Wind the cheapest form of new power generation

EUR 1 = USD 1.12
ECB, 2019 exchange rate

Based on BNEF 2019 data for North West Europe.
Offshore wind has developed individually in each country

WindEurope forecasts 2,882 MW by the end of 2020

Source: WindEurope

Cumulative Installed Capacity (MW)

Annual Installed Capacity (MW)
Poland is now the hottest market

Source: (PWEA, 2020) Vision for Poland. Development of offshore wind in the Baltic Sea region
A journey to gain experience

Vindeby Wind Farm
Lolland, Denmark
1991

Source: WindEurope
Maritime Spatial Planning

1. Land sea interactions
2. Ecosystem Based approach
3. Integrated coastal management
4. Involvement of stakeholders
5. Best available data
6. Member States and third countries cooperation

WindEnergyEurope
Maritime Spatial Planning

Why is it important?

- Reduce conflicts on access to maritime space
- Reduce cumulative environmental impacts
- Reduce coordination costs
- Improve visibility for private investments

Implementation timeline:

- 2014: September Entry into force
- 2016: Set up authority
- Draft MSPs, Stakeholder meetings and consultations
- 2021: MSP in each Member State

Source: European Commission
Who’s responsible where?

Source: WindEurope
Offshore grid connections
Different configurations, different costs

Source: WindEurope
Cost of offshore wind is decreasing

Auction results

Price €/MWh

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Source: WindEurope
February 2020

-75%
Delivering high volumes requires auctions and Contracts for Difference (CfD)
The UK is now revising the transmission long term strategy
But the grid requires a new approach
Much more coordinated

Source: PROMOTioN
HUB solution evolution (2025-2050)
With private and public stakeholders

Hybrid projects and regional cooperation

- North Sea Energy Cooperation
- EE-LV 1GW joint project
- UK-NL Multi-purpose interconnector
- Baltic Sea Offshore Wind Pact
For Europe to be climate neutral
Some lessons learned in offshore wind in Europe

1. Get your maritime spatial planning right
2. Beef up your permitting authorities
3. Accelerate grid development - on and offshore
4. EU regulatory framework for “cross border” projects
5. Electrify transport, heating and industry
6. Visibility on volumes and revenues
NGA & Embassy of Denmark Offshore Wind Summit

Kirsty Townsend
Head of Special Projects
October 7, 2020
Ørsted Offshore: Global overview
25+ years of experience and unparalleled trackrecord

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
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
- There is no clear rulebook for how this new industry can and should develop
- Without a rulebook, offshore wind faces several major challenges
- States and the federal government can set the stage for success
Offshore wind market on the East Coast
Potential for 25+ GW
Ørsted U.S. Offshore Wind portfolio
Awarded over 2,900 MW of offshore capacity on the East coast

In Operation

**Block Island Wind Farm**: 30MW

Awarded

**Revolution Wind**: 50/50 JV w/ Eversource, 704MW (400MW to RI, 304MW to CT)

**South Fork Wind**: 50/50 JV w/ Eversource, 132MW

**Sunrise Wind**: 50/50 JV w/ Eversource, 880MW

**Ocean Wind**: with the support of PSEG, 1,100MW

**Skipjack Wind Farm**: 120MW

Under Construction

**Coastal Virginia Offshore Wind**: EPC contract, 12MW demo project
Key Challenges
Key challenge: complex design & permitting uncertainties

- Offshore wind farms are complex
- Multi-year design & planning phases
  - Globally ~ 7-year average
- U.S. had to create a permitting regime from scratch
  - Multiple state and federal agencies
  - Enormous amount of uncertainty regarding costs and timelines
Key challenge: finding physical space to come ashore

- Power cables need to physically and electrically interconnect to land to serve customers
- On the U.S. East Coast:
  - High population density
  - High real estate costs
  - Difficult to find suitable space for substations and cable routing
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
    - Hinders climate goals
Independent System Operators manage new generator interconnection process to maintain reliability

- Slow and uncertain process
- In ISO NE feasibility studies have a 90 timeline, but in Q2 2020 average completion time of 241 days reported
- 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

- Currently, only offshore wind ineligible for capacity market revenue in New York and PJM; and limited in New England
Key challenge: reducing impacts to coastal communities & the environment

- Agreements to help reduce impacts of cable landfall needed for coastal communities
- Scientific research necessary to protect marine wildlife
Fisheries Outreach Resources

- Fisheries Liaisons
- Fisheries Representatives
- Outreach — early and often
- Input on project layout and design
- Collaborative design
Solutions & Opportunities
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
– 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

Solutions & opportunities: large-scale offshore power grid upgrades
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
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
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

Kirsty Townsend
Head of Special Projects
KIRTO@orsted.com
Panel Discussion on Electricity Market Structure & Transmission Grids

Moderator: Rob Gramlich, President - Grid Strategies

Panelists:

• Judy Chang, Undersecretary of Energy and Environmental Affairs - Massachusetts
• Mary Beth Tung, Director - Maryland Energy Administration
• Al McBride, Director of Transmission Strategy and Services - ISO New England
Conceptual Depiction of Offshore Interconnections: 8,000 MW

For illustration purposes only
State Breakout Discussions on Electricity Market Structures & Transmission Grids
State Report Out
Summary & Closing
Summit Wrap-Up

General

**COLLABORATION & COOPERATION.** Vital across states and regions
**LONG-TERM VISION.** Investors respond best to long-term signals
**COST DECLINES.** LCOE reductions significantly greater than anyone expected
**SUPPLY CHAIN & EMPLOYMENT.** Renewable generation is a jobs machine

Stakeholders

**ROLES & RESPONSIBILITIES.** Clearly designated methodology and pathways
**CLEAR PROCESS.** Clarity at the outset significantly helps stakeholder engagement
**COMPREHENSIVE ENGAGEMENT.** All key stakeholder perspectives at the table

Ports & Infrastructure

**MULTIPLE PORT OPTIONS.** Different approaches fit different states
**FINANCING.** Leveraging public/private investment can be done in multiple ways
**WATERFRONT VS. INLAND.** Inland regions are a key part of the offshore supply chain

Electricity Markets & Transmission

**BACKBONE VS. RADIAL.** The decision between the two is not binary
**OFFSHORE PLANNING.** It takes a LOT of time to plan, permit and build
**POWER FLOWS FROM OFFSHORE.** Onshore grid was not built for offshore wind