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New Jersey Offshore Wind Transmission Stakeholder Meeting

Panel 1 – Other Jurisdictions' Efforts to Connect Geographically Remote Generation through Shared Transmission Facilities

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Agenda

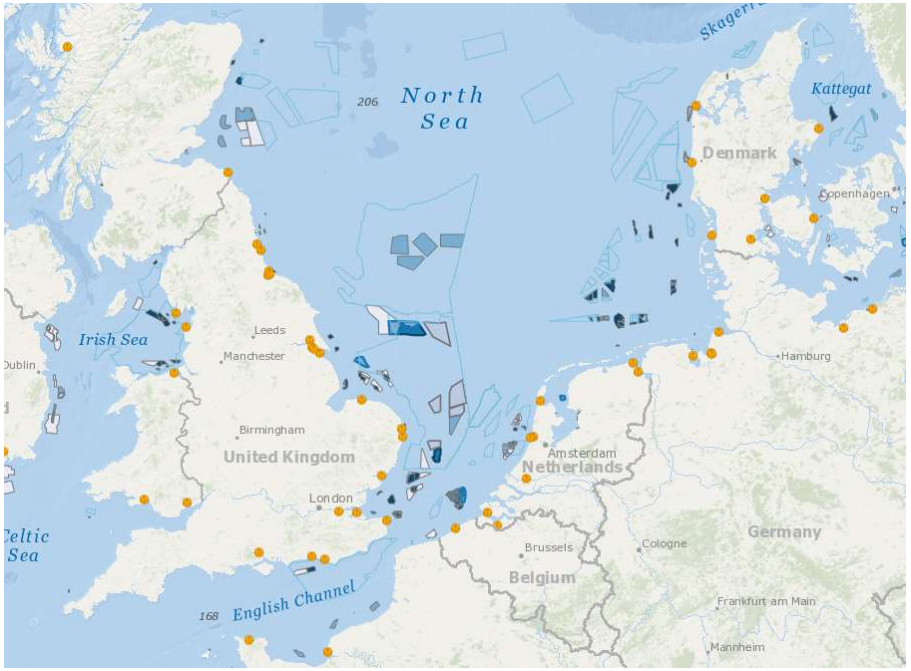
01 European OSW Transmission Efforts

02 US Renewables Transmission Efforts

03 New Jersey Transmission situation and options

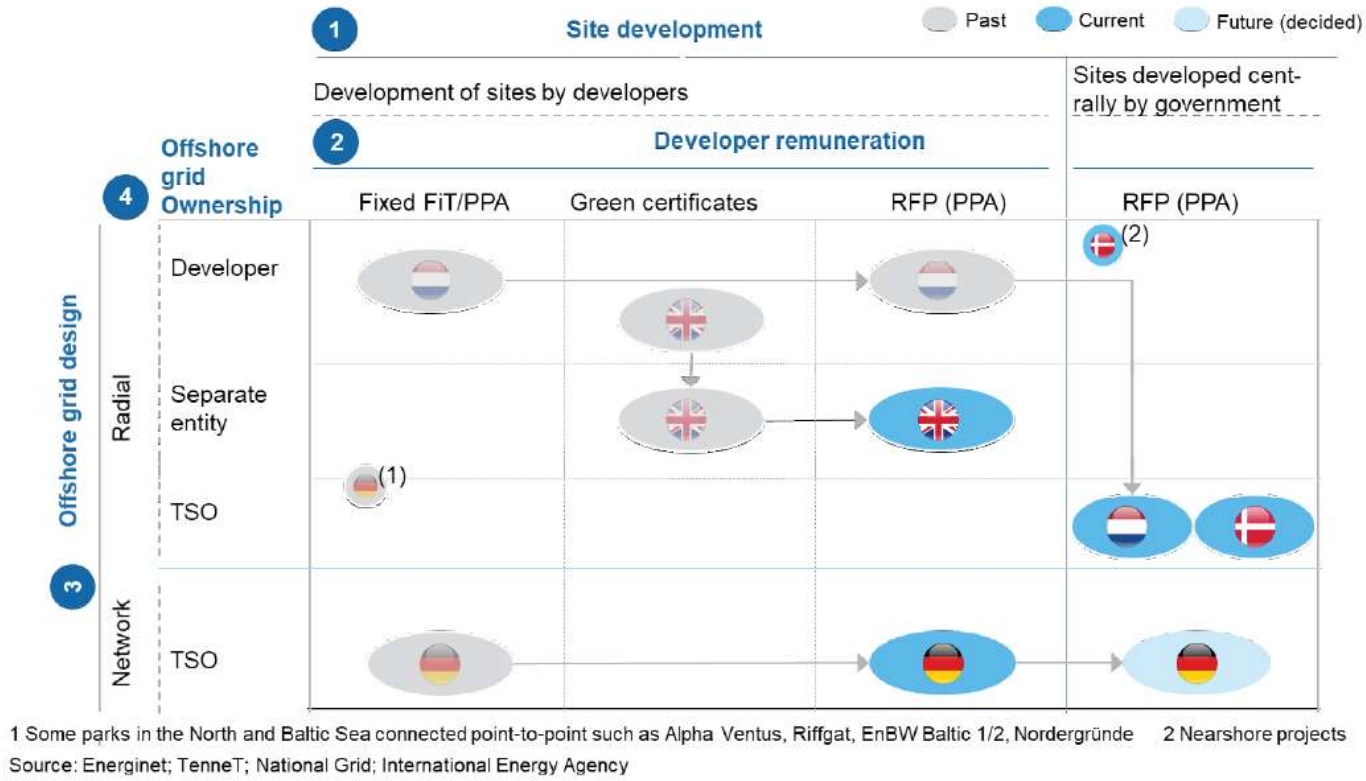
European OSW Transmission Efforts

- 18GW of installed and connected Offshore Wind in Denmark, Germany, the Netherlands and the United Kingdom, and an expected 70GW by 2028.
- TSOs ensure that onshore grid developments are coordinated with offshore connections.
- Each country has created it's own transmission strategy, based on specific factors and choices.
  - Different design
  - Different ownership
- All European systems implemented to date have good and bad points. Everything evolved rather than being planned from experience. No perfect system yet.



Source: 4coffshore

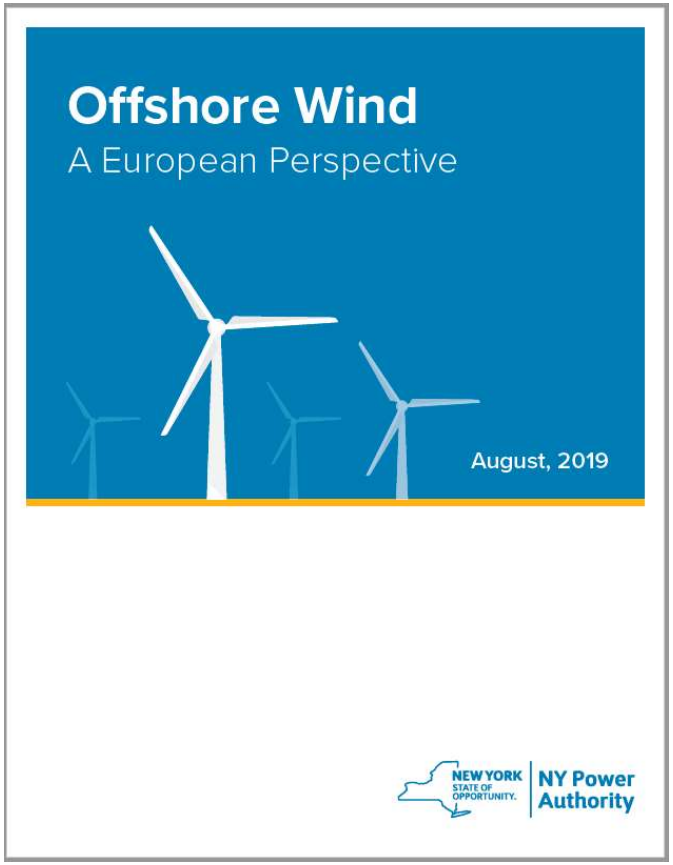
European OSW Transmission Efforts



Source: NYPA, Offshore Wind a European perspective, August 2019

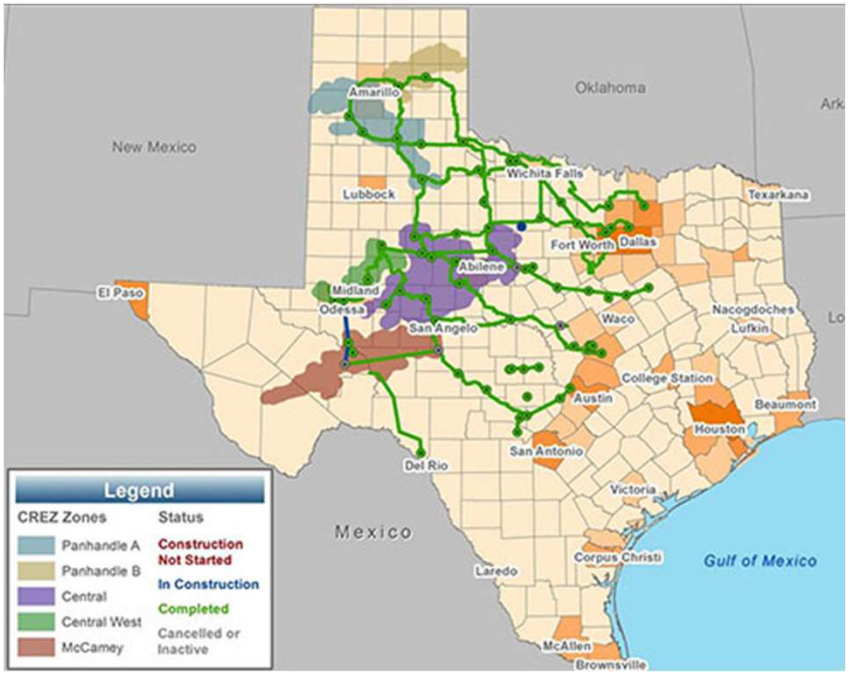
European OSW Transmission Efforts

- Report issued from NYPA in August 2019 regarding Offshore Wind transmission and interconnection strategies developed in Europe over the last two decades.
- Main takeaways from the study are:
  - The most effective path to low-cost wind power is through scale and healthy competition.
  - Model used is dependent on a variety of physical and non-physical factors including geography.
  - Visible, long-term grid planning on and offshore, removes barriers to entry, improves coordination and lowers costs.
  - Cross-border coordination helps countries leverage planned transmission infrastructure, achieve resource flexibility and gain economies of scale.



US Renewables Transmission Efforts – Texas CREZ

- Western Texas wind energy resources is far from the main load located in Eastern Texas
- Texas legislature ordered in 2005 that the Public Utility Commission of Texas (PUC) and the Electric Reliability Council of Texas (ERCOT) to designate **competitive renewable energy zones (CREZ)** and develop a transmission plan.
- The PUC identified five CREZs in 2007 and ERCOT began to develop a transmission optimization study.
- The PUC selected a scenario that would accommodate 18.5 GW of wind at a cost of $6.8 billion and construction was initiated in 2010 and was completed in 2014.
- The implementation of CREZ also helped overcoming curtailment and transmission congestion.



Source: www.eia.gov

New Jersey Transmission Situation

- Onshore coastal grid is not planned to receive large amount of generation.
- Significant onshore system upgrades will be required to safely deliver the electricity to the load.
- Risks of congestion and curtailment should also be assessed.
- Need to include other sources of renewable energy in the mix of new generation.

Situation is similar to CREZ where a proactive planning allowed for a very large amount of wind energy to be delivered from remote generation through shared facilities.

- State target is to have 3.5GW in service by 2030.

Time is of the essence here. Need to work now with options that are available.

- Coastlines and available point of interconnections (POIs) are limited and their access is very challenging

Lessons learn from European countries should be considered for next steps

New Jersey queue position area

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New Jersey Transmission Options

1. Interconnection process for radial line
   - Reasonable upgrades for initial projects, but system upgrades will ramp-up quickly.
   - High risks on both rate payers (costs of upgrades risks) and Developers (timeline risks).
   - Doesn't provide a coordinated approach with other offshore wind projects and onshore renewable projects.
   - Provides more flexibility to Developers, especially for first comers.

2. State Agreement Approach
   - Allow for a coordinated approach with other state goals including onshore renewable energy and storage.
   - Transmission plan selected would optimized the system upgrades to increase reliability and reduce congestion and curtailment.
   - Timeline is unknow, might be a challenge.
   - Study could piggyback on the current queue position planned upgrades.

Based on European experience and other project in US such as the CREZ project in Texas, the onshore system required to connect the OSW must be planned and coordinated through the State Agreement Approach.

This should be the first priority to reduce the risks for both the rate payers and the Developers and to optimize the transmission assets.

Thank You.

Questions?