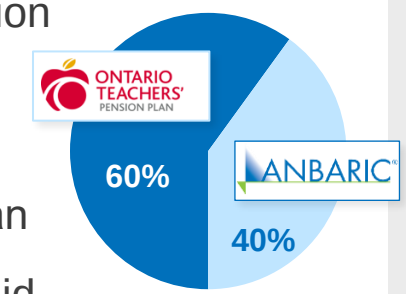
Transmission for Offshore Wind

CSG East

Manchester, NH
August 16, 2022

Anbaric: Who We Are

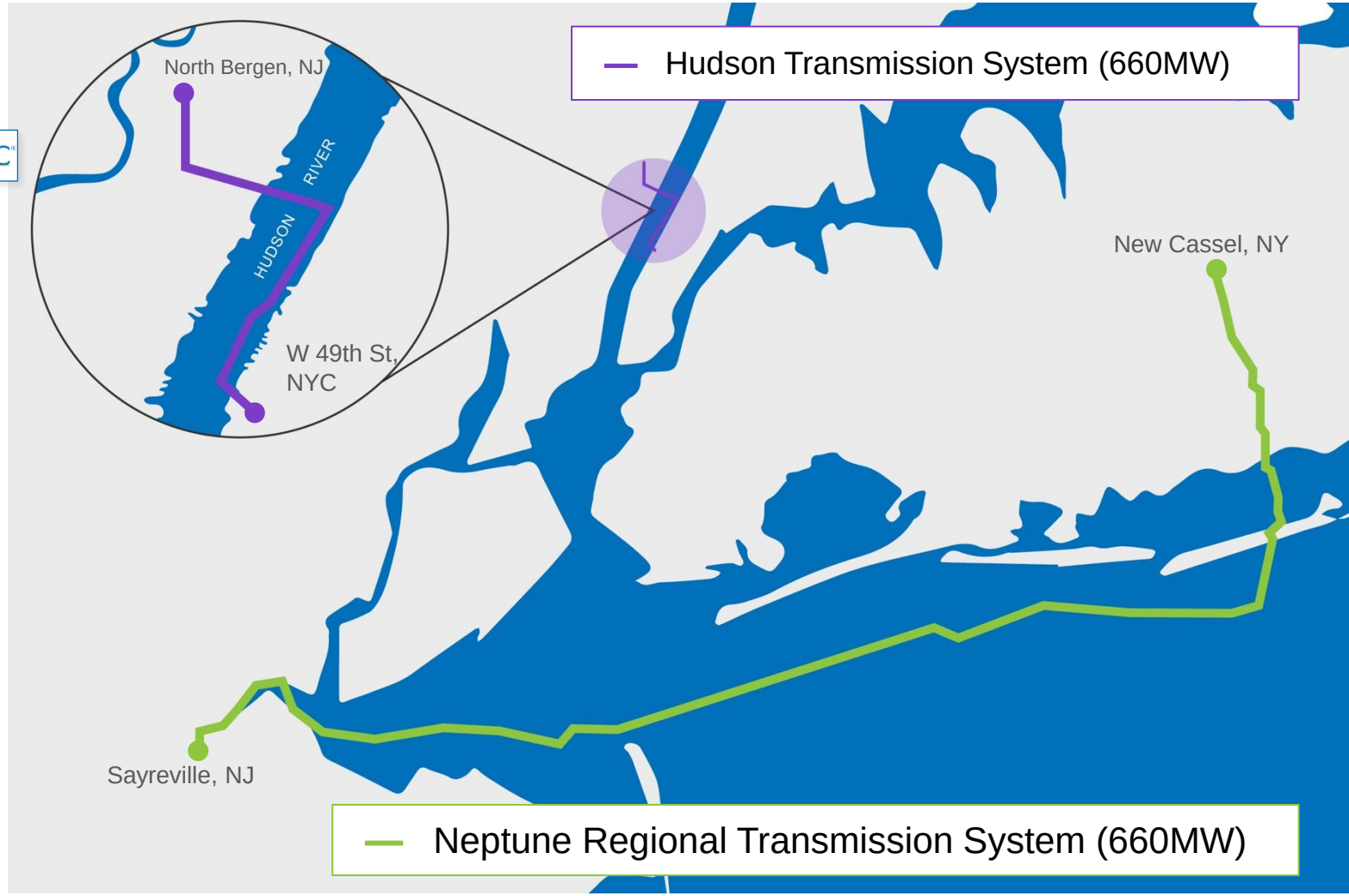
Developers of transmission and energy storage



- Backed by Ontario Teachers' Pension Plan
- Active in Northeast, Mid-Atlantic, Canada and California

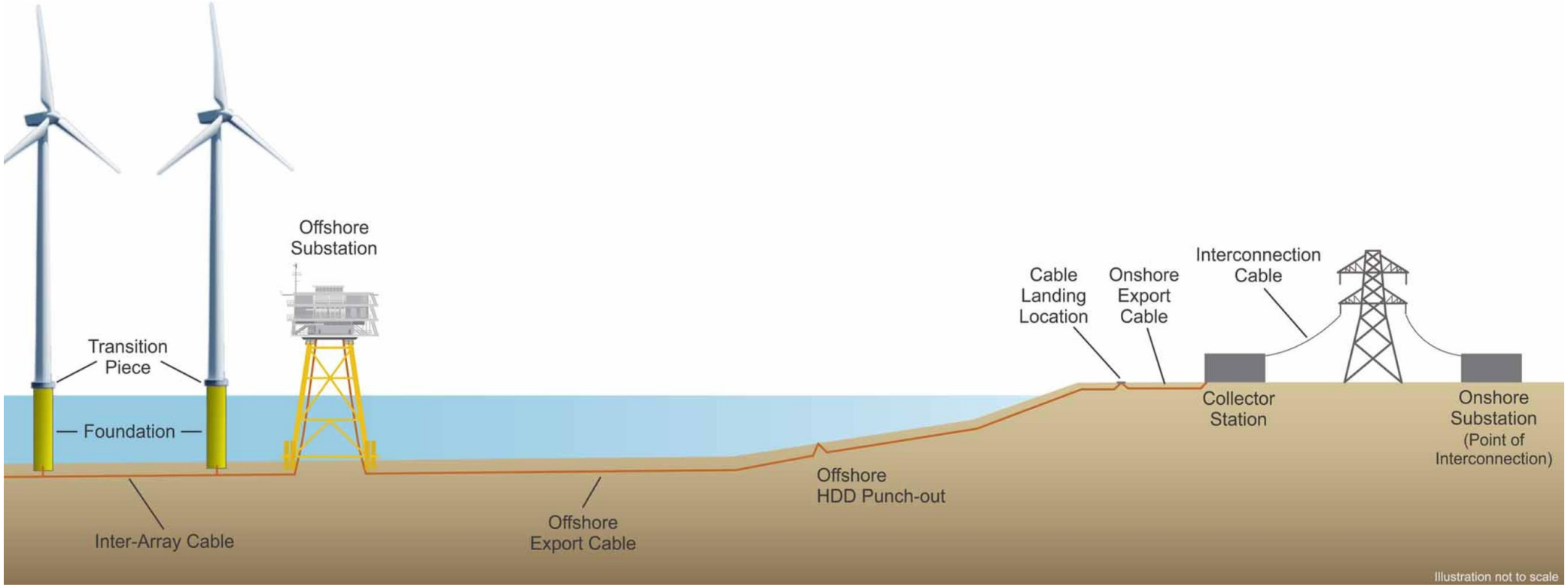
Record of Success: Neptune and Hudson

- ✔ Two large buried HVDC transmission projects (COD 2007 and 2013)
- ✔ $1.5B total capex
- ✔ On-time & On-budget
- ✔ Built with local, union labor



Offshore Wind Transmission: What is it?

- Wind turbines connected to offshore substation via buried inter-array cables
- Offshore export cable buried in seabed to shore landing
- (Typically) underground cable connects to existing grid
- Cost and duration of upgrades to onshore grid often unknown at time of bid submission



https://coastalvawind.com/about-offshore-wind/delivering-wind-power.aspx

Offshore Wind Transmission: Overview

Two approaches to transmission

- Generator lead line: offshore wind company responsible for wind farm + transmission & interconnection
  - Transmission optimized for one project
  - No cable corridors, multiple cable landings

- Planned, independent transmission: 3rd party (transmission developer, utility or offshore wind company) responsible for transmission & interconnection
  - Transmission optimized for all projects
  - Cable corridors, fewer cable landings

Industry trend

- Typically starts with generator lead lines
- As interconnection costs (particularly onshore upgrades) and routing challenges increase, transmission is separated from generation, evidenced in:
  - Europe
  - New Jersey
  - [New England?]

Offshore Wind Transmission:
An Analysis of New England and New York Offshore Wind Integration

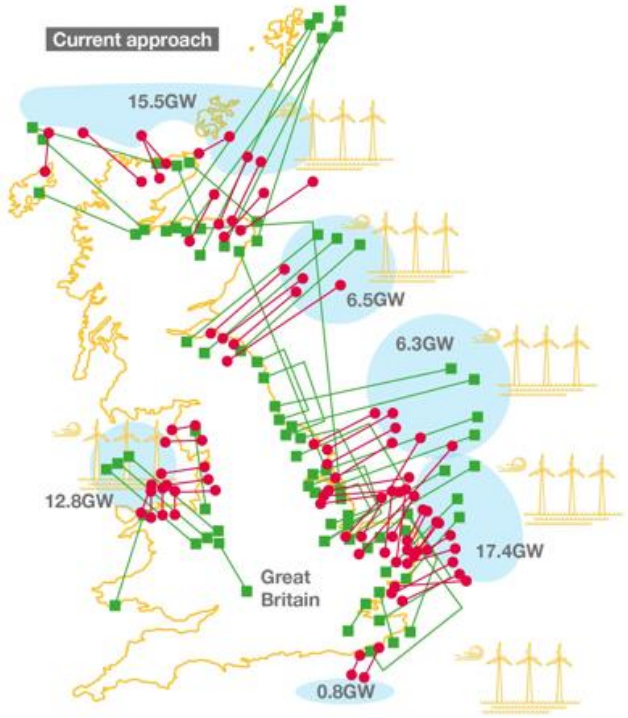
THE Brattle GROUP

Prepared for:
Northeast Regional Ocean Council & Mid-Atlantic Regional Council on the Ocean Webinar

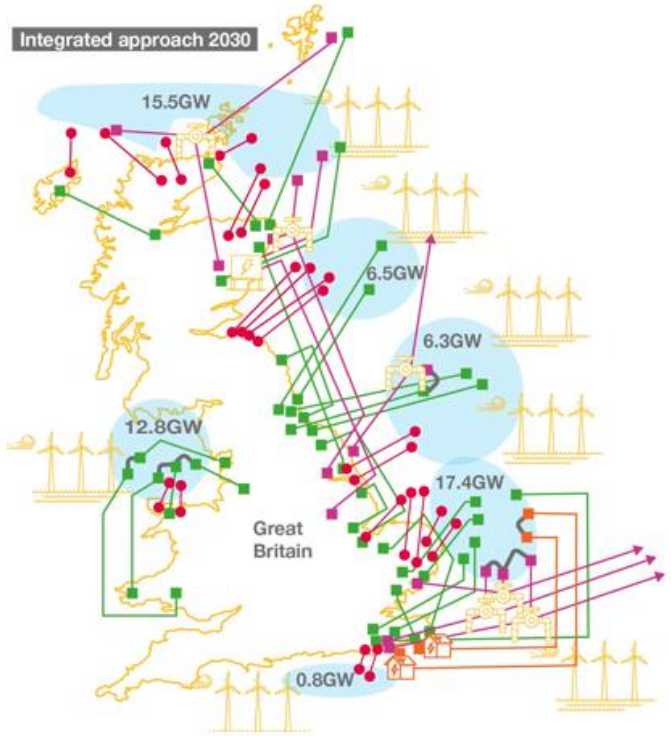
Elements we examine	A planned approach shows…
Total onshore + offshore transmission costs • **Onshore transmission upgrade costs** (more risk) • **Offshore transmission costs** (less risk)	Lower overall costs in both NE & NY • Substantially lower onshore costs • Slightly higher offshore costs
Losses over offshore transmission	Reduced losses
Impact to fisheries and environment	Substantially lower impacts
Effect on generation & transmission competition	Increased competition
Utilization of constrained landing points	Improved landing point utilization
Enabling third-party customers	Improved third-party participation

https://www.brattle.com/wp-content/uploads/2021/06/21229_offshore_wind_transmission_-_an_analysis_of_options_for_new_england_and_new_york_offshore_wind_integration.pdf

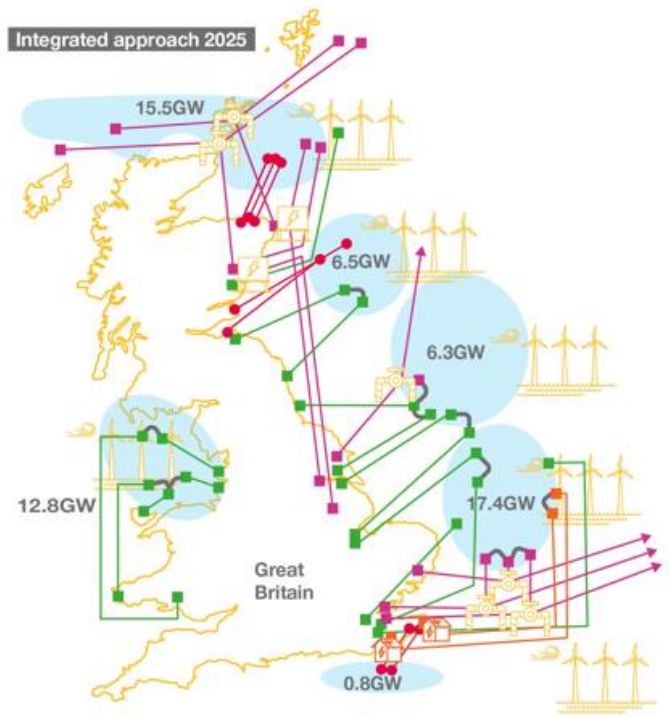
Offshore Wind Transmission: United Kingdom



Capex Cost: £29 billion
Total Assets: 330
Total Landing points: 105



Capex Cost: £27 billion (-8%)
Total Assets: 40% reduction
Total Landing points: 60



Capex Cost: £23 billion (-18%)
Total Assets: 70% reduction
Total Landing points: 30

https://newenglandenergyvision.files.wordpress.com/2021/02/bstojkovska-02-02-2021-draft.pptx

New Jersey & PJM

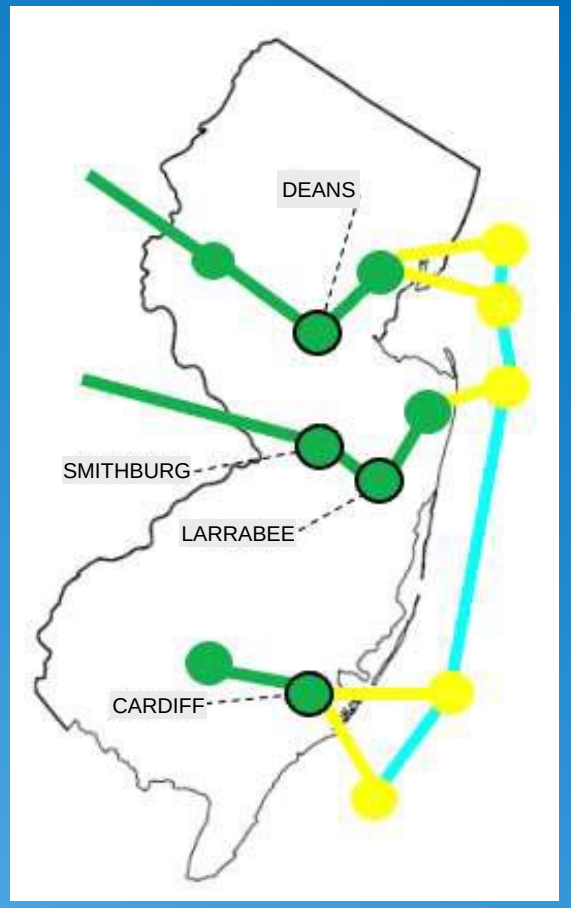
New Jersey & PJM procuring transmission solutions for up to 6.4GW of offshore wind

- First offshore wind transmission procurement in United States
- Awards expected October 2022
- 80 bids from 13 developers, including offshore wind companies, utilities, and transmission developers (including Anbaric)…

  …vs. 2 bidders in Massachusetts' latest offshore wind procurement
- Increased competition found to reduce costs ~20% to 30% for onshore* and offshore** transmission

Other states in PJM could use similar mechanism to procure transmission

Procurement Scope:



Green:
- Option 1—Upgrade PJM Transmission system to on-shore substations
- Black Outline indicates substations targeted for injections as described at left.

Yellow:
- Option 2—From Upgraded Shore Substations over Beach crossing to New (wet) collector stations.

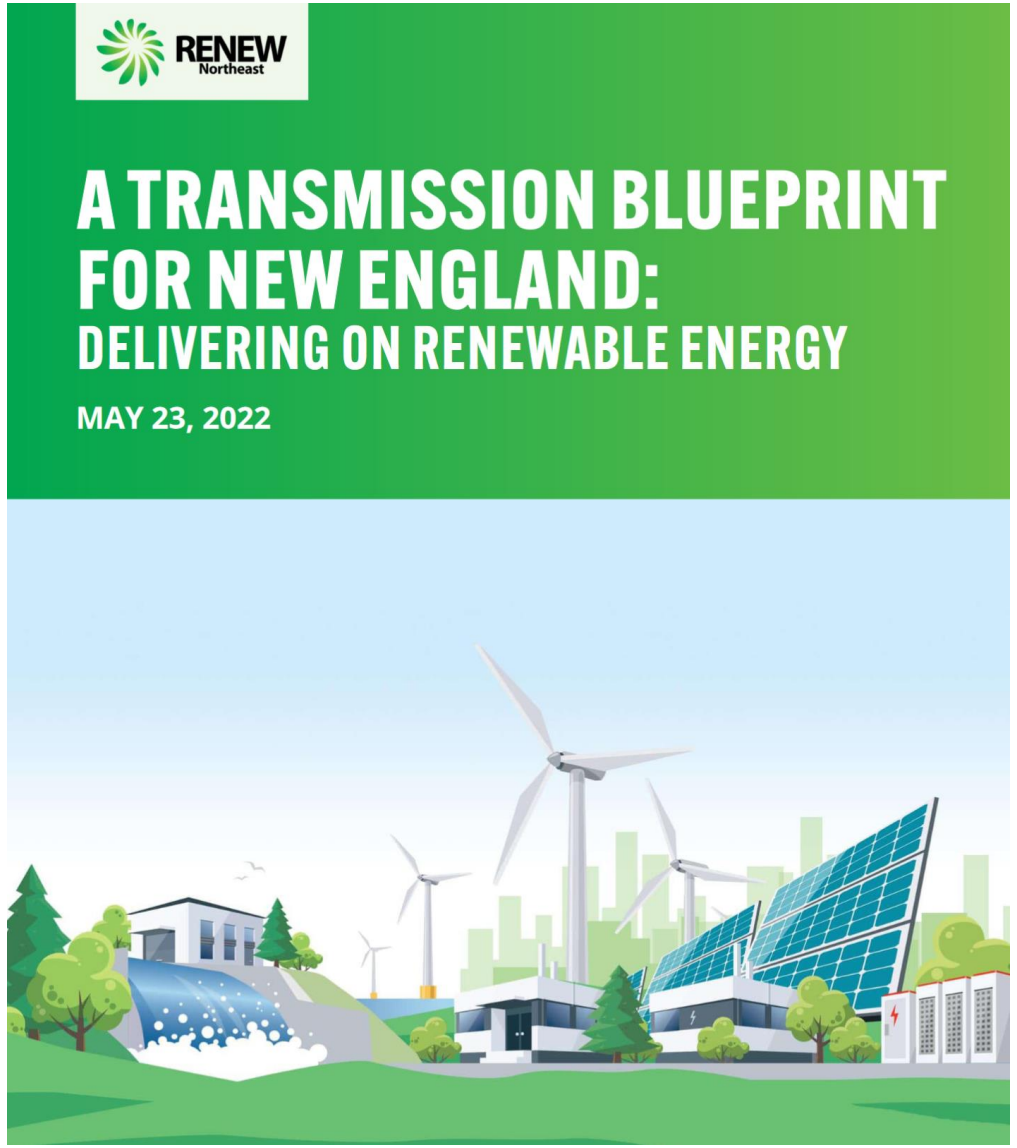
Blue:
- Option 3—Interconnecting collector stations in a network to facilitate delivery of offshore wind.

* The Brattle Group, "Cost Savings Offered by Competition in Electric Transmission: Experience to Date and the Potential for Additional Customer Value," April 2019, Produced for LSP Transmission.
** Cambridge Energy Policy Associates, "Evaluation of OFTO Tender Round 2 and 3 Benefits," March 2016, Produced for Ofgem

New England

- Massachusetts, Connecticut & Rhode Island authorized to procure independent transmission for offshore wind
- Federal funding for transmission available through Infrastructure Investment and Jobs Act
- Policy Statement from Federal Energy Regulatory Commission (FERC) encourages states to propose voluntary agreements to develop transmission*
- All or a subset of New England States could collaborate to procure transmission for offshore wind and potentially onshore renewables (e.g., from Northern Maine)
- No need to wait on FERC transmission rulemaking, which will take years to implement

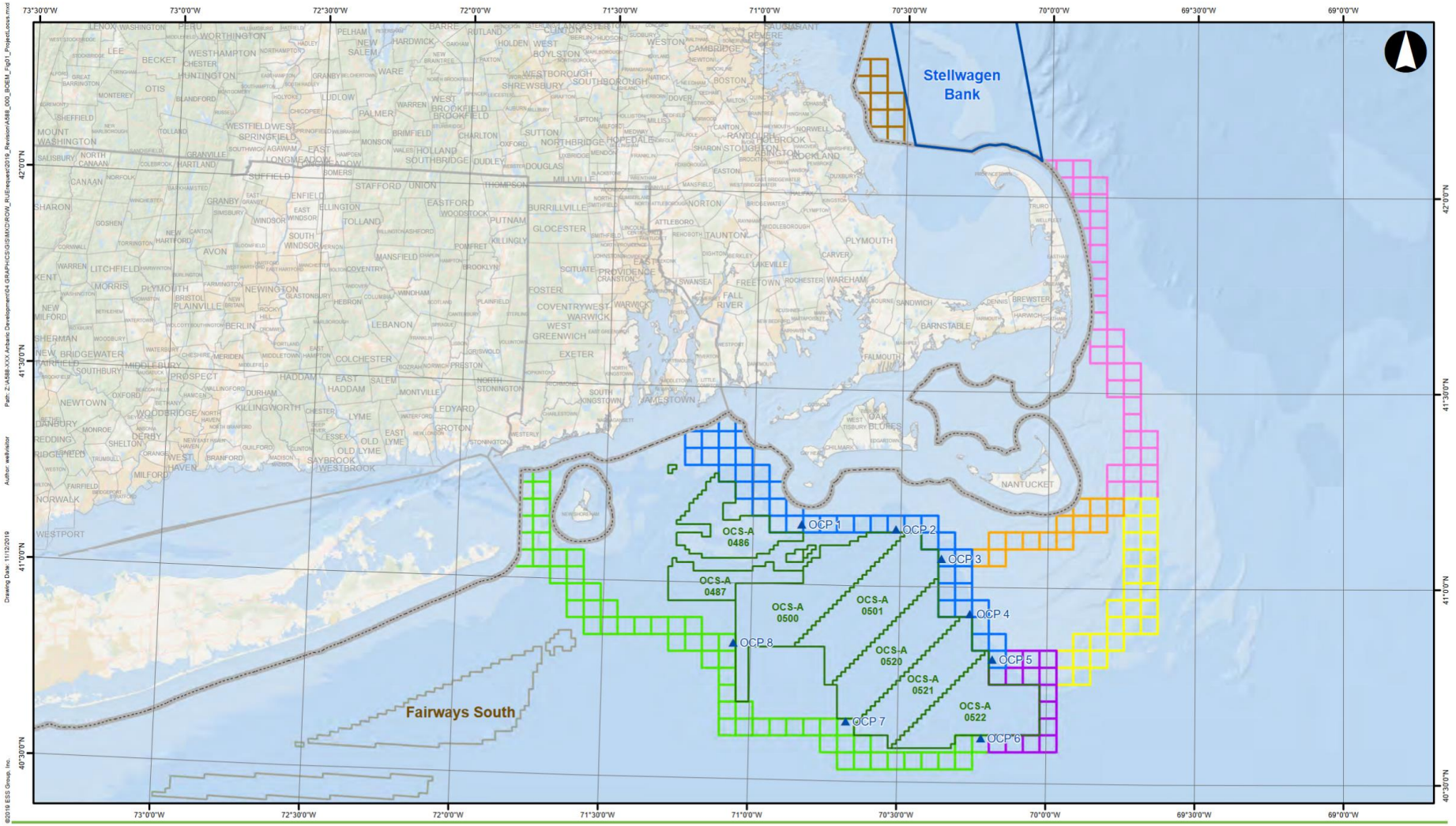
* https://www.ferc.gov/media/e-2-061721



https://renewne.org/wp-content/uploads/2022/05/RENEW-Northeast-Transmission-Blueprint-2022-05-23.pdf

Appendix – supplemental slides

Southern New England Ocean Grid – BOEM Application



- Non-exclusive right of way/right of use application to Bureau of Ocean Energy Management submitted Nov. 18, 2019
- In federal waters >3 miles from shore
- Access routes to robust points of interconnection in Massachusetts, Rhode Island, Connecticut and New York

Source: https://www.boem.gov/sites/default/files/documents/renewable-energy/Anbaric-S-New-England-OceanGrid.pdf