Learning from the Experts Webinar Series

Assessing and Advancing Transmission Upgrades for Offshore Wind

Greg Brinkman
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August 9, 2023

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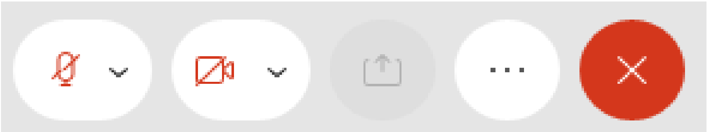

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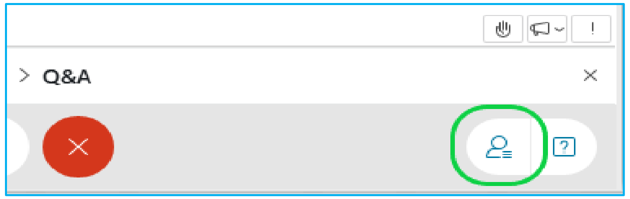

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Learning from the Experts

This webinar series is hosted by NYSERDA's offshore wind team and features experts in offshore wind technologies, development practices, and related research.

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NREL
Transforming ENERGY

Assessing and Advancing Transmission for Offshore Wind in New York

Greg Brinkman
NREL and NYSERDA
Aug 9, 2023

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Why should we care about offshore wind, and associated transmission, in New York?

New York State Clean Energy Goals

Climate Leadership and Community Protection Act

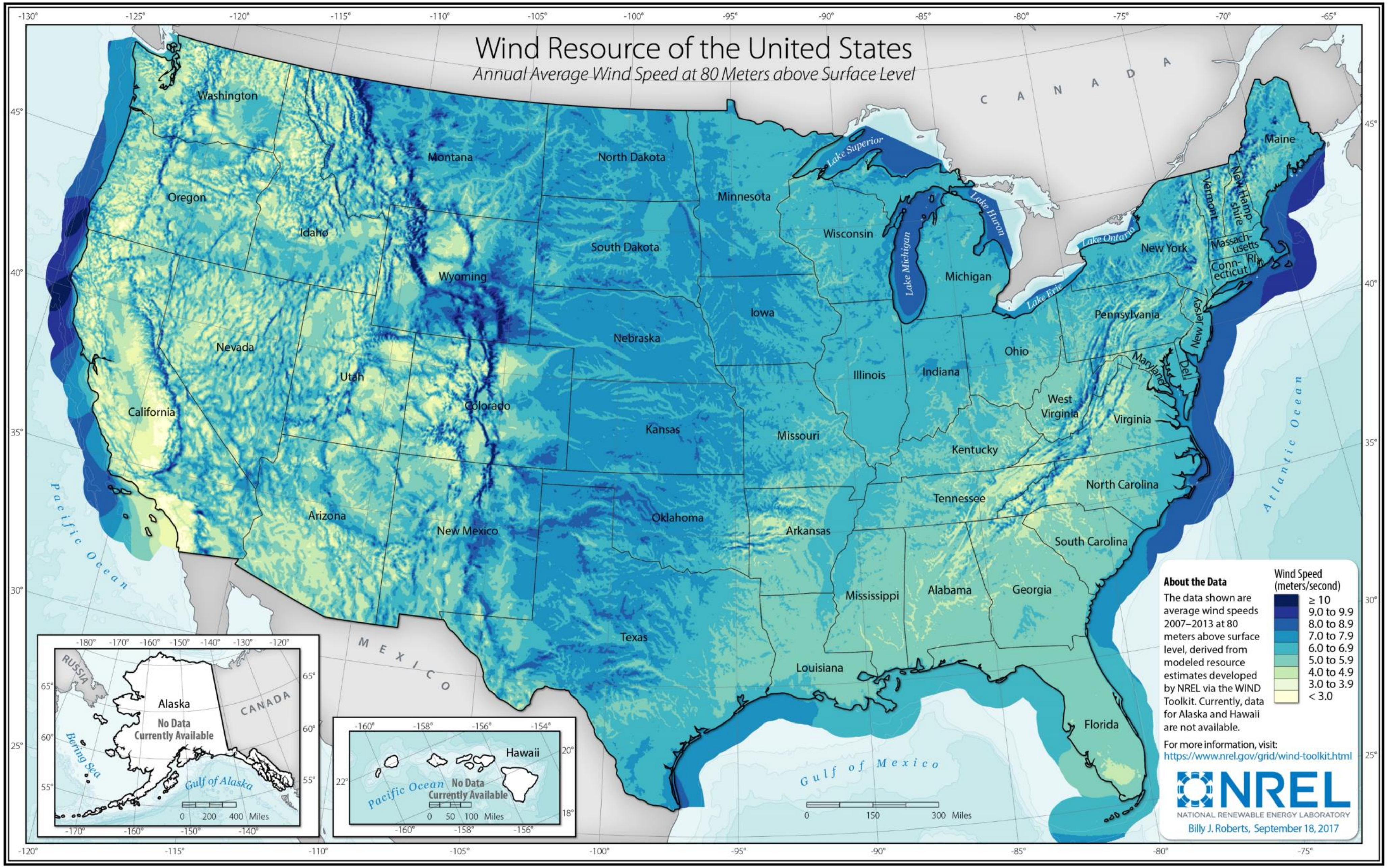
- 70% electricity from renewable energy by 2030
- **9+ GW of offshore wind (OSW) by 2035**
- Zero-emission electricity system by 2040
- 85% reduction in greenhouse gas emissions below 1990 levels by 2050

NYS Climate Action Council Draft Scoping Plan*

- Initial framework for achieving net-zero emissions, increasing renewable energy usage, and ensuring climate justice
- **Includes projections of a potential 16-19 GW of OSW by 2050**

*https://climate.ny.gov/Our-Climate-Act/Draft-Scoping-Plan. The Council is working to release a final scoping plan by January 1, 2023.

Offshore wind resource near NY is very good



New York is expected for winter peak demand to exceed summer in the next 10+ years

- NYISO ([see Gold Book]) and others are projecting system to peak in winter starting approximately 10 years from now
  - Primarily due to heating demand electrification from climate goals
- Offshore wind resource is winter peaking (see figure)

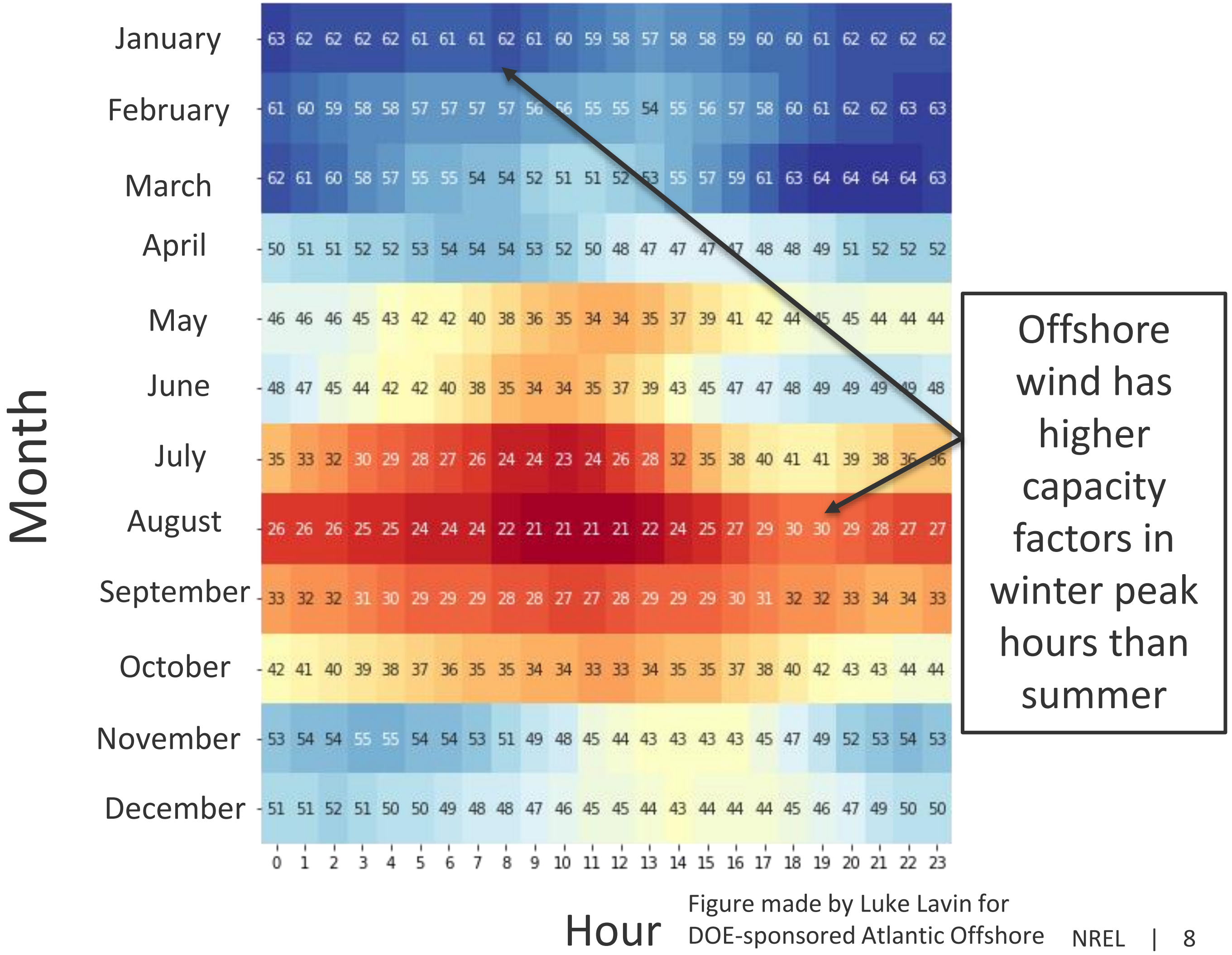
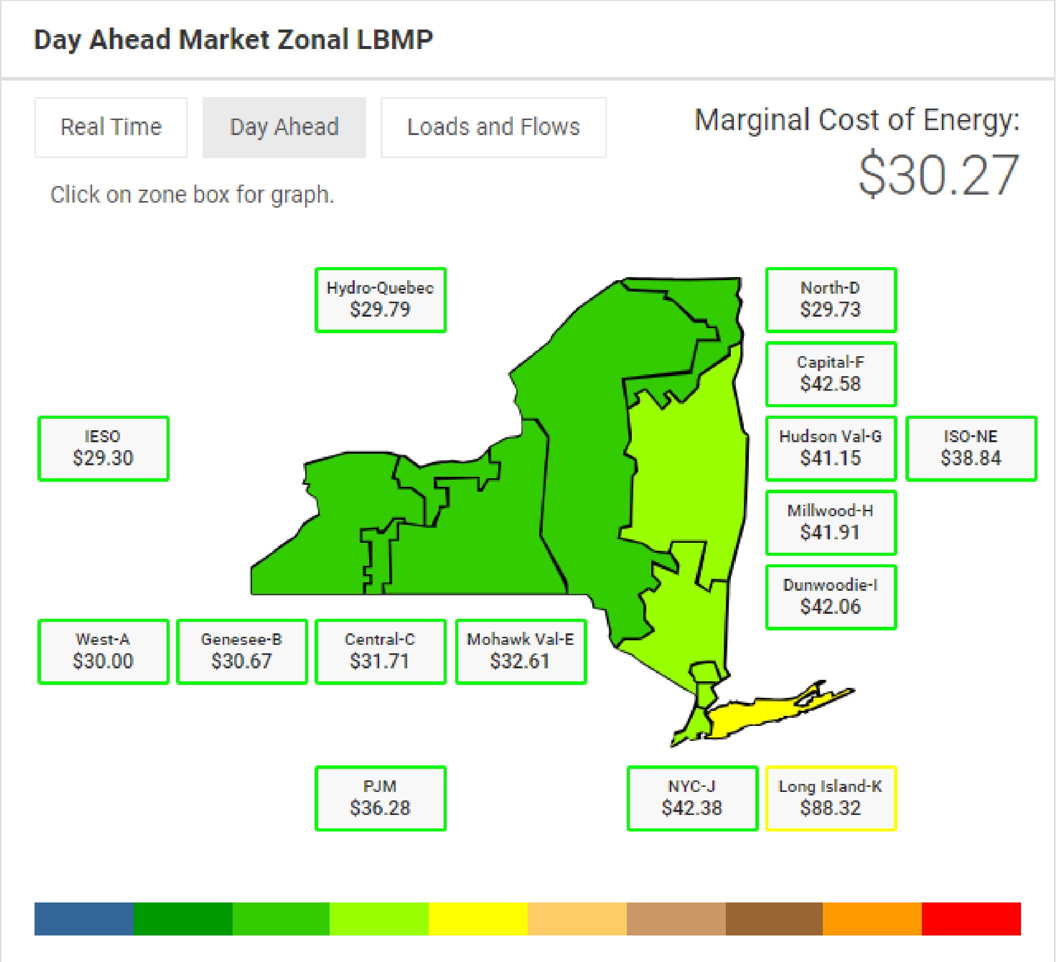
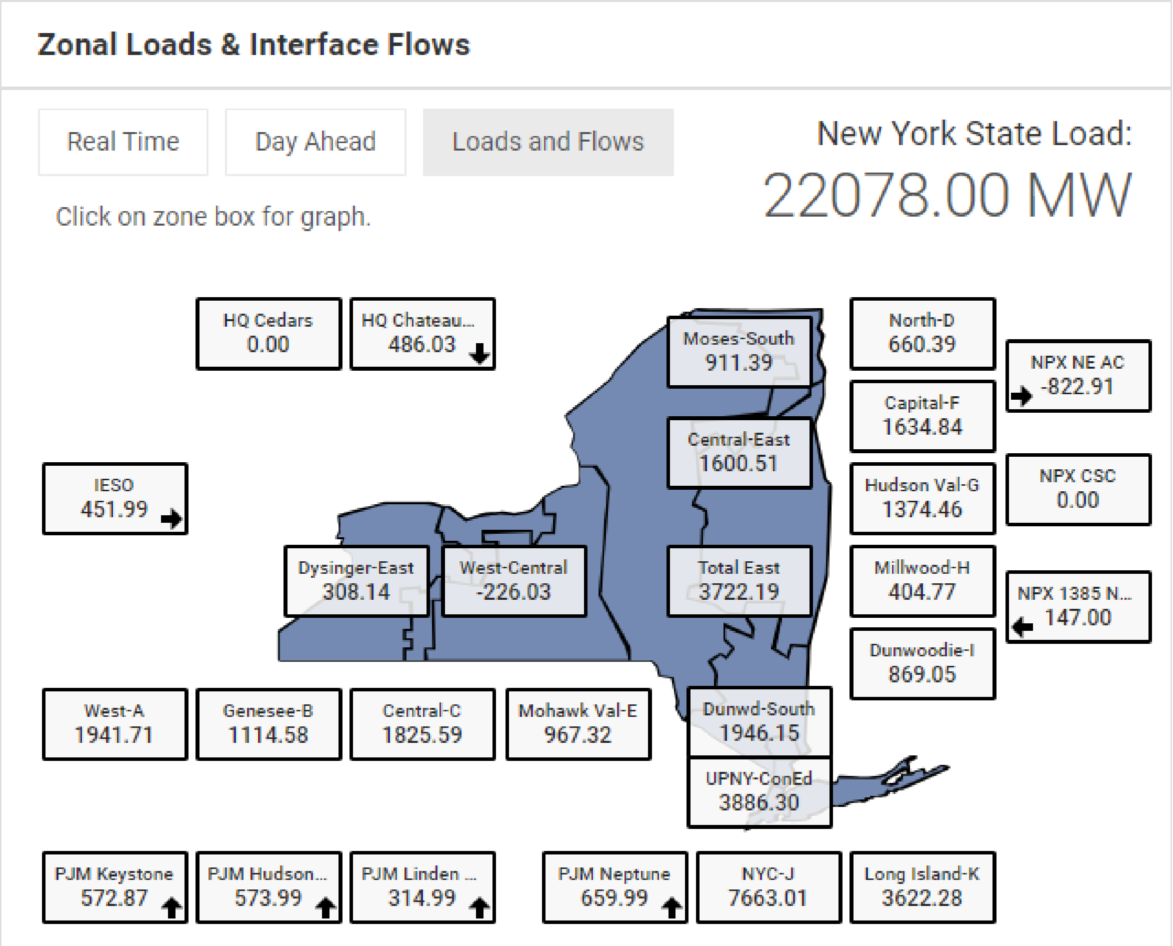


Figure made by Luke Lavin for DOE-sponsored Atlantic Offshore Wind Transmission Study

Long Island and NYC are impacted by congestion

Snapshots from yesterday's [NYISO real-time dashboard](#) (Aug 8, 4 pm EDT)





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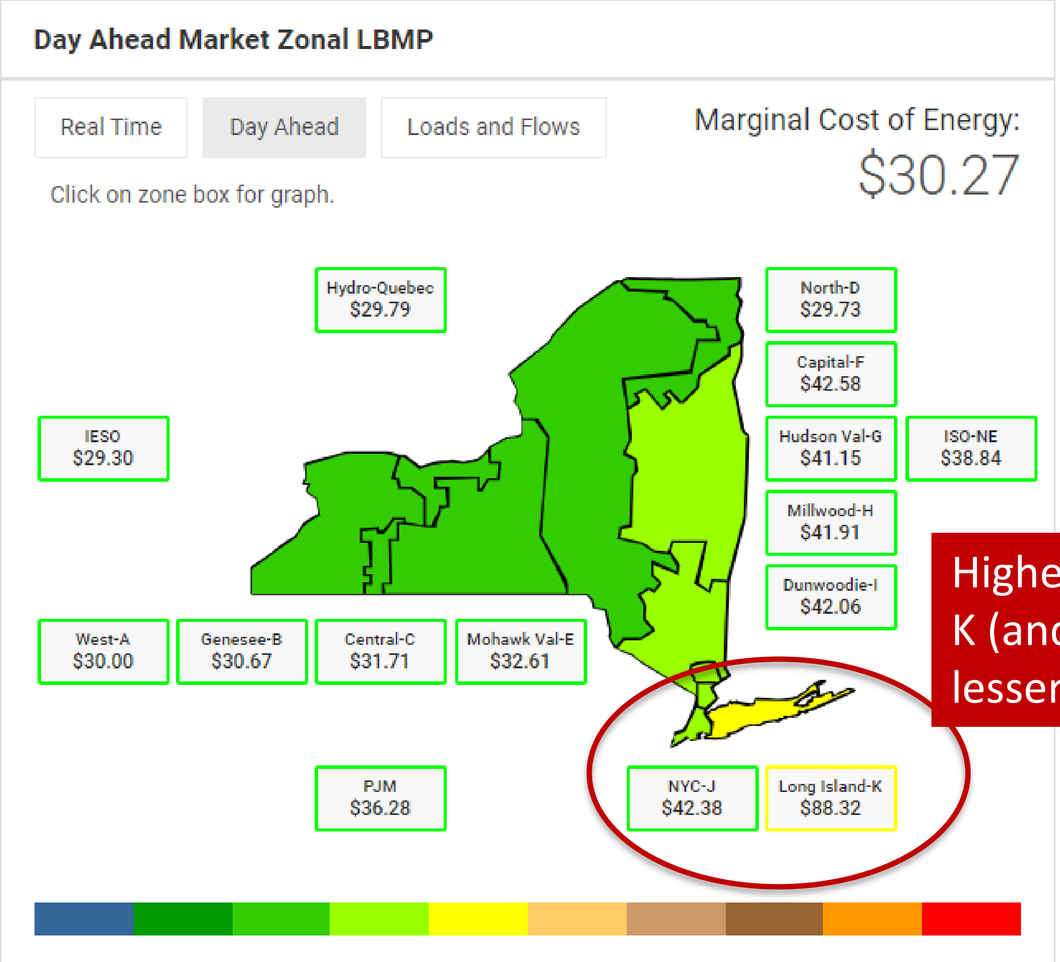
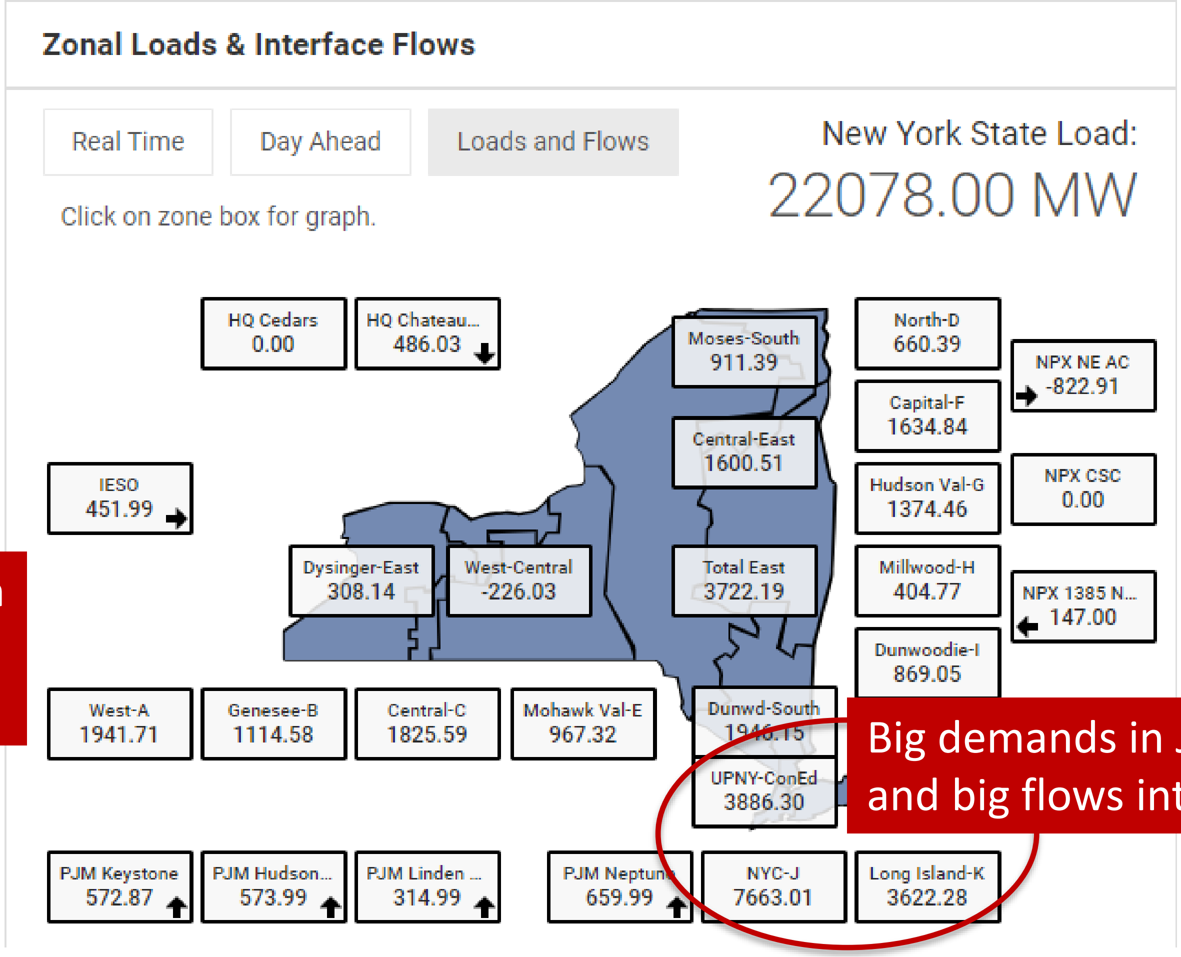


Higher prices in K (and J, to lesser extent)



Big demands in J/K and big flows into J

Offshore wind transmission

- Clean energy goals
- Offshore wind resource is good
- Grid is congested
- Most population-dense area of United States is in zone J (NYC)

Relevant Governance

(overview: not comprehensive)

Transmission work is done in the context of:

- Federal Electricity Regulatory Commission (FERC), especially Order 1000
- NY Public Service Commission (Key orders and matters linked later in these slides)
- New York Independent System Operator (NYISO)
- Utilities
- Department of Public Service (DPS) and New York State Energy Research and Development Authority (NYSERDA)
- Developer and stakeholder inputs, etc.

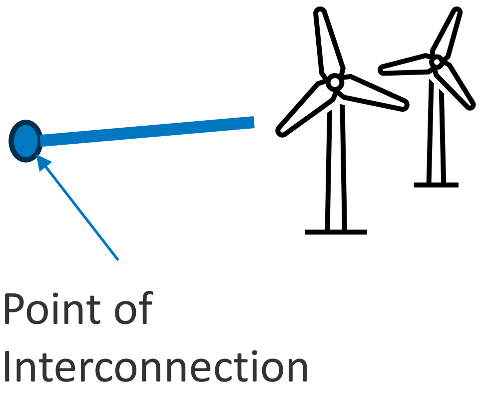
Information/support comes from studies commissioned by NY, developers, and others:

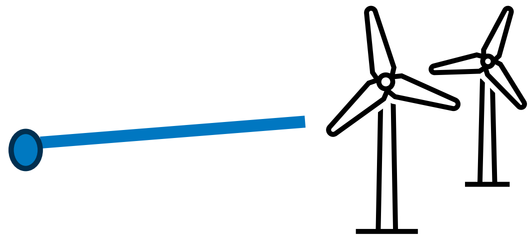
Examples that are not project-specific:

- NY Power Grid Study
- Benefit and Cost of Preserving the Option to Create a Meshed Offshore Grid
- US DOE Atlantic Offshore Wind Transmission Study

Types of OSW-relevant transmission

- Getting the power from the offshore wind turbines to the existing grid (export cables)
  - Export cables are generally procured with the generation
- Getting the power from injection point to consumers
  - NYISO Interconnection process: Grid upgrades through the standard NYISO process
  - Public Policy Transmission Needs (PPTN) in Long Island (2020 process) and NYC (2022 process)
  - Other hub concepts
- Leveraging OSW investment by interlinking offshore platforms to mitigate congestion and improve reliability
  - Mesh Ready requirements
  - Possible future: Mesh Implementation?
  - Possible future: Interregional offshore networks?





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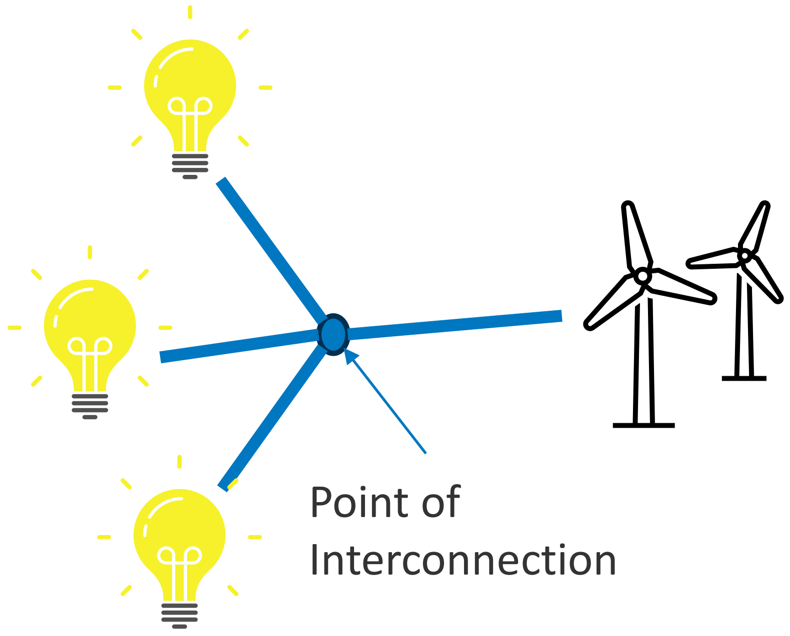

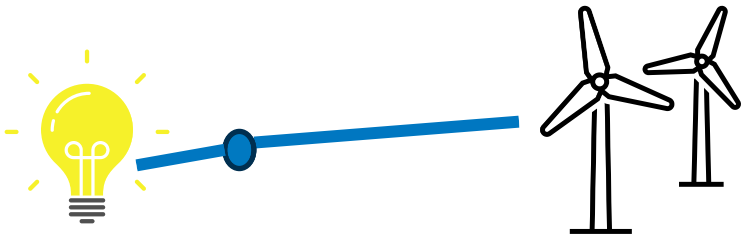

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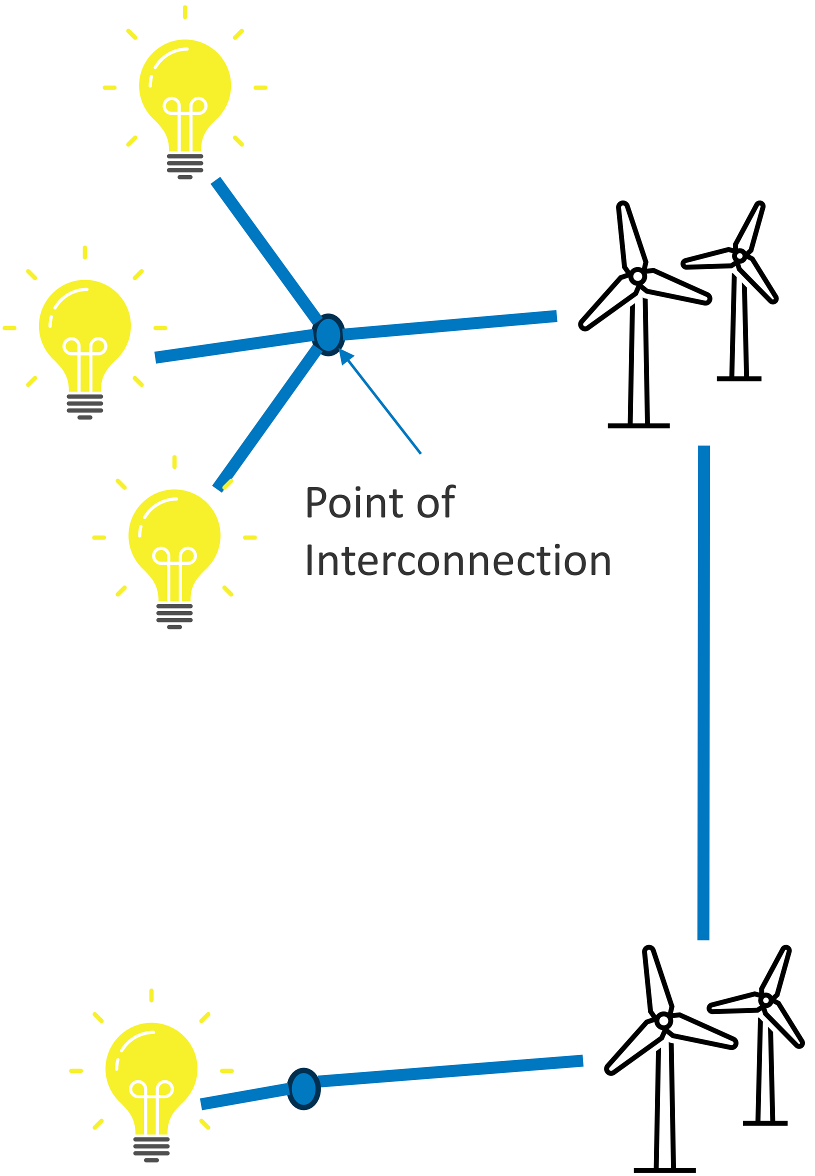


Links to Public Service Commission relevant matters/orders

- Offshore Wind Energy
  - Procurement of offshore wind and associated radial connections
  - Power Grid Study Recommendations (e.g., Mesh Ready, HVDC, NYCA injection)
- Establish Policies and Procedures Regarding Transmission Planning for Public Policy Purposes
  - Lays out the Public Policy Transmission Need process (New York's implementation of FERC Order 1000)
- NYISO Proposed Public Policy Transmission Needs for Consideration for 2020
  - Long Island PPTN to enable 3 GW OSW
- NYISO Proposed Public Policy Transmission Needs for Consideration for 2022
  - NYC PPTN for Point of Interconnection
- Implement Transmission Planning Pursuant to the Accelerated Renewable Energy Growth and Community Benefit Act
  - Many relevant orders, including Con Edison's Brooklyn Clean Energy Hub, Scalable Reliability version

Tip: Filter by "Document Type" to see only the PSC Orders in the list

How does the process work for some example projects?

PSC Orders

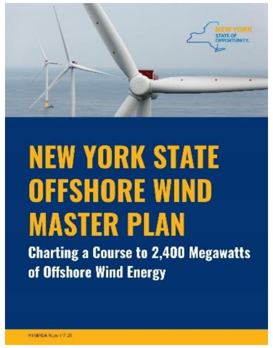
Categories of process flow
Examples to follow…

Petitions, or inputs from Utility, NYISO, or NYSERDA, or others

Competitive Solicitations

Transmission Development Moves Forward/ Cost Recovery Approved

How are export cables built and interconnected?



PSC Offshore Wind Solicitation Order(s)

NYISO Interconnection process

NYSERDA Offshore Wind Solicitation

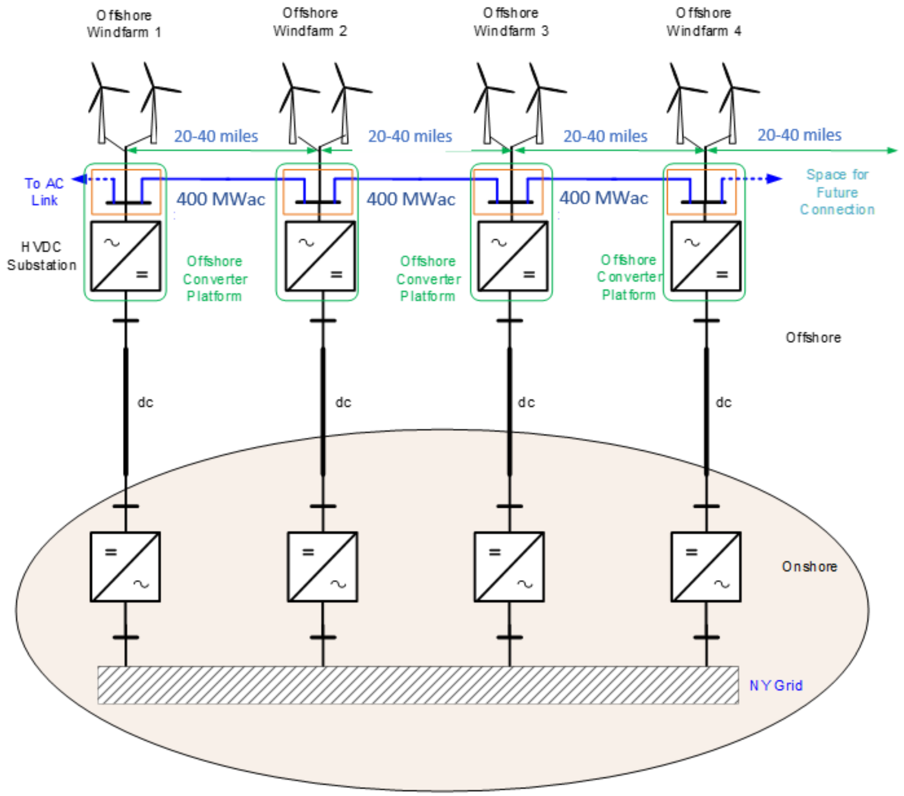
Transmission development moves forward/ cost recovery approved

PSC Power Grid Study Order

Mesh ready
HVDC
NYCA injection

State and Federal Permitting, etc.

Meshed Ready Procurement



HVDC Converter and Cable Systems Offshore Windfarms	Traditional Offshore Project
AC Meshed Ready Substation	Meshed Ready project
AC Meshed Connection	Fully Meshed Network

Purpose:

- Preserve optionality for future offshore grid development in line with Power Grid Study

Key Assumptions:

- Connection distance of 20-40 nautical miles
- Two AC connections per offshore substation, each able to transmit 400 MW (in addition to dedicated HVDC radial tie lines)
- Clustering of "Meshes"
- Project sizes expected to be in the >1 GW range

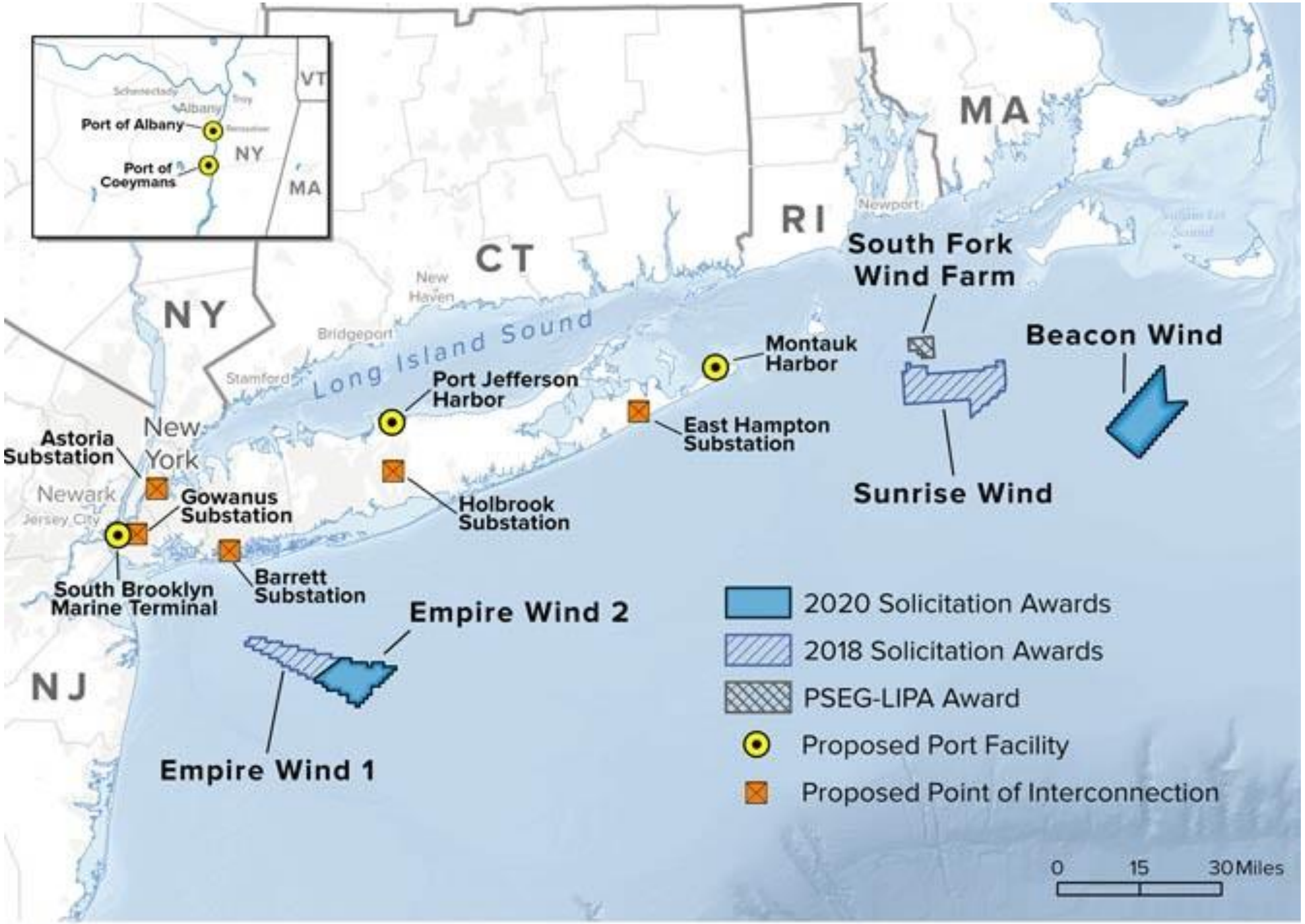
Figure adapted from The Benefits and Costs of Preserving the Option to Create a Mesh Offshore Grid in New York (Brattle/Hatch/Siemens)

Potential benefits of a meshed offshore grid

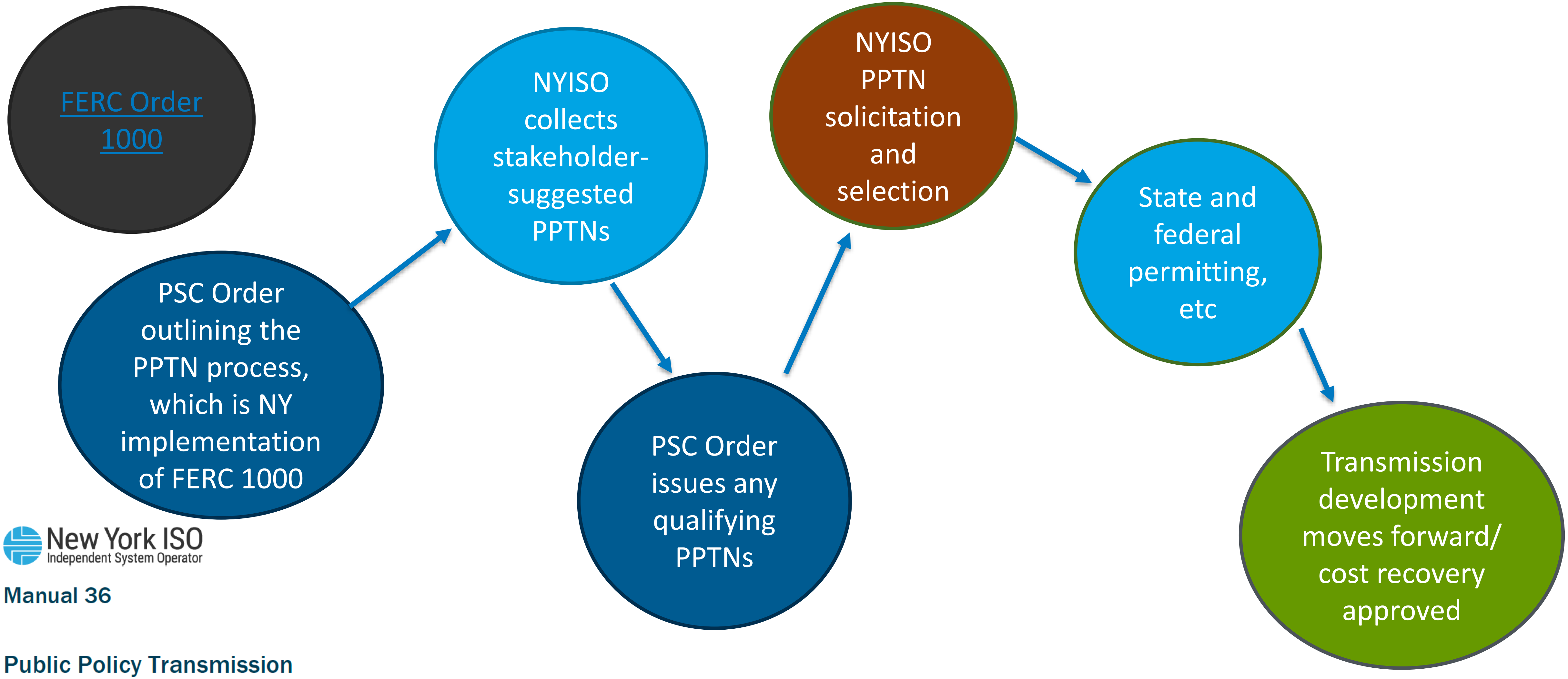
- Reliability / resilience
  - Additional redundancy allows power to flow on the mesh network to a different Point of Interconnection (POI) in the case of an export cable outage or even an onshore outage
- Congestion and curtailment relief
  - During normal system conditions (no outages), power can flow on the mesh to maximize the system benefits of offshore wind by flowing to the POI with highest price/value
  - Avoiding onshore congestion can also reduce curtailment of offshore wind, or even other renewable resources
- Pfeifenberger et al. estimated over $40m per year in avoided costs due to a single J/K mesh interlink.

2018 and 2020 solicitation results

- Note: these were awarded before Mesh Ready and HVDC requirements
- Source: [NYSERDA OSW website]()



Public Policy Transmission Need Process



New York ISO
Independent System Operator

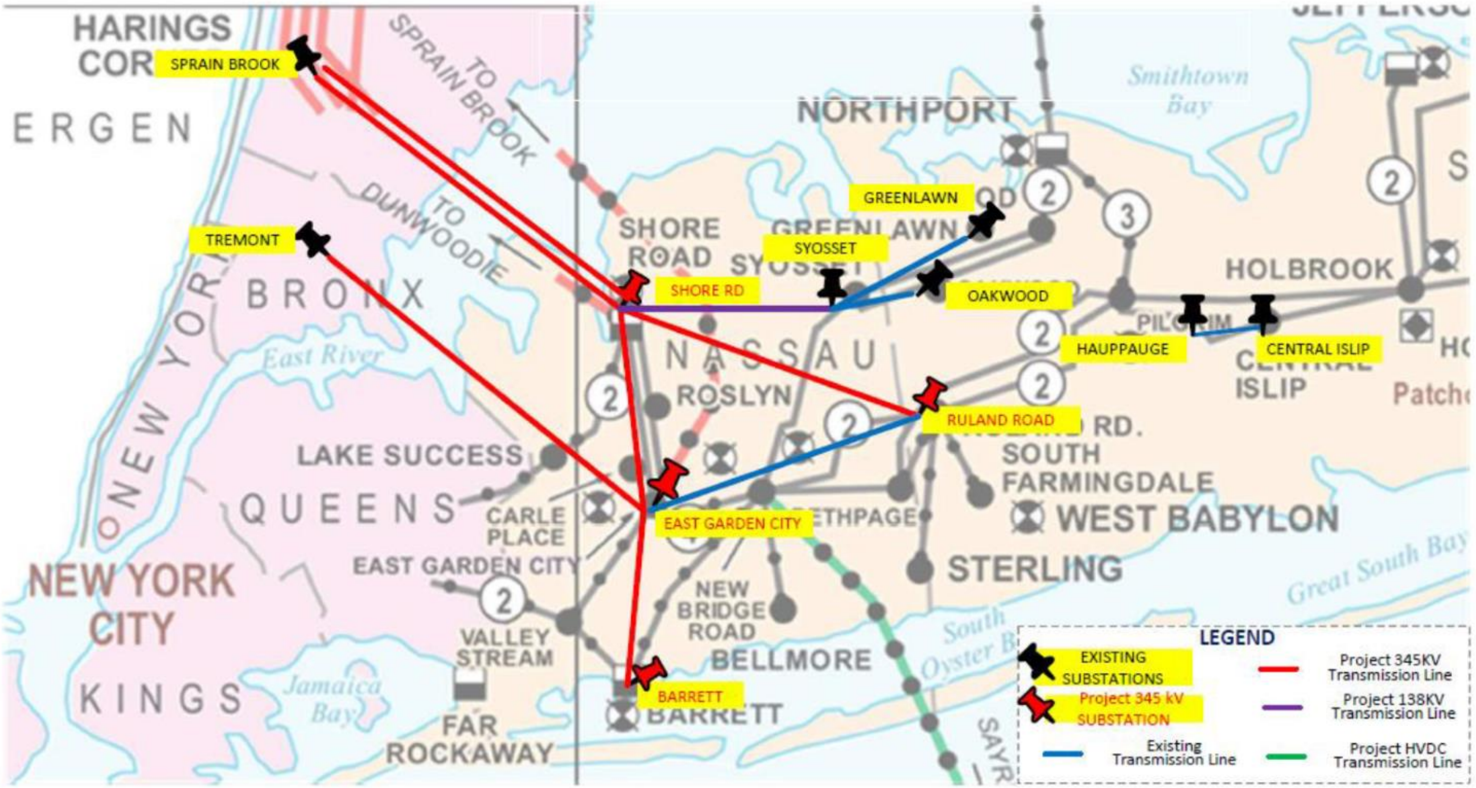
Manual 36

Public Policy Transmission Planning Process Manual

Long Island Public Policy Transmission Need

Executive Summary from *Long Island Offshore Wind Export Public Policy Transmission Planning Report* (June 13, 2023)

NYISO Board of Directors selected Propel NY Energy solution diagramed in this figure



T051 proposes three new 345 kV Long Island tie lines: two between Shore Road and Sprain Brook and one between East Garden City and Tremont. The project is bolstered by a Shore Road – Ruland Road – East Garden City 345 kV backbone and other transmission facilities in Long Island. T051 has a total capital cost

Cost recovery / allocation… it depends on the application

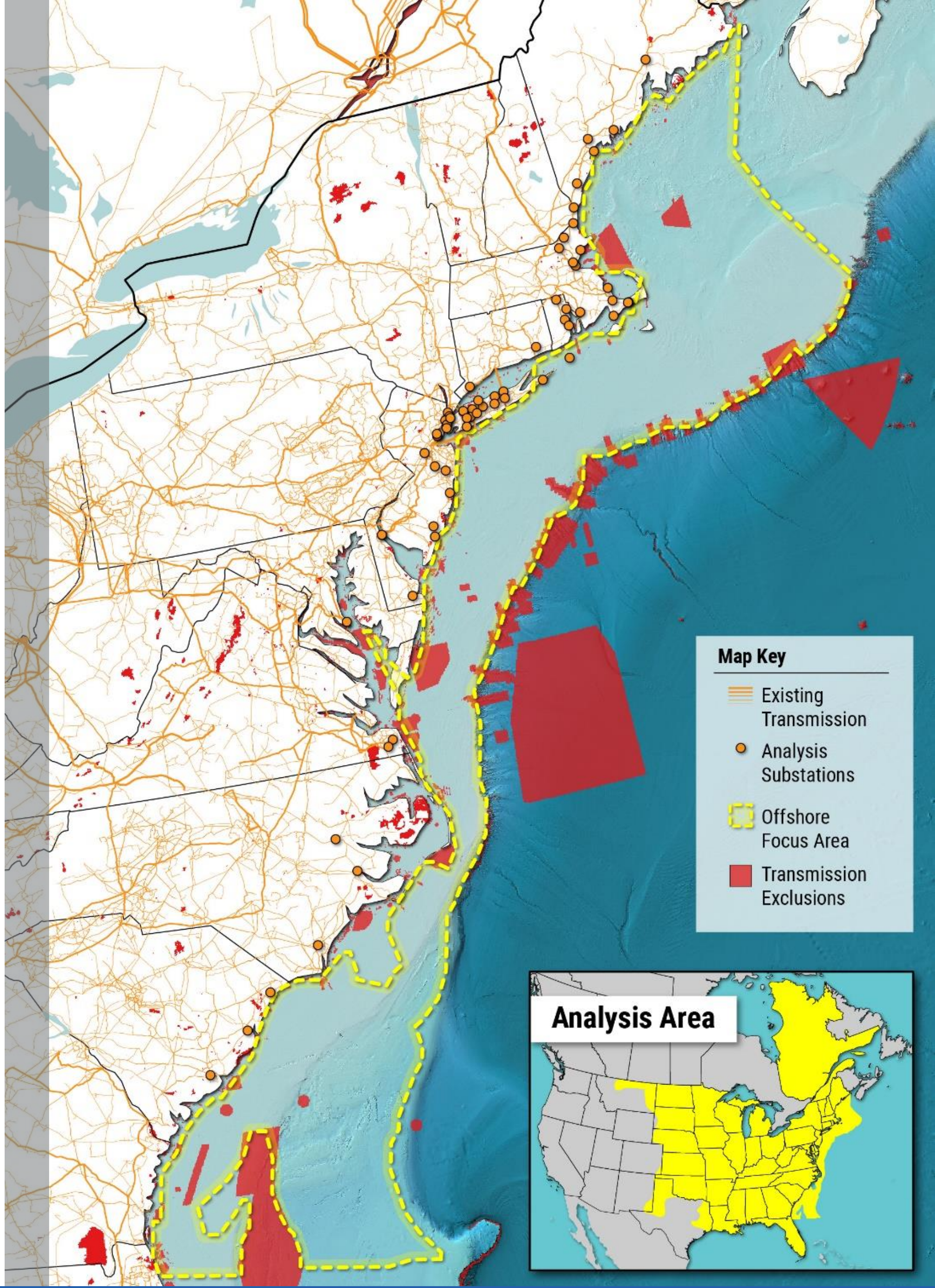
- Public Policy Transmission Need costs are spread throughout the state
- Other projects (e.g., reliability upgrades) can be different
- All through rules set up with FERC / NYISO Tariffs / PSC orders, and cost recovery details are explained in the PSC Orders

Future possible interregional offshore transmission?

- Brief discussion of US Department of Energy-sponsored Atlantic Offshore Wind Transmission Study
- Ongoing study and discussion

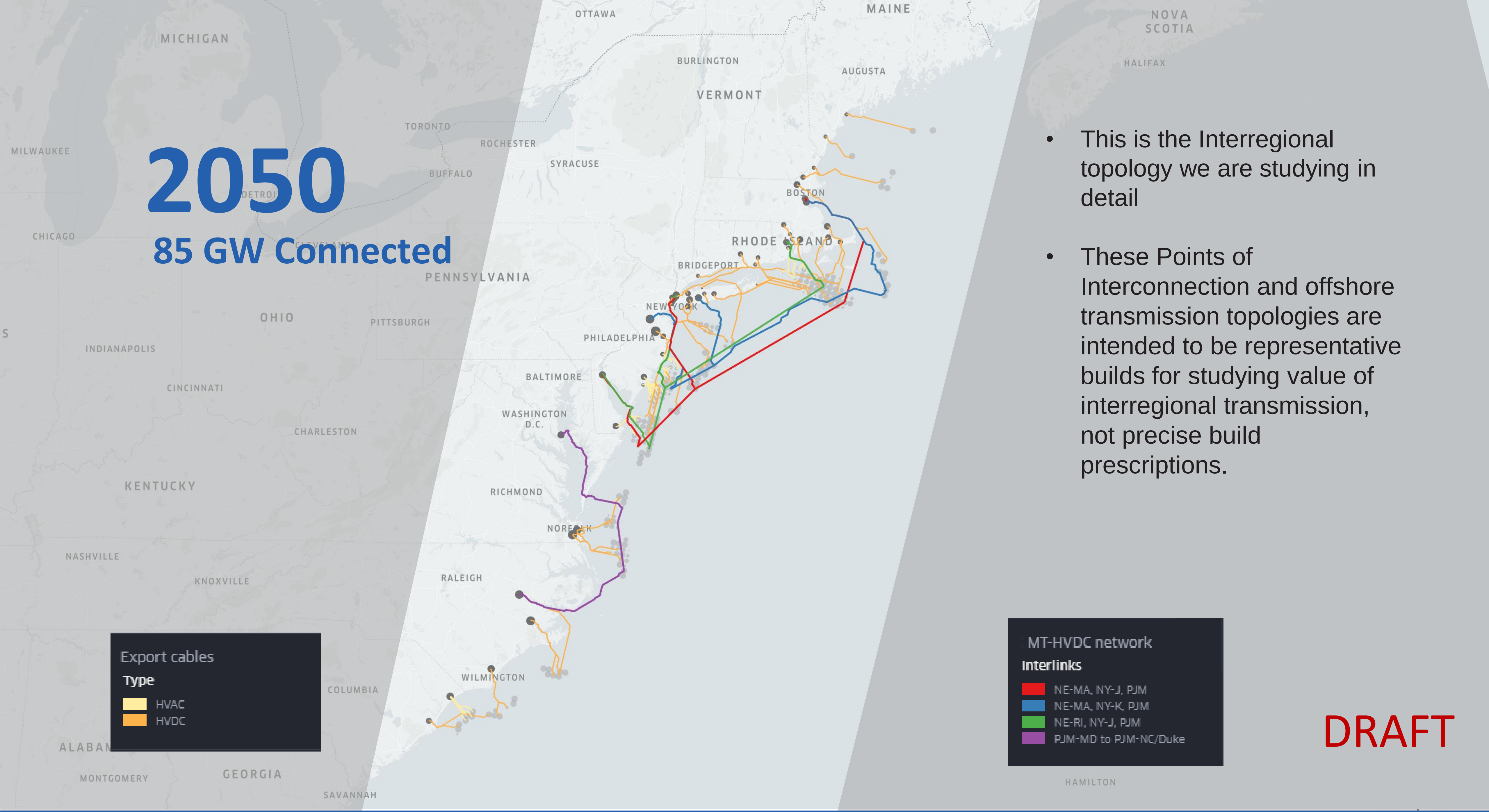
Study Overview

- Studies scenarios and pathways of offshore wind (OSW) and transmission deployment
- Quantifies impacts such as economics, reliability, and resilience of multiple OSW and transmission scenarios and pathways
- Scenarios presented consider **85 GW OSW** in the Atlantic by 2050.
- Offshore wind development provides a unique opportunity to potentially add interregional transmission capacity in a lower-cost, lower-impact way.
- The team designed offshore transmission topologies to take advantage of these opportunities. These topologies are being studied in greater detail through the completion of the study later in 2023.
- The team will be studying four topologies:
  - **Radial**: Planned connections from offshore substations to onshore grid.
  - **Interregional**: Specifically designed to take advantage of opportunities to connect diverse regions by interlinking offshore platforms
  - **Intraregional**: Within-region connections that could complement (and come before) interregional solutions
  - **Backbone**: Larger version of interregional build



2050

85 GW Connected



- This is the Interregional topology we are studying in detail
- These Points of Interconnection and offshore transmission topologies are intended to be representative builds for studying value of interregional transmission, not precise build prescriptions.

DRAFT

Thank you!

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Q&A

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Coming Soon

August 23, 1:00 p.m. ET

Research and Regulations for Marine Mammal interactions with Offshore Wind

Doug Nowacek (Duke's Nicholas School for the Environment) and Nick Sisson (NOAA Fisheries)

September 20, 1:00 p.m. ET

How to Tap into the Offshore Wind Supply Chain

Kristian Ravn (Green Ducklings) and Andreas Schønbeck (Horten)

Visit wind.ny.gov to register

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- Offshore Wind Resiliency Planning
- Offshore Wind Transmission Systems
- Offshore Wind Submarine Cabling
- Port Development Considerations for Offshore Wind

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