# OFFSHORE WIND TRANSMISSION TO REACH NEW YORK'S CLEAN ENERGY GOALS

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# Introduction

# The Brattle Group Report Presentation

LCV Virtual Policy Forum

August 6, 2020

# Offshore Wind Transmission:
## An Analysis of Options for New York


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Prepared for

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THE Brattle GROUP

# Presenting today


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Dr. Spokas is an Associate with a focus on electricity sector topics such as renewable and climate policy analysis, electricity policy design, and market design. He's worked for policy-makers, renewable energy buyers, and governments to evaluate clean energy policies to ensure strategies are feasible, create additional benefits, and are cost-effective.

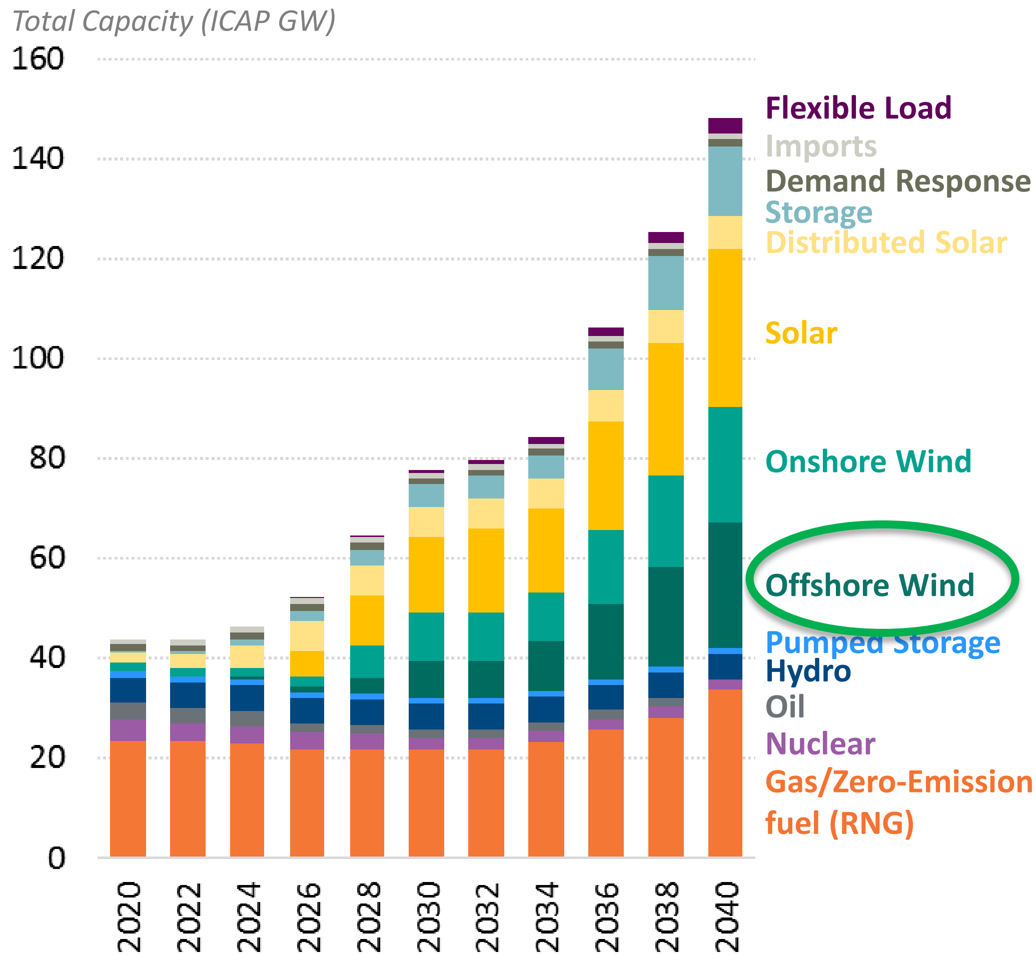
# Motivation and policy goals: Substantial off-shore wind development to occur in NY

Thousands of MW of new clean resources will need to be built to achieve decarbonization goals in New York – **including between 14,000 and 24,000 MW of OSW by 2040**

New York State has already committed to **9,000 MW of OSW**

A key policy challenge is **ensuring a pathway to enable the lowest-cost solutions** for delivering new clean energy from source to population centers

**New York "100% by 2040" Decarbonization Goals under a "High Electrification" Scenario**




*Source:* Brattle Study for NYISO by Roger Lueken et al., "New York's Evolution to a Zero Emission Power System: Modeling Operations and Investment Through 2040." May 18, 2020.

# Project scope and approach

**Anbaric retained Brattle to compare the potential costs and benefits of offshore transmission options to contribute to the ongoing studies currently being undertaken in New York State**

**We qualitatively and quantitatively examined two approaches to developing offshore transmission and associated onshore upgrades to reach New York's offshore wind (OSW) development goals**

1. The **"generator lead line" approach** wherein OSW developers compete primarily on cost to develop incremental amounts of offshore generation and associated project-specific generator lead lines (GLLs)
2. An **alternative "planned" approach** wherein transmission is developed independently from generation. Offshore transmission and onshore upgrades are planned to minimize overall risks and costs of achieving the state's offshore wind and clean energy goals

**While other transmission configurations are possible, those captured here are representative of plausible outcomes under the two approaches**

# Key takeaways

**1. Cost Differential Analysis:** Planned approach estimated to reduce total transmission costs by at least $500 million, not counting additional competitive benefits

**2. Utilization of Points Of Interconnection (POI):** Planned transmission maximizes OSW integration with efficient utilization of POIs, while GLLs risk limiting ability to meet clean energy standards cost-effectively.

**3. Environmental Impact:** Planned transmission significantly reduces the impact on the fishing industry, coastal communities, and marine environments

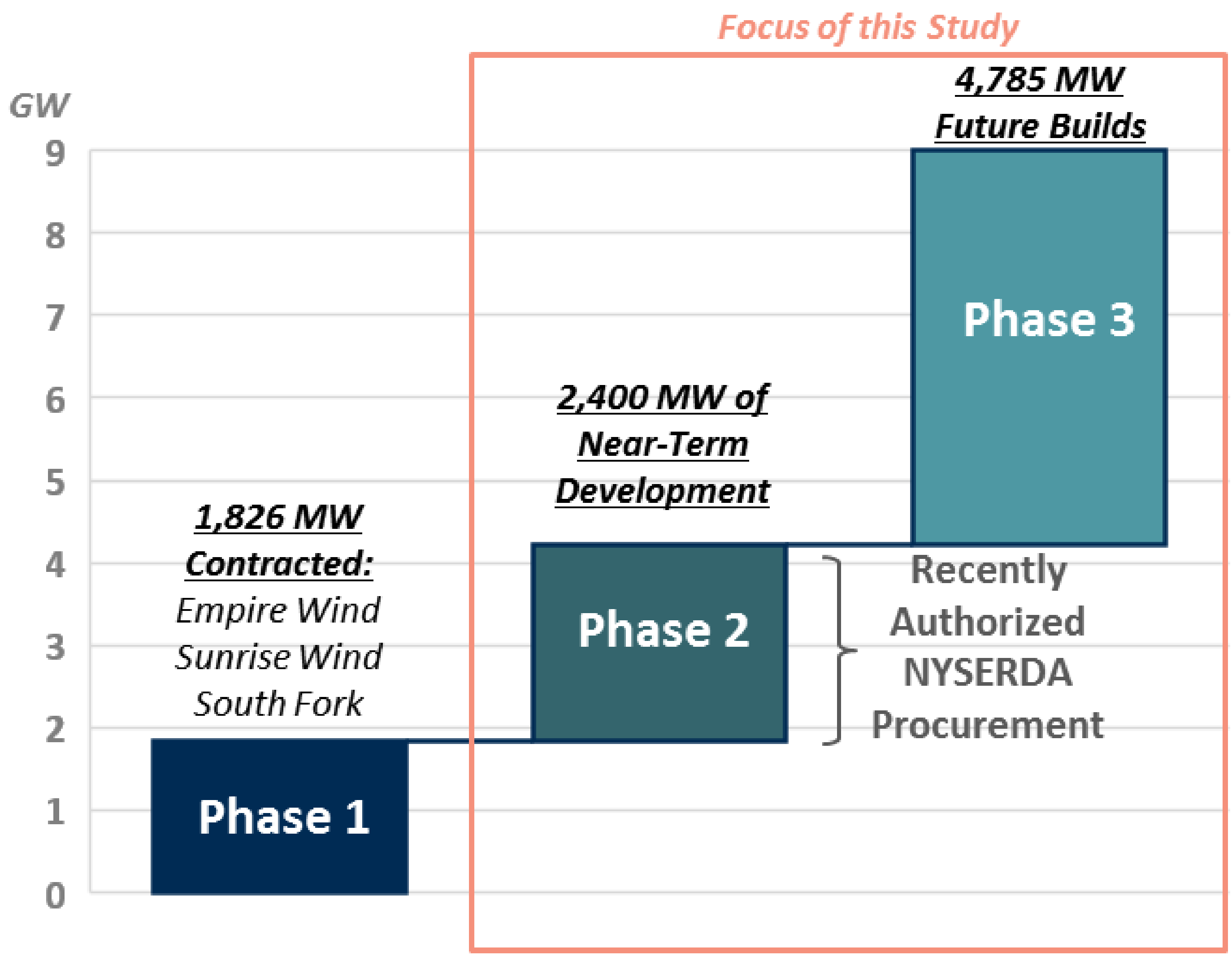
**4. Curtailments:** This transmission planning effort identifies curtailment challenges that need to be addressed to reduce developer risk from future projects (though further planning is needed)

**GLL Offshore Transmission Scenario**

**Planned Offshore Transmission Scenario**

# Analytical Approach

# We compare transmission approaches to connect 9,000MW of offshore wind to NY



# Designing "generator lead line" and "planned" scenarios

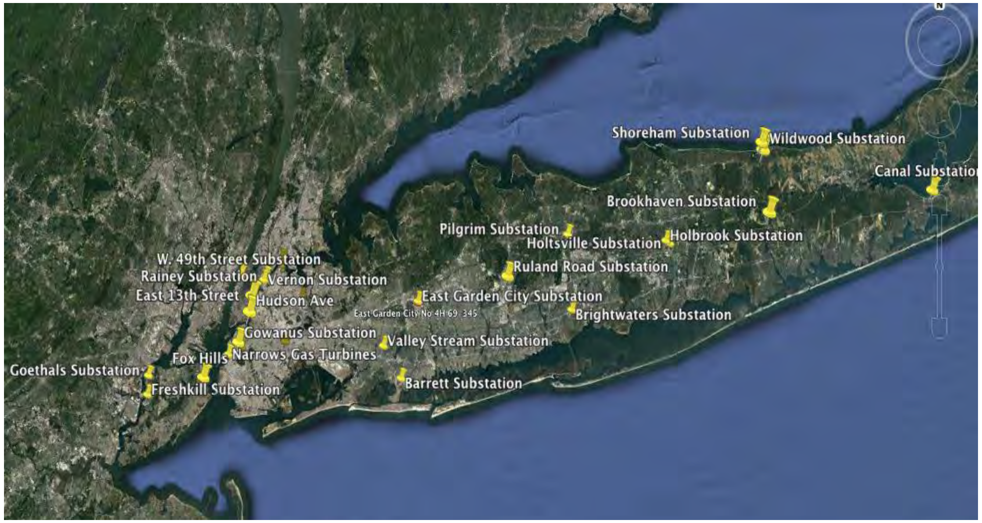
Identified potential POIs → Analyzed injection potential & sensitivities → Chose multiple onshore upgrade scenarios for further study → Studied upgrades needed and estimated costs → Chose illustrative scenarios for "GLL" and "planned" → Evaluated non-cost advantages and disadvantages

Engineering, cost, and seabed analyses by Pterra, PSC, and Intertek **contribute quantitatively** to transmission planning:

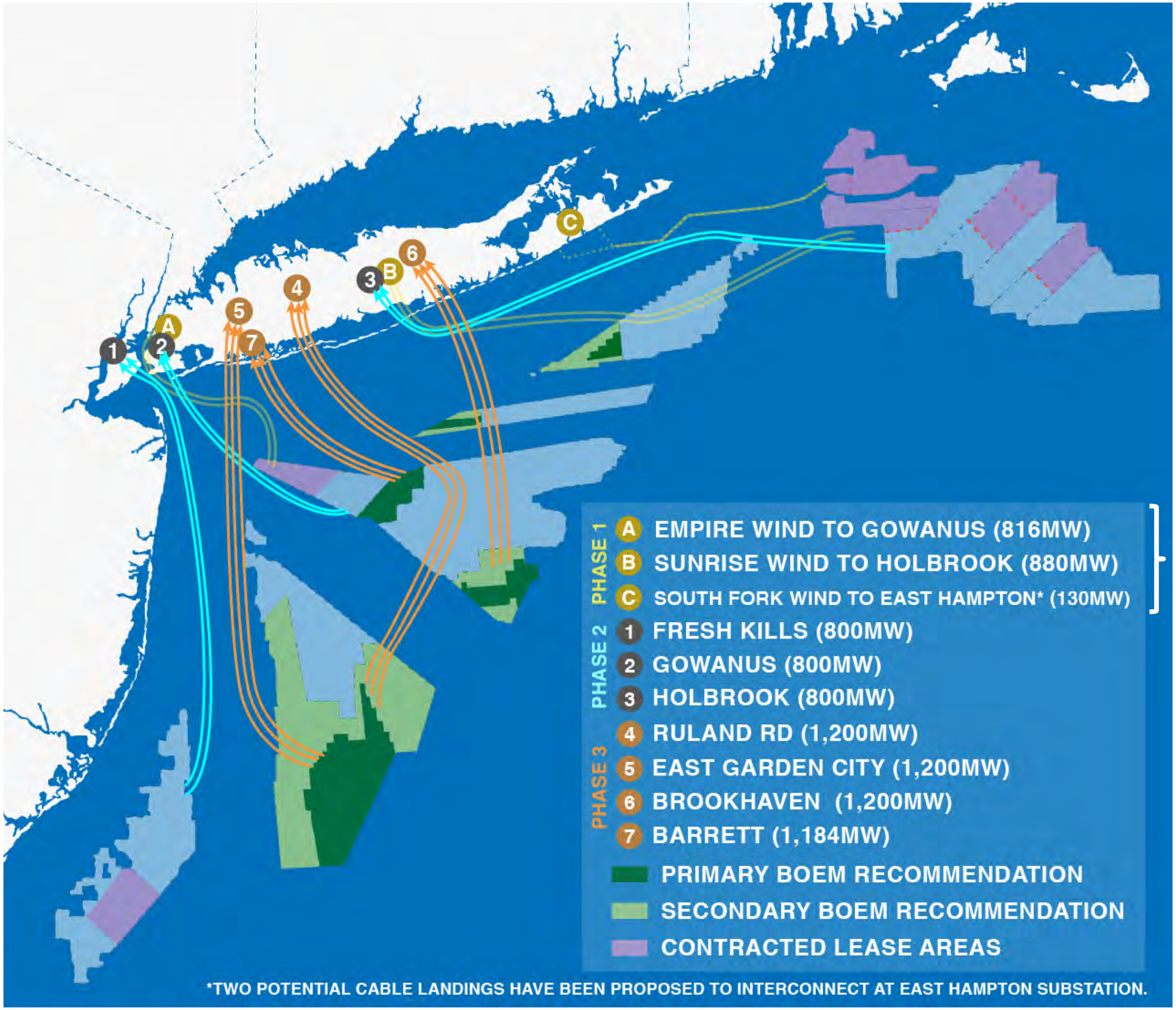
- Power flow modeling using PSSE to evaluate
  - POI injection feasibility
  - Energy resource interconnection service upgrades
  - Capacity resource interconnection service upgrades
- Full year 8760-hour production simulation
  - Curtailments under GLL and planned approaches
  - Impact of optional transmission upgrades on curtailments

Details can be found in online appendix

## Substations Considered for POI



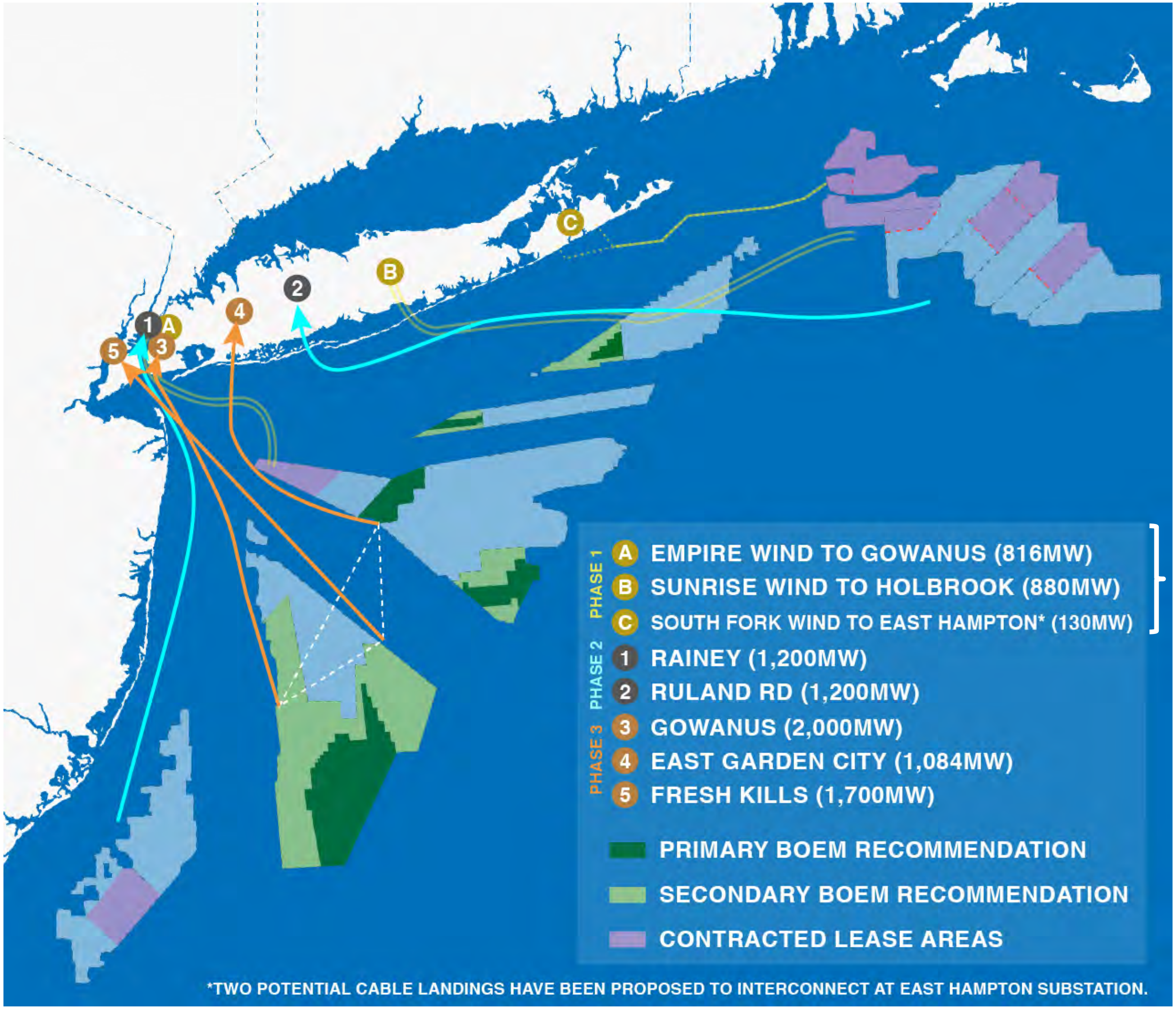
# Plausible offshore transmission buildout under generator lead line (GLL) approach




*Phase 1 is already contracted using HVAC cables. In the GLL scenario, projects in* ***Phases 2 and 3 also use HVAC lines.***

*Already contracted projects*

# Likely offshore transmission buildout under planned approach




*Phase 1 is already contracted using HVAC cables. Planned approach utilizes **HVDC cables for Phases 2 and 3.***

*Large injections are utilized at Gowanus (2,000MW) and Fresh Kills (1,700MW) to reduce cabling and costs, and would require modification of current single contingency limit.*

*Already contracted projects*

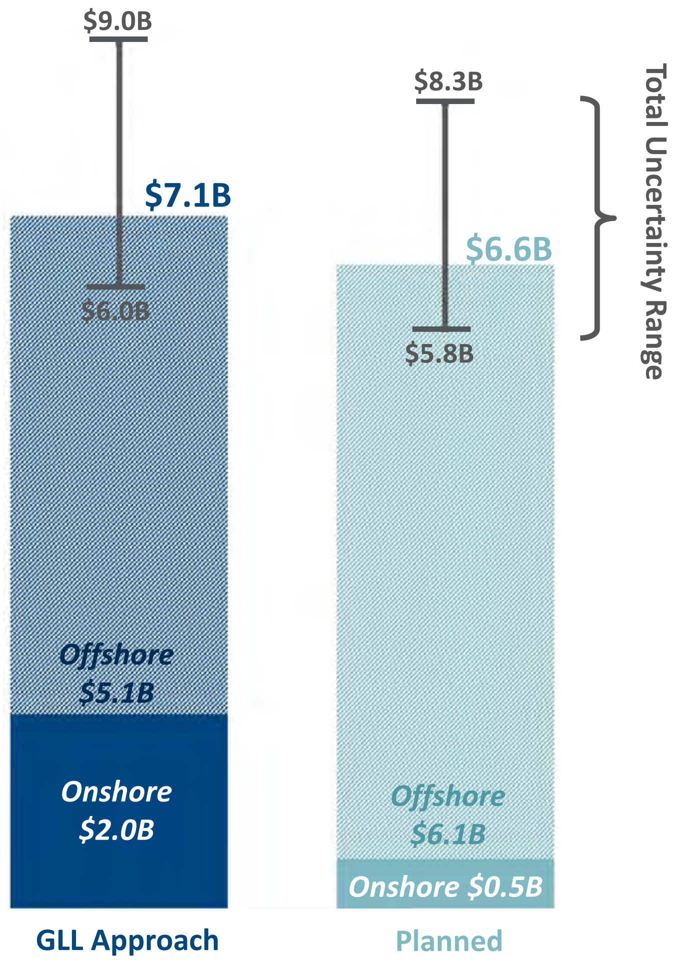
# Findings

# Total costs of transmission are expected to be lower under a planned approach

We estimate total costs of onshore upgrades plus offshore transmission to enable the next ~7,200 MW of OSW would be **$500 million lower under a planned than the GLL approach**

The planned approach to building offshore transmission can enable significant long-term cost savings and avoid the substantial risks associated with onshore upgrades

## Comparison of Total Onshore Plus Offshore Transmission Costs




*Source for cost data: Onshore upgrade cost estimates based on Pterra power flow modeling and PSC Consulting analysis of reliability transmission upgrades. See Appendix B. Does not include elective transmission upgrades. Estimate for offshore transmission equipment based on proprietary supplier information provided to Anbaric. We assumed +25%/-10 uncertainty for the offshore cost, plus the uncertainty for the onshore upgrades given by PSC.*

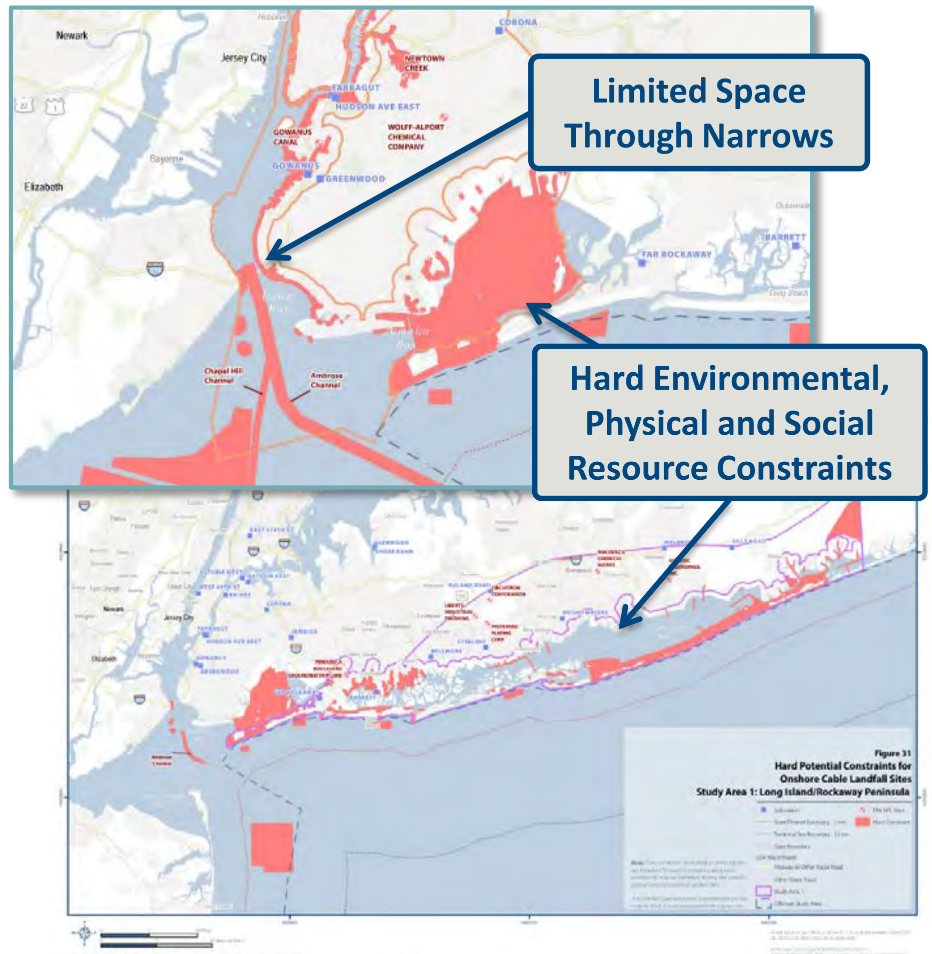
# Constrained access routes require efficient offshore transmission to meet goals at low cost

There are a limited number of robust POIs for connecting offshore wind to the onshore grid and limited access routes to these POIs

If each OSW project builds a separate GLL to the onshore transmission system, **viable landing sites and cabling routes will become constrained. A planned transmission approach can make better use of the limited landing sites**

The clearest example of this is the cable approach route through the **<u>Narrows</u>** to reach POIs in New York Harbor

**Landing Limitations along NY Coast**




*Sources:* NYSERDA, "New York State Offshore Wind Master Plan: Cable Landfall Permitting Study", November 2017.
Analysis of Narrows constraints by Intertec (see Appendix C for details).

# Reduced impacts to fisheries, coastal communities, and the marine environment

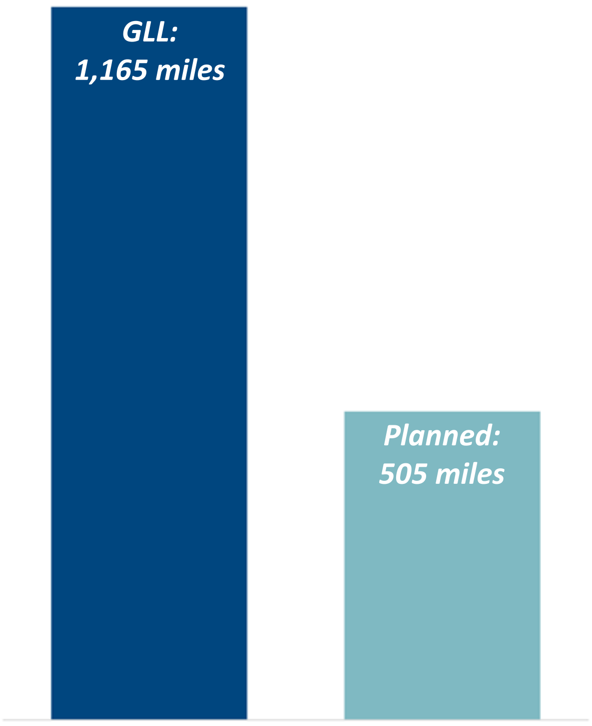
Better planning can **reduce the cumulative effects of offshore transmission on fisheries, coastal communities, and the marine environment**

Fewer cables results in **less disruption and impacts on the marine and coastal environment**

Minimizing the number of offshore platforms, cabling, seabed disturbance, and cables landing at the coast **reduces impacts on existing ocean uses and marine/coastal environments** to the greatest practical extent

**Comparison of Total Length of Undersea Transmission Under GLL and Planned Approaches**

*(Excluding Already-Contracted Projects)*



# Future curtailments are high in each scenario and require planners' attention

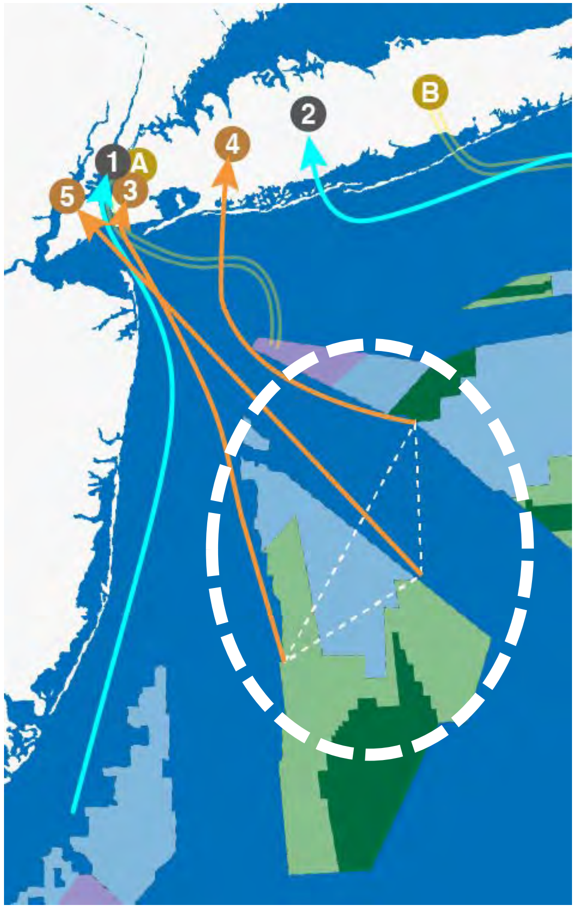
After Phase 2 with 4,200 MW assumed in service, total curtailments under the **planned approach are negligible at 0.1% but significant in the GLL approach at 4.2%**

**Preliminary analyses indicates much higher curtailment** (~18%) under both scenarios studied with full 9 GW of OSW

The risk of high curtailments can be addressed under a planned approach by:

- Further planning analysis to optimize to optimize the transmission configuration to reduce curtailments
- Integrated planning of NY's 3,000 MW storage goal with offshore transmission
- Future networking of HVDC cables into an offshore grid to move OSW injections to less congested POIs (which also reduces risks from transmission outages)

**DC Technology Enables Potential Future Offshore Networking in the NY Bight**




*may be higher due to must-run units

# Key Conclusions

# A planned transmission approach improves outcomes across seven criteria

| Elements we examine | Our analysis indicates… |
| --- | --- |
| Total onshore + offshore transmission costs<br>• Onshore transmission upgrade costs (more risk)<br>• Offshore transmission costs (less risk) | $500 million (7%) lower under planned approach<br>• 74% lower under planned approach<br>• 19% higher under planned approach |
| Impact to fisheries and environment | 59% lower marine cabling and 54% fewer cable landings under planned approach |
| Offshore wind curtailments | Planning can reduce wind curtailment (and mitigate developer risk from future OSW additions), though further studies are needed |
| Effect on generation and transmission competition | Increased competition (with cost savings) under planned approach |
| Utilization of constrained landing points | Improved under planned approach (e.g., cable routing through the Narrows) |
| Utilization of existing lease areas | Improved under planned approach |
| Enabling third-party customers | Improved under planned approach |

# A planned approach offers significant advantages

**A planned approach can lower overall costs and risks by making best use of scarce cable routes and POIs, by leveraging competition among transmission developers, and by enhancing competition between off-shore wind generators**

Bundled procurement under the GLL approach could be transitioned to a planned approach through bid selection and an open access requirement

Under the planned approach, OSW generation developers would be able to participate in transmission development and would develop open-access transmission for other leaseholders when participating in any transmission-only procurement (even if their generation bid is unsuccessful in the gen procurement)

Project-on-project risk has been cited as a concern, but:

- The GLL approach places development of generation and offshore transmission under a single developer and leaves (substantial) onshore upgrades with incumbent (onshore) transmission owners, so there is still project-on-project risk
- A planned approach can also address individual project-on-project risk

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# Panel Discussion

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