**LS Power Grid Comments in Response to
New England States Transmission Initiative
Request for Information
October 28, 2022**

Introduction

LS Power Grid, LLC ("LS Power Grid") is pleased to provide the following comments in response to the New England States Transmission Initiative Notice of Request for Information as revised September 22, 2022. LS Power Grid is an active participant in competitive transmission processes throughout the United States.

- An LS Power Grid subsidiary was a participant in the New Jersey State Agreement Approach ("SAA") Process, which planned for transmission expansion for 7,500 MW of Offshore Wind ("OSW") delivery to New Jersey. A case study of the New Jersey SAA Process is included as Attachment A.

- LS Power Grid subsidiary is participating in the NYISO Long Island Export Public Policy Transmission Need ("PPTN") Process, which is planning for integration of at least 3,000 MW of OSW into the New York grid. A case study of the Long Island Export PPTN Process is included as Attachment B.

LS Power Grid provides these comments from the perspective of a transmission developer, with lessons learned from other OSW transmission planning processes. A broad Request for Proposals ("RFP) for OSW transmission is the best approach to OSW transmission planning to achieve the New England States' goals. An open-ended approach will allow the market to identify innovate approaches, and will also provide other benefits such as cost containment and risk mitigation. The RFP should have as few constraints as possible and seek solutions for OSW transmission to identify the ultimate, least-cost least-risk plan for New England.

Comments on Changes and Upgrades to the Regional Electric Transmission System Needed to Integrate Renewable Energy Resources (Select Questions)

2. Comment on ways to minimize adverse impacts to ratepayers including, but not limited to, risk sharing, ownership and/or contracting structures including cost caps, modular designs, cost sharing, etc.

   In competitive transmission processes, transmission developers and utilities have been willing to provide significant risk mitigation to ratepayers through a variety of cost containment measures.

   The table on the following page identifies cost containment proposed by developers in the New Jersey SAA Process (described more fully in Attachment A), which included hard cost caps, caps on the rate of return on equity, caps on the amount of equity in rates, and even caps on the total annual revenue requirement. This includes both non-incumbent transmission developers and incumbents such as PSEG and ConEd,[1] which have not proposed these types of risk mitigation measures for traditional cost-of-service regulated projects.

[1] ConEd subsidiary Rockland Utilities is an incumbent utility in New Jersey.

Table 3. **Cost Containment by Developer**

Cost Containment by Developer[1]

Category	Anbaric (2&3)	NEETMH (1A,2&3)	LS Power[3] (1B&2)	PSEG-Orsted[4] (2&3)	MAOD (2&3)	RILPOW[5] (1B)	ConEd (2)	APT[6] (2)
Project Cost Cap ($2021)	$84M-$2.2B (125-130% of bid cost range applies to PJM modeled proposals)	$84M-$5.3B (range applies to PJM modeled proposals)	$1.3-2.2B (range applies to PJM modeled proposals)	$4.8-7.1B (range applies to PJM modeled proposals)	$6.6B (115% of bid cost; applies to MAOD #321)	$28M-1.3B (partial cap; range applies to PJM modeled proposals)	$824M (soft cap, 30% of bid cost)	
ATRR Cap			Capped for first 10 yrs					Capped for entire 40-yrs
ROE Cap (inclusive of adders)	8.5% (relieved from the cap if Anbaric can't secure financing with current cap. Structure)	9.8%	8.95%	9.9% Capped for first 15 yrs		9.75% Capped for first 6 yrs		
Equity Ratio Cap	45%	40% (1A) 30%[2] (2&3)	40%	48.35%		50%		
O&M Cap		Capped for first 15 yrs						
Exceptions	Taxes, AFUDC, Escalation, Uncontrollable force, SOW change	Taxes, AFUDC, Uncontrollable force, SOW change	Property Tax, Uncontrollable force, SOW change,	Taxes, AFUDC, Escalation, Uncontrollable force, SOW change, Award Delay, Forex risk	Taxes, AFUDC, Escalation, Uncontrollable force, SOW change	Taxes, AFUDC, Escalation, Uncontrollable force, SOW change	Taxes, AFUDC, ROW, Uncontrollable force, SOW change	Uncontrollable force, SOW/change, One-time adjustment factor
Other Mechanism/Issues	ROE to be increased or reduced based on actual project cost and schedule delays; ROE cap applies to AFUDC	Debt expense sharing mechanism; Seek recovery of Depreciation, Cost of Debt if actual project cost exceeds cap; AFUDC capped by 100% debt	If actual costs in any given year are lower than TRR Cap, the difference is rolled forward; ROE cap applies to AFUDC	Project cost cap subject to change based on inflation, foreign exchange rates; ROE to be increased if actual cost is lower; ROE cap applies to AFUDC	Open to alternatives, e.g., multiple-tier cost allocation structure with higher hard cap	Project cost cap applies to the material & equipment and construction & commission cost of certain components; ROE cap applies to AFUDC	Sharing mechanism only effective when cost is 5% higher than bid amount.	ATRR schedule subject to change based on foreign exchange rates and commodity price fluctuations

Note: (1) AE, Transource, PPL, PSEG, and JCPL proposals are not included in this table due to lack of cost containment.
(2) NEETMH option 2 & 3 proposals offer a soft equity cap of 30% - stated as a target.
(3) Only LS Power option 1B & 2 proposals offer the caps above, option 1A proposals capped only project cost.
(4) PSEG-Orsted only offers the above cost containment for the combined Option 2 and 3 proposals. The above cost cap applies to #683 and 871. PSEG Option 1A have no capping mechanism.
(5) RILPOW offers partial project cost cap for #171 and #490.
(6) APT's ATRR cap increases by 0.5% annually, based on the first COD year RR cap.

https://www.pjm.com/-/media/committees-groups/committees/teac/2022/20220906/nj-osw-financial-analysis-report-september-final.ashx

The Long Island Export PPTN Process (described more fully in Attachment B) also provided an opportunity for developers to proposed cost containment under the NYISO tariff, which has not been provided for typical cost-of-service transmission outside of a competitive process.

3. Identify the advantages and disadvantages of utilizing different types of transmission lines, like alternating current (AC) and direct current (DC) options for transmission lines and transmission solutions. Should 1200MW/525kV HVDC lines be a preferred standard in any potential procurement involving offshore transmission lines?

There is not a simple answer for when an AC or DC approach is best suited to a specific situation. In general, the existing transmission grid is AC and an AC approach would provide a low cost solution that integrates seamlessly with the existing grid. An AC approach also ensures compatibility with future transmission system elements, as discussed in response to Question 7 below. However, due to technical limitations, AC cables are less effective over very long distances, in which case a DC approach would be required. A DC approach typically has a higher cost due to the cost of DC converters, which is somewhat offset by savings in cable procurement and installation cost due to having fewer cables. DC equipment also brings other benefits such as controllability and black start capability.

LS Power Grid has proposed both an AC approach and a DC approach for OSW. In the New Jersey SAA Process, an LS Power Grid subsidiary identified significant cost savings from an AC approach, and was the only developer to propose an entirely AC solution. In the Long Island Export PPTN Process, an LS Power Grid subsidiary proposed a DC solution for new transmission lines on the interface between Long Island and Westchester County due to its low cost per MW of transfer, *high controllability, and other benefits.*

Constraining the process by having a requirement such as requiring 525 kV HVDC lines could limit innovation in proposals and result in a potentially higher-cost to ratepayers.

4. Comment on whether certain projects should be prioritized and why. For example, should a HVDC offshore project that eliminates the need for major land- based upgrades be prioritized over another HVDC offshore project that does not eliminate such upgrades.

   The sequencing of projects should be a function of maximizing benefits for ratepayers. LS Power recommends the New England States issue an open-ended request for proposals, similar to the New Jersey SAA Process identified in Attachment A, allow the market to identify the least cost, least risk plan. Once the transmission plan has been identified, it can be described to generators in future OSW procurements, allowing for generators to bid for delivery to the selected POIs. Transmission construction can be phased ahead of when it is needed by contracted OSW generation. Priority of projects should not be based on items such as the need for on-shore upgrades, but should be sequenced to match generation.

5. Identify any regional or interregional benefits or challenges presented by the possibility of using HVDC lines to assist in transmission system restoration following a load shedding or other emergency event and particularly from using the black start capabilities of HVDC lines in the event of a blackout.

   One advantage of having on-shore HVDC converters is the ability to provide ancillary services such as black start capability to the network in the event of a blackout. However this benefit should be considered as an additional benefit if such an approach is identified as the best plan, and not a driver of the overall technology selection for the system.

7. Comment on the region's ability to use offshore HVDC transmission lines to facilitate interregional transmission in the future.

   One drawback of offshore HVDC transmission lines is increased complexity for future interregional transmission. HVDC breakers are not currently commercially available, and if they are developed they likely present other challenges in offshore deployment due to their size. As identified in Question 13, HVDC converters do not currently have a standard for compatibility among different manufacturers. AC transmission lines offer more flexibility with regard to future system compatibility. The use of AC transmission lines for interregional transmission in the future (even in combination with offshore HVDC transmission) could avoid this issue.

9. Comment on how to develop transmission solutions that maximize the reliability and economic benefits of regional clean energy resources.

   Having developers identify on-shore and off-shore solutions for OSW transmission is the best way to develop transmission to maximize the reliability and economic benefits of regional clean energy resources. System reliability and economic benefits can be analyzed in the evaluation of proposals. Reliability is not a specific metric in that its difficult to measure the reliability benefit of discrete elements, but the analysis should ensure that all required reliability upgrades are identified, and the cost of such upgrades included in the evaluation of proposals and identification of the best plan. Production cost modeling of proposals will allow for identification of economic benefits of alternatives, including reduced congestion or reduced curtailment (and therefore higher delivery) of clean energy resources.

Comments on the Draft MOWIP

10. Identify potential Points of Interconnection (POIs) in the ISO-NE control area for renewable energy resources, including offshore wind. What are the benefits and weaknesses associated with each identified POI? To the extent your comments rely on any published ISO-NE study, please cite accordingly.

Both the New Jersey SAA Process and New York Long Island Export PPTN Process provide lessons learned on the approach to POIs.

In the SAA Process, PJM and New Jersey identified default POIs as well as injection amounts that informed, but did not constrain the process. The RFP explicitly contemplated the possibility of alternative POIs. Interestingly, none of the proposals exactly matched the default POIs and injection amounts. A large number of alternative POIs were identified, with more than half of the analyzed scenarios including at least one alternative POI. By allowing developers the latitude to identify innovative approaches, there was a wide variety of plans with a wide variety of capital costs and lifetime costs. As discussed in Attachment B, the most expensive plan on a new present value basis was an incumbent plan that had nearly three times the expected cost of the least cost plan.

Similarly, the Long Island Export PPTN Process identified expected POIs for OSW in Long Island for an expansion case, which provided for up to 6,000 MW of OSW injection into Long Island. This case provided guidance to proposers, but did not constrain the process, and developers proposed a wide variety of proposals to integrate OSW generation from different POIs.

The New England states should take a similar approach, and provide the MOWIP and other analysis to bidders to inform the process, but they should not constrain the process. The market should be used to identify the POIs for the best plan.

11. Similarly, comment on whether there are benefits to integrating offshore wind deeper into the region's transmission system rather than simply interconnecting at the nearest landfall (*e.g.,* using rivers to run HVDC lines further into the interior of New England). If there are enough benefits to make this approach feasible, please comment on any obstacles, barriers, or issues that Participating States should be aware of regarding such an approach.

There are likely benefits to integrating offshore wind deeper into the regional grid, the primary benefit being reduction of on-shore upgrades. This is particularly likely to be the case after interconnection points near the shore become saturated with offshore wind generation. As identified in response to Question 9, reliability and economic benefits should be considerations in the evaluation of proposals.

12. Identify likely offshore corridor options for transmission lines. Please comment on the potential for such corridor options, include size of the corridor footprint and potential number of cables that can be accommodated, to minimize the number of lines and associated siting and environmental disturbance needed to integrate offshore wind resource. For any offshore corridor identified, please indicate how the corridor avoids or minimizes disturbances to marine resources identified in the applicable plan, including the Connecticut Blue Plan and the Massachusetts Ocean Management Plan.

The best way to identify corridor options and associated impacts would be through evaluation of actionable proposals from developers. Avoidance areas can be identified in the proposal requirements as necessary. Having real world, actionable proposals will allow for the identification of tradeoffs between corridor options in the identification of the best plan.

13. Identify strategies to optimize for future interconnection between offshore converters, either AC or DC, to permit power flow between converters to facilitate the transmission of power from offshore to multiple POIs as needed. Similarly, comment on the ability of offshore converters from competing manufacturers to communicate with one another in this future case.

The New Jersey SAA Process described in Attachment A included the ability for developers to proposal "Option 3" proposals for interconnections between offshore converters. This allowed a real world evaluation of such connections based on actionable proposals, and would allow the New England states to identify the benefits and costs of such elements in the near term.

To preserve the potential benefits of future interconnections, a planning process should value flexibility and expandability. Currently, HVDC converters from competing manufactures cannot communicate with one another due to the lack of a standard. However, the international standards organization CIGRE is working on a standard to provide for this in the future. Further, AC interconnections between offshore converters would avoid this problem.

14. Comment on the benefits and/or weaknesses of different ownership structures, such as a consortia of developers with transmission owners or use of U.S. DOE participation as an anchor tenant through its authorizations in the federal Infrastructure and Investment Jobs Act, for new offshore transmission lines.

Different ownership structures will have little impact on the overall performance and cost of the system. To the extent there are tangible benefits from an ownership structure, bidders will have an incentive to include such provisions to advantage their proposals.

U.S.DOE's anchor tenant authorization of the Infrastructure and Investment Jobs Act would not necessarily apply to new transmission for offshore wind procured by the New England states, due to the requirement that DOE make a determination that an eligible project is unlikely to be constructed in the absence of DOE funding. In addition, the DOE Transmission Facilitation Program funding is in the form of a loan to be repaid (with interest), which provides limited savings relative to a direct subsidy or grant.

Attachment A
New Jersey State Agreement Approach Process

Introduction

The State of New Jersey Board of Public Utilities ("BPU") recently completed a first-of-its-kind offshore wind transmission planning competitive process. It is a long-term process that began in 2019 with transmission facilities scheduled to be placed in service ahead of offshore wind generation between 2030 and 2035. There are many lessons to be learned for other regions, including that applying transmission competition can successfully identify creative technical solutions, risk mitigation, and can provide significant ratepayer savings.

Background

In 2019, New Jersey Governor Murphy set a goal of 7,500 megawatts (MW) of offshore wind generation by 2035. New Jersey's 2019 Energy Master Plan[1] included recommendations for BPU to become more proactive in transmission planning in order to ensure the state could meet its ambitious goals. In June 2019, the first offshore wind solicitation was complete and contracts awarded to two projects totaling 1,100 MW. These two projects proposed electrical interconnections to Oyster Creek and B. L. England, the site of retired generation plants proximate to the shore and close to the offshore wind lease areas, which made perfect sense. However, beyond these first two interconnections New Jersey does not have any other available Points of Interconnection (POI) proximate to the shore, and the BPU had yet to procure an additional 6,400 MW of offshore wind generation by 2035. The BPU's offshore wind procurement schedule is summarized below.

Solicitation	Capability Target (MW)	Capability Awarded	Issue Date	Submittal Date	Award Date	Estimated Commercial Operation Date
1	1,100^(1)	1,100	Q3 2018	Q4 2018	Q2 2019	2024-25
2	1,200-2400^(2)	2,658	Q3 2020	Q4 2020	Q2 2021	2027-29
3	1,200	N/A	Q3 2022	Q4 2022	Q2 2023	2030
4	1,200	N/A	Q2 2024	Q3 2024	Q1 2025	2031
5	1,342	N/A	Q2 2026	Q3 2026	Q1 2027	2033

(1) NJBPU Solicitation Award - June, 2019
(2) NJBPU Solicitation Award - June, 2021
https://www.njcleanenergy.com/renewable-energy/programs/nj-offshore-wind/solicitations

Solicitation schedule

In November 2019, the Staff of the BPU held an offshore wind technical conference to solicit input on transmission considerations and solutions. Many comments at and following the technical conference identified that having 6 to 12 different generators responsible for their own interconnections will result in 6 to 12 different landfalls to multiple points of interconnection to grid, will result in significant system upgrades over time, and would not necessarily result in the least cost plan over time. It became clear

[1] https://www.nj.gov/emp/

that coordinated planning could have several benefits including reducing the environmental impacts of the offshore transmission and reducing onshore upgrades (saving time, money, and reducing impacts).

The PJM Interconnection, LLC ("PJM") Operating Agreement includes a provision to allow a State Agreement Approach planning process. Under the State Agreement Approach, one or more state can have PJM perform public policy transmission planning, based on a premise that since the transmission would be needed to meet the states' goals, and the cost would be allocated solely to the participating states. PJM conducts a project proposal window and performs technical and economic analysis, with the state(s) responsible for selecting the transmission to be constructed, if any. If the state(s) decide to move forward with transmission, the transmission would be included in the PJM Regional Transmission Expansion Plan.

The BPU issued an Order in November 2020[2] triggering a State Agreement Approach process with New Jersey as the sole participating state. The November 2020 Order identified that coordinated planning of transmission for offshore wind could reduce the number of landfalls and reduce the length of cables, which would reduce environmental impacts and also reduce costs. Having each generator plan, permit, and construct its own radial transmission interconnection would result in a greater number of landfalls, higher environmental impacts, and could have significant onshore upgrades with their own impacts and costs.

During the implementation of the process, New Jersey and PJM negotiated a State Agreement Approach Agreement, which outlined the roles and responsibilities of each party during the process. The State Agreement Approach provision of the Operating Agreement is silent on the reservation of transmission capacity created by the process, and how such capacity would be assigned to generators, which was a concern to New Jersey. Since the new transmission was being planned for, and paid for by the State, New Jersey desired an explicit provision that it could designate the capacity for specific generators, including as generators proceed through the interconnection queue. This would ensure the capacity could not be taken by others. In addition, the Operating Agreement was silent on cost sharing from potential future users of the transmission capacity beyond New Jersey, and New Jersey desired an explicit provision that future users of the capacity would be subject to cost sharing. These provisions were negotiated into the State Agreement Approach Agreement, which was filed at FERC in January 2022 and approved by FERC Order on April 2022.[3]

Now that the SAA process is complete, the transmission plan will be incorporated into future offshore wind procurements, and offshore wind generators can bid to the specific POIs. Facilities can be permitted, with construction sequenced to ensure the needed transmission will be placed in service ahead of the generation.

PJM Process

PJM conducted a project proposal window similar to all of its transmission planning, with stakeholder participation in the Transmission Expansion Advisory Committee. PJM, in collaboration with BPU staff, identified a base case of POIs. PJM and the BPU staff also identified categories of transmission system elements – Option 1 representing facilities entirely on-shore facilities, Option 2 for facilities connecting from onshore POIs to offshore facilities, and Option 3 for offshore networked facilities. Option 1 was

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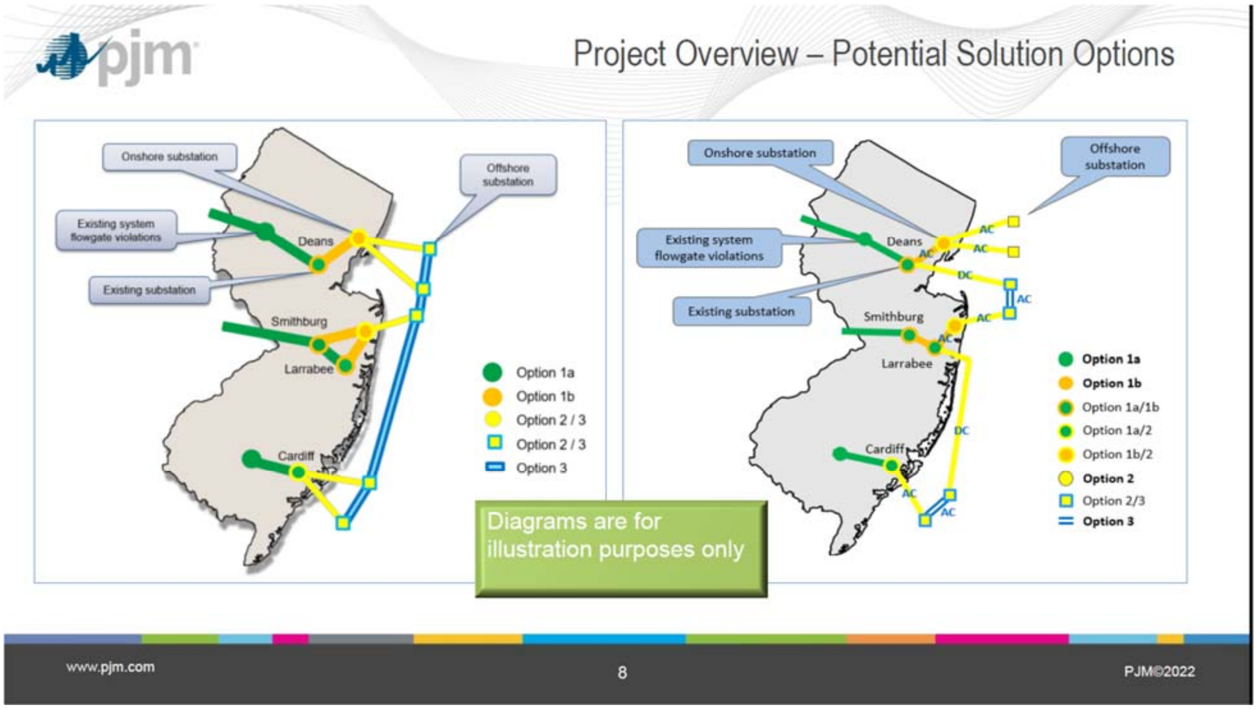
[2] https://www.nj.gov/bpu/pdf/boardorders/2020/20201118/8D%20-%20ORDER%20Offshore%20Wind%20Transmission.pdf
[3] https://elibrary.ferc.gov/eLibrary/filedownload?fileid=1B92778A-513D-CC4A-961F-802ADA500000

further refined into Option 1a for reliability upgrades require to the existing system, and Option 1b for new on-shore facilities for offshore wind interconnection.



The proposal window was opened on April 15, 2021.[4] The problem statement identified the need to integrate up to 3,742 MW[5] of offshore wind from Solicitations 3-5, and potentially a portion of the 2,658 MW from Solicitation 2, and consideration of expandability.[6] Bidders could propose interconnections to the default POIs, or could propose new alternative POIs. The diagrams above identify the Options as well as the existing POIs or conceptually how new onshore POIs could be proposed.

The proposal window problem statement also identified the extensive proposal requirements and proposal evaluation considerations including:

- Transmission system reliability requirements including ability to integrate offshore wind generation while addressing potential system overloads based on detailed transmission system planning models provided to bidders;
- Project constructability including ability to site, ability to permit, technology risk considerations, project schedule achievability, and demonstration of plans to mitigate risks that could increase costs or delay development including permitting plan;
- Project cost including the total cost to New Jersey ratepayers, cost risk mitigation measures including capital cost and annual revenue requirement commitments;
- Environmental benefits including minimizing impacts to marine, nearshore, and onshore habitats, minimizing impacts to cultural resources, potential benefits related to water quality,

[4] Information on PJM's competitive proposal windows is available at https://www.pjm.com/planning/competitive-planning-process

[5] The 2035 offshore wind goal of 7,500 MW less the 1,100 MW and 2,658 MW procured in Solicitation 1 and Solicitation 2 respectively.

[6] In fact, New Jersey has recently increased its offshore wind goal to 11,000 MW by 2040

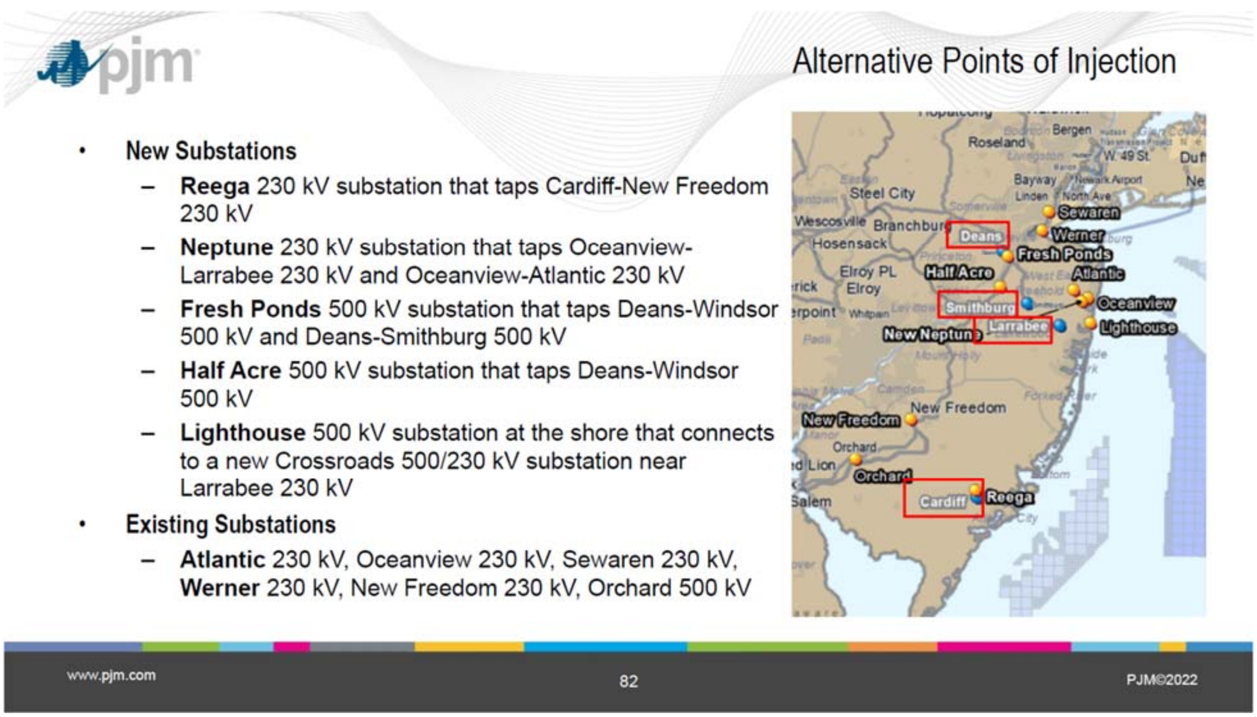
noise, aesthetics, tourism, navigation, and impacts related to fisheries resources and the fishing community and industry, and community benefits;
- Flexibility, modularity, and option value of solutions; and
- Market value of offshore wind generation including the ability to maximize the capacity and energy value of offshore wind and minimizing congestion and curtailment risk.

In addition to the traditional information submitted to PJM in a transmission planning proposal window, PJM and BPU staff identified significant additional supplemental information to be provided to PJM and to the BPU.

PJM had received 80 proposals across all options from 13 companies prior to the close of the proposal window on September 17, 2021:

- 45 proposals addressing overloads to existing facilities under Option 1a;
- 22 proposals creating new onshore facilities for offshore wind under Option 1b;
- 26 proposals between onshore facilities and offshore facilities under Option 2; and
- 8 proposals for offshore networked facilities under Option 3.[7]

The proposals varied significantly by technology and POIs, representing a significant amount of creative technical approaches to the stated problem. Proposals included an entirely alternating current (AC) approach and high voltage direct current (HVDC) converters at 320 kV and 400 kV. POIs included the default POIs of Deans, Smithburg, Larrabee & Cardiff as well as numerous alternative POIs as identified in the figure below.



[7] The total is more than 80 due to some proposals falling into multiple categories. https://www.pjm.com/-/media/committees-groups/committees/teac/2021/20211005/20211005-item-09-reliability-analysis-update.ashx

PJM identified that 57 of the 80 proposals included some form of cost containment provisions, providing value to ratepayers through risk mitigation.

PJM and BPU staff were faced with a challenge of evaluating this large set of proposals which addressed different aspects of transmission for offshore wind and had a wide variety of POIs and also megawatt capability, resulting in endless possible permutations. In addition to reliability and economic modeling, constructability and feasibility review was required. Recognizing the significant scope of analysis that would be required, in February 2022 the BPU postponed the offshore wind solicitation 3 in order to incorporate the State Agreement Approach transmission.[8] PJM began identifying and refining various scenarios based on POI injections in April 2022 which continued to be refined and evolved through the technical analysis which let to a series of reports published in September 2022. In parallel with this PJM analysis, the BPU staff conducted its own evaluation process.

BPU Process

In March 2022, BPU identified a series of stakeholder meetings related to the State Agreement Approach Process:

- Meeting 1 to review the process and have each bidder present its company and proposals;
- Meeting 2 to review the integration of offshore wind generation with the transmission proposals;
- Meeting 3 related to environmental and permitting issues; and
- Meeting 4 discussing ratepayer protections and cost controls.[9]

The BPU identified a comment deadline at the end of April for public comments on the proposals, and also identified a process of clarifying questions to bidders. Generally two rounds of clarifying questions and responses were completed in May 2022 and July 2022. Hundreds of documents were filed into the record at the BPU related to the proposals, technical conference presentations, comments, and responses to clarifying questions.[10] BPU ultimately decided not to have in-person or virtual interviews with bidders.

PJM Analysis

PJM performed detailed evaluation of the proposals along four bodies of analysis:

- Reliability
- Economic
- Constructability
- Financial

[8] https://nj.gov/bpu/newsroom/2022/approved/20220228.html
[9] https://nj.gov/bpu/pdf/publicnotice/Notice%20SAA%20Public%20Stakeholder%20Meeting.pdf
[10] https://publicaccess.bpu.state.nj.us/CaseSummary.aspx?case_id=2109468

A summary of the analysis was presented to stakeholders by PowerPoint at a special meeting of the Transmission Expansion Advisory Committee in July 2022[11] with more detailed reports posted in September 2022.[12]

Reliability Analysis

PJM's Reliability Analysis followed the categories of proposals. Reliability Analysis consisted of complex computer simulations of each transmission system configuration, to evaluate how offshore wind would be delivered under different conditions including a summer peak day, a winter peak day, and a light-load spring day. The objective of the Reliability Analysis is to identify the investment required to ensure a reliable system – one without transmission system violations under study conditions. The output of this analysis is identification of all transmission upgrades that would be necessary under each scenario, in order to identify the total cost of each scenario.

Option 1a proposals were grouped into areas based on the reliability violations targeted by the proposals. Within each area, one or more upgrade was selected that resolved each overloaded facility most effectively, at the least cost. This resulted in four proposals out of 45 being carried forward in the reliability analysis. In addition to the Option 1a proposals submitted, many of the POI scenarios had additional on-shore overloads that would need to be addressed, which was also identified in the analysis of the Option 1b and Option 1b/2 scenarios.

Option 1b scenarios were analyzed, with six identified in the final analysis. Each Option 1b scenario included injection of over 7,500 MW of offshore wind at varying POIs, with the total cost of each scenario identified to range from $1.5 billion to $2.7 billion. However, Option 1b scenarios alone do not represent complete plans for offshore wind integration, as it excludes facilities from the offshore wind generation area to the grid.

Twenty Option 1b/2 scenarios were identified in the final analysis, consisting of plans from one to three bidders in each scenario. The total capital costs ranged from $4.3 billion (Scenario 7 – LS Power) to $8.7 billion (Scenario 16 – Nextera). The Option 1b/2 scenarios also varied by the amount of new offshore wind generation accommodated by each, ranging from 3,600 MW to 6,400 MW. A meaningful comparison would then be the cost per megawatt, to account for the fact that a more expensive plan might also accommodate more capacity. The cost per megawatt of the Option 1b/2 scenarios ranged from $0.88 (Scenario 7 – LS Power) to $2.03 million per megawatt (Scenario 11 – PSEG/Orsted).

[11] https://www.pjm.com/-/media/committees-groups/committees/teac/2022/20220906/item-11---nj-osw-saa.ashx

[12] Posted under the meeting materials for the September 6, 2022 meeting at https://www.pjm.com/committees-and-groups/committees/teac

Table 15. POI Onshore/Offshore Scenarios – Option 1b/2

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate ($M)	Proposal IDs	Cost Estimate ($M)	Cost Estimate ($M)	Cost Estimate ($M)	Cost Estimate ($M/SAA MW)
1.1	6310	4800	COEDTR, ANBARD	None	$0	990 574 831	$2,747 $1,810 $1,877	$327	$6,761	$1.41
1.2	6310	3652	COEDTR, PSEGRT	None	$0	990 613	$3,317 $2,151	$360	$5,828	$1.60
1.2a	6400	3742	COEDTR, ANBARD	None	$0	990 574	$2,747 $1,810	$360	$4,917	$1.31
1.2b	6400	3742	COEDTR, ATLPWR	None	$0	990 210 172	$2,747 $2,024 $1,601	$360	$5,831	$1.56
2c	6258	4748	AE, JCPL, MAOD	797 929.9 453.1-18,24,28-29	$233 $70 $377	551	$4,411	$677	$5,768	$1.21
4	6010	4500	NEETMH	None	$0	461 27	$3,608 $1,477	$390	$5,475	$1.22
4a	6400	3742	NEETMH	None	$0	461 27	$3,608 $1,477	$387	$5,461	$1.46
5	6310	4800	JCPL, MAOD	453	$620	321	$5,726	$568	$6,914	$1.44
6	6400	4890	CNTLM	781	$1,772	594	$2,460	$271	$4,503	$0.92
7	6400	4890	CNTLM	629	$1,568	594	$2,460	$283	$4,311	$0.88

Table 16. POI Onshore/Offshore Scenarios – Option 1b/2

Scenario ID	Total (MW)	\SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate ($M)	Proposal IDs	Cost Estimate ($M)	Cost Estimate ($M)	Cost Estimate ($M)	Cost Estimate ($M/SAA MW)
10	6400	4890	ANDBARD	None	$0	882 841 921 131	$1,776 $1,794 $1,545 $1,648	$406	$7,169	$1.47
11	6399	3741	PSEGRT	None	$0	683	$7,181	$402	$7,583	$2.03
15	6400	4890	NEETMH	None	$0	250	$7,029	$311	$7,340	$1.50
16	6400	6400	NEETMH	None	$0	604 860	$2,943 $5,285	$519	$8,747	$1.37
16a	6400	3742	NEETMH	None	$0	860	$5,285	$327	$5,612	$1.50
17	6400	4890	ATLPWR, NEETMH	None	$0	210 172 15	$2,024 $1,601 $3,023	$780	$7,428	$1.52
19	6258	3600	ATLPWR	None	$0	210 172 769	$2,024 $1,601 $1,478	$324	$5,427	$1.51
20	6400	3742	NEETMH	None	$0	298 461	$2,662 $3,608	$594	$6,864	$1.83
20a	6400	3742	NEETMH, ANBARD	None	$0	298 574	$2,662 $1,810	$586	$5,058	$1.35
20b	6400	3742	NEETMH, ATLPWR	None	$0	298 210 172	$2,662 $2,024 $1,601	$586	$6,873	$1.84

Economic Analysis

The economic analysis report is an analysis of impact of the various proposals and scenarios on the regional energy market. Detailed modeling of the energy market was conducted. In addition, potential impacts on the capacity market were also investigated. The key takeaway of the economic analysis is that while some small differences between some proposals were identified, the differences were not found to be significant.

Constructability Analysis

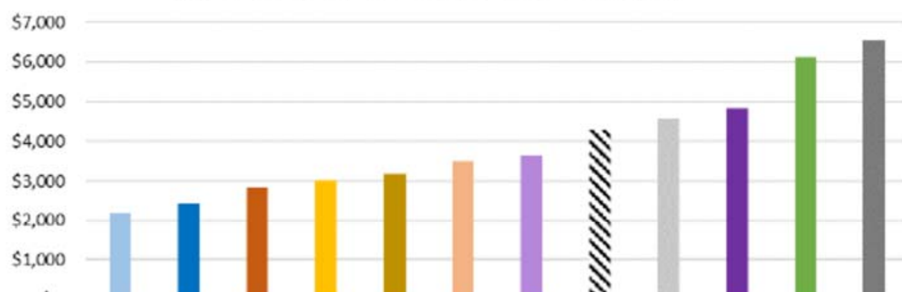
A significant amount of review of the feasibility of each proposal was performed. Three constructability reports were published, one for Option 1a proposals, one for Option 1b proposals, and one for Option 2 and 3 proposals, with each report over 200 pages. Similar to the Economic Analysis, the conclusion is that all of the proposals are feasible, with some small differences in the risks presented by different proposals.

Financial Analysis

While the reliability analysis included a capital cost estimate for each scenario, the cost to ratepayers is not the capital cost of the proposals alone. A detailed Financial Analysis report includes an analysis of the total lifetime cost of each proposal including consideration of the capital cost as well as other key cost determinates including the cost of capital, depreciation, operating costs, etc. The metric representing the total cost to New Jersey ratepayers is the Net Present Value of Revenue Requirement, which is a single dollar value of the total cost for each year of the life of the transmission project, discounted back to today. The Net Present Value of Revenue Requirement was calculated both on a proposal basis in dollars, and in a cost per megawatt basis. Figure 1B/2-1.1 from the Financial Analysis Report identifies the range of Net Present Value of Revenue Requirements for Option 1b/2 proposals to be from $2,204 million (LS Power Proposals 627 & 594) to $6,551 million (PSEG-Orsted Proposal 683). The range of NPVRR per MW is from $0.59 million/MW (LS Power Proposals 627 & 594) to $1.75 million/MW (PSEG-Orsted Proposal 683).

Figure 1B/2-1.1

Option 1B/2 Comparison: Base Case NPVRR ($M)



	627 & 594	294 & 594	990 Larrabee + Smithburg	461 & 27	860	990 Deansx2	831, 841 & 921	172, 210 & 769	871	131, 831, 841 & 921	321 & 453	683
	LS Power	LS Power	ConEd	NEETMH	NEETMH	ConEd	Anbaric	APT	PSEG-Orsted	Anbaric	MAOD + JCPL	PSEG-Orsted
NPVRR Base Case	$2,204	$2,451	$2,839	$3,032	$3,178	$3,512	$3,667	$4,288	$4,553	$4,850	$6,128	$6,551
OSW Injection MW	3742	3742	2400	3742	3742	2400	3742	3600	2800	4890	4800	3742
$million/MW	0.59	0.65	1.18	0.81	0.85	1.46	0.98	1.19	1.63	0.99	1.28	1.75

The BPU did not decide to move forward with any of this Option 1B/2 scenarios, as discussed in the next section. However, if Option 2 proposals were found to be beneficial, the savings from conducting a competitive process for those elements was in excess of $4 billion.

Selection

On October 26, 2022, the New Jersey BPU selected a portfolio of transmission projects in an Order in the State Agreement Approach proceeding.[13] A key consideration in the decision is that due to the ability of OSW generators to obtain an Investment Tax Credit[14] as well as project-on-project risk, staff did not recommend moving forward with any of the Option 2 proposals. As Option 3 proposals were linked to Option 2 proposals, no Option 3 proposals were considered for selection. Among the Option 1b proposals, the order identifies that creating a single onshore POI would reduce overall impacts to the state, and reducing the scope of on-shore upgrades will reduce costs and on-shore impacts. A subset of Option 1b proposals 453 and 17 was identified as enabling the desired amount of OSW injection with a cost of approximately $504 million, and with a set of Option 1a proposals with a cost of approximately $575 million, for a total cost of $1 billion, representing savings of $900 million compared to the baseline scenario. This selection also provided environmental benefits by consolidating impacts to a single corridor and avoiding sensitive offshore areas, and reduced on-shore impacts by minimizing on-shore construction and using existing corridors.

Conclusion

The New Jersey State Agreement Approach process shows that applying transmission competition can successfully identify creative technical solutions, risk mitigation, with the potential for significant ratepayer savings.

[13] https://publicaccess.bpu.state.nj.us/DocumentHandler.ashx?document_id=1279919

[14] Note that OSW transmission owners may also be eligible for an Investment Tax Credit

Attachment B
Long Island Export Public Policy Transmission Need Process

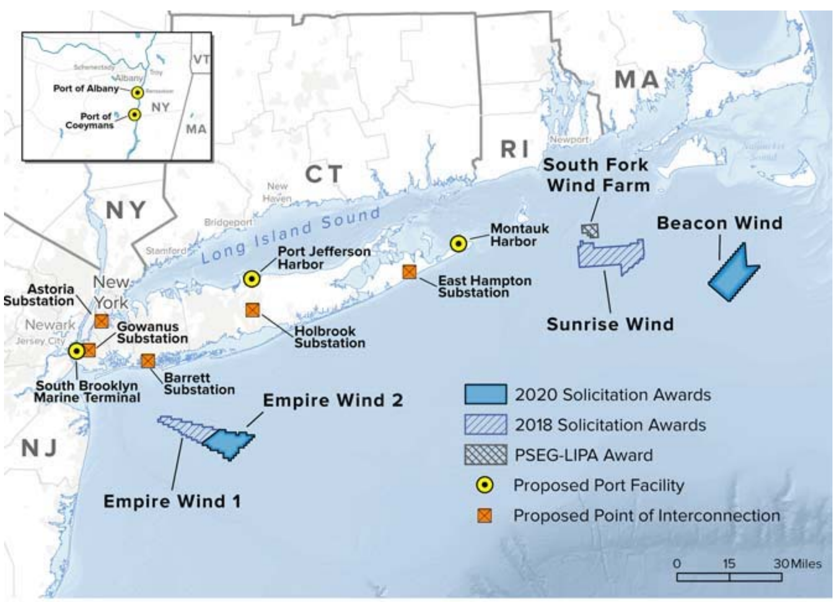
Introduction

The Climate Leadership and Community Protection Act ("CLCPA") created a requirement for New York State to install 9,000 megawatts ("MW") of Offshore Wind ("OSW") by 2035. One measure taken by the New York Public Service Commission ("PSC") was to initiate a competitive transmission planning process at the New York Independent System Operator ("NYISO") to facilitate integration of anticipated OSW generation into the New York State grid.

Background

In 2019, New York established a requirement to install 9,000 MW of OSW generation by 2035. Two specific state agencies responsible for implementing this requirement are the New York State Renewable Energy Research and Development Authority ("NYSERDA") responsible for procuring OSW and the New York PSC responsible for oversight of all aspects of New York State energy regulation, including approving contracts entered into by NYSERDA. NYSERDA and the New York PSC have each completed studies related to planning and procurement of OSW which have identified transmission as a key constraint which to be addressed in order to meet the OSW requirement. These constraints include physical constraints, such as limits on the number of cables that can be installed in the Narrows and further in New York harbor, and electrical constraints, such as overloads on the existing transmission system.

To date, NYSERDA has entered into contracts with four OSW generation projects, and the Long Island Power Authority has entered into a contract with one OSW generation project. The location of the projects as well as their proposed points of interconnection are shown below. These interconnections have each required on-shore upgrades[table of queue?].



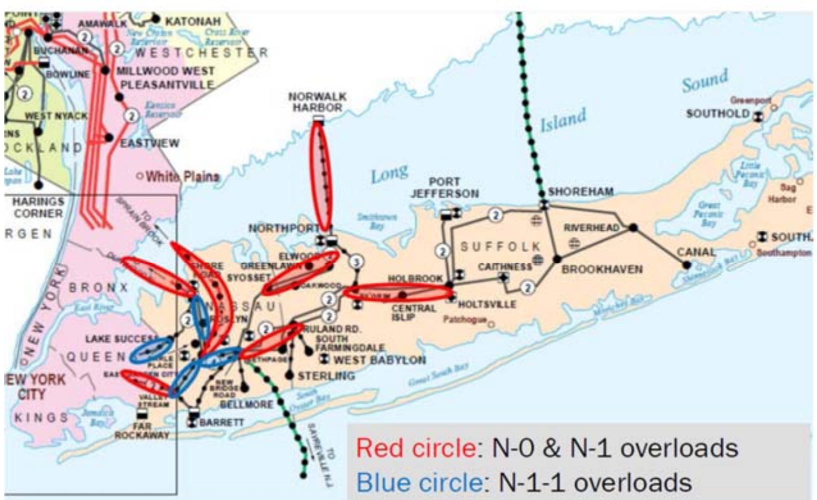
In its planning studies, NYISO has assumed that the 9,000 MW of OSW to be in-service by 2035 would connect to the New York transmission system roughly proportional to the existing load proximate to the Atlantic – which is 66% in New York City and 33% in Long Island, or 6,000 MW in New York City and 3,000 MW connected to Long Island. However, achieving either of these goals is expected to be a challenge. As identified above, the ability to connect to New York City is constrained by physical constraints in the Narrows as well as by the limited amount of real estate available in New York City for land for DC converters for OSW generators. The Long Island transmission system is relatively weak, primarily consisting of a 138 kV backbone, with very poor connectivity with the rest of the state. In order to address this last issue, in March 2021 the PSC issued an Order Addressing Public Policy Requirements for Transmission Planning Purposes[1] which required a process for planning for Long Island Export.

The NYISO Tariff includes a provision for transmission planning for a Public Policy Requirement. Stakeholders propose state requirements that could constitute a PPR, and if the PSC agrees that a PPR exists, it can direct the NYISO to conduct a competitive process. NYISO conduct a project proposal window and perform technical and economic analysis. The NYISO staff will complete a selection report, with the NYISO board making the final selection.

In the 2020-2022 planning cycle, several stakeholders identified OSW under the CLCPA as a PPR, and the Long Island Power Authority specifically identified the inability of the Long Island grid to accommodate 3,000 MW of OSW generation. In March 2021, the PSC issued the Order Addressing Public Policy Requirements for Transmission Planning Purposes, which defined the PPR as adding at least one bulk transmission intertie to increase the export capability of the LIPA-Con Edison interface to ensure the full output from at least 3,000 MW of OSW is deliverable from Long Island.

NYISO Process

The first step for the NYISO is to define the PPR and develop the planning models to be used in the process for developers to develop proposals and for proposals to be evaluated. In developing the proposals, NYISO identified many constraints on the existing transmission system. The figure below identifies the overloads on the existing system which results from the delivery of 3,000 MW of OSW to Long Island.[2]



[1] https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B8C8F3D7A-4FEB-4B18-88F5-82CF587895C9%7D

[2] link

The proposal window was opened on August 12, 2021.[3] The problem statement identified the need to integrate at least 3,000 MW of OSW to Long Island with consideration of expandability.[4] The NYISO tariff identifies extensive proposal requirements and proposal evaluation considerations including:

- Sufficiency requirements;
- Project schedule, work plan, route and site information,
- Technical information including rating information, one-line diagrams, modeling data, technical drawings,
- Environmental requirements and permitting requirements;
- Project cost including cost risk mitigation measures through cost containment;
- Performance, operability and expandability of solutions; and
- Production cost modeling and other benefits.

The Long Island Export PPTN process is the first process since NYISO had made several modifications to its tariff, including explicit provisions related to the treatment of cost containment proposals. In an attempt to simplify the evaluation of cost containment proposals, NYISO identified a standardized cost cap with standardized exclusions, which is optional for bidders. Bidders can elect no cost cap, a hard cost cap, or a soft hard cap. Under a hard cost cap the developer is prohibited from recovering costs from ratepayers above the hard cost cap for the scope of included costs. Under a soft cost cap, the developer identifies a cost sharing arrangement, where at least 20% of costs above the soft cost cap would not be recoverable. In evaluating proposals, NYISO takes into account its independent cost estimate as well as any cost cap, and the strength of the cost cap.

NYISO identified that it had received 19 proposals from four bid teams prior to the close of the proposal window on October 11, 2021. NYISO completed its initial Viability and Sufficiency Assessment[5] on April 5, 2022 and filed it at the PSC, finding that 16 proposals from three bid teams met the criteria and were eligible for full evaluation.

The proposals varied significantly by technology and points of interconnection ("POIs") to the existing grid, representing a significant amount of creative technical approaches to the stated problem. Proposals alternating current (AC) and high voltage direct current (HVDC) elements. New proposal elements are new underground cables to be generally installed in streets, new submarine cables, and new substations. Proposals also identified required upgrades to the existing transmission system. Proposals included connections or modifications to 22 different substations throughout Southeast New York (Zones H, I, J and K). The figures below summarize the wide variety of proposals from the bidders. On the left in green is the single LS Power proposal. In the middle in red is a representation of all nine alternative proposals from Nextera, with elements common to all proposals shown as a solid line and elements included in alternative proposals as dotted lines. Similarly, on the right is a representation of the six alternative proposals submitted by the bid team of the New York Power Authority and New York Transco with common elements shown as solid and alternative elements as dotted lines.

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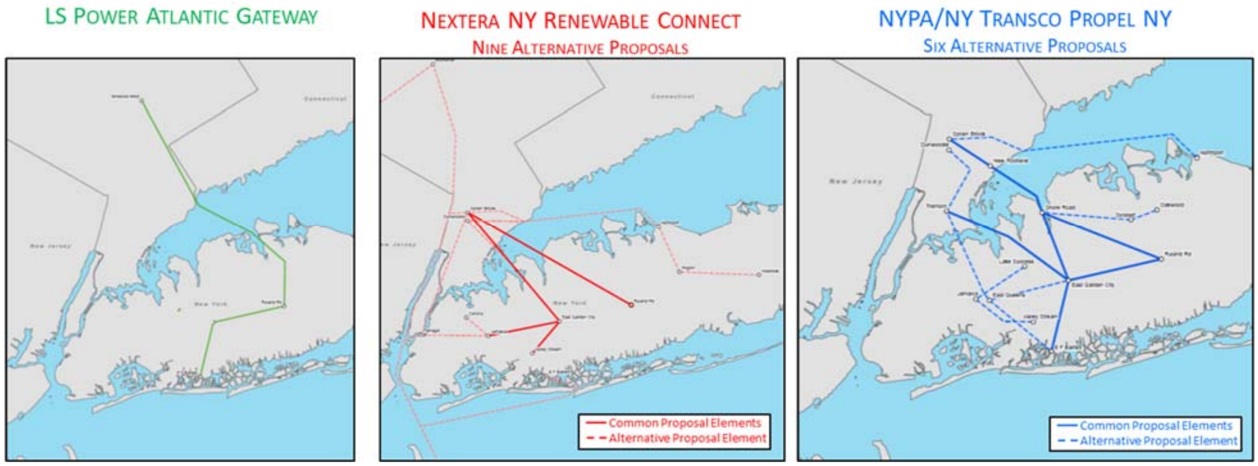
[3] https://www.nyiso.com/documents/20142/22968753/Long-Island-Offshore-Wind-Export-Public-Policy-Transmission-Need-Project-Solicitation.pdf/51b8fdeb-1a66-2938-f116-38f1be486e0d

[4] Recognizing constraints into New York City, and the potential for additional generation to connect to Long Island, the solicitation included a methodology to evaluate an increasing amount of generation deliverability into Long Island above the 3,000 MW minimum.

[5] https://www.nyiso.com/documents/20142/22968753/LI-OSW-Export-PPTN-Viability-Sufficiency-Assessment_Report.pdf



While the scopes of the proposals have been identified in the interconnection process, the costs of the proposals have not yet been disclosed. NYISO's full evaluation of the 16 viable and sufficient proposals is underway and will include detailed system reliability modeling, transfer analysis, production cost analysis, independent cost estimate, feasibility review, and other analysis. NYISO's latest estimate is that the results of the evaluation will be available in the first quarter of 2023.

Conclusion

While the Long Island Export process is still underway, it is clear that the Long Island Export process has identified a variety of innovative technical approaches to the problem statement of integrating offshore wind into the existing New York grid. In addition, it is likely that most if not all bidders included some form of cost containment, providing risk mitigation benefits to ratepayers. Competitive pressure can help the market to identify creative technical solutions and shifting risk to developers willing to provide cost containment.