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VIA E-MAIL ONLY

Carmen Diaz, Secretary of the Board
Board of Public Utilities
44 S. Clinton Ave., 9th Floor
P.O. Box 350
Trenton, NJ 08625-0350

Re: IN THE MATTER OF THE OPENING OF NEW JERSEY'S THIRD SOLICITATION FOR OFFSHORE WIND RENEWABLE ENERGY CERTIFICATES (OREC)
Request for Information, Docket No. QO22080481

Dear Secretary Diaz:

Please accept this correspondence on behalf of Public Service Enterprise Group ("PSEG" or the "Company") in reply to the above-referenced October 28, 2022 Request for Information ("RFI") Notice issued by Staff of the New Jersey Board of Public Utilities ("NJBPU" or "Board") in support of New Jersey's third offshore wind solicitation ("Third Solicitation"). PSEG remains actively engaged and poised to continue to support New Jersey's ongoing efforts to pursue offshore wind development. Additionally, we remain optimistic that our Coastal Wind Link joint venture with Ørsted, with its emphasis on reliability and resiliency, will keep it as a strong contender for any future transmission solicitations to bring regional offshore wind projects on-shore as the state implements steps in furtherance of its increased offshore wind goal of 11,000 MWs by 2040.[1] As highlighted by Board Staff's insightful RFI questions and discussed further below, transmission will be critical to the success of offshore wind as the state considers the process for this Third Solicitation and beyond.

PSEG RESPONSE TO STAFF QUESTIONS

PSEG offers the following responses to Staff's individual questions:

A. Design Considerations for the Prebuild Infrastructure

1. **Please identify any requirements that should be included in the solicitation guidance document ("SGD") to support the design and timely construction of the Prebuild Infrastructure. Please provide any recommendations for specification of these requirements.**

[1] Exec. Order N. 307 (2022).

PSEG sees this question broken into two parts: 1. Information/requirements that the BPU should provide in the SGD to the bidders, and 2. Information the BPU should request from bidders to supply in their bid to the solicitation:

- Information/requirements that the BPU should provide in the SGD to the bidders:
  - The maximum MW's that each system (duct banks and cables) should be capable of transporting from the Offshore HVDC Collector Station (OCS) to the Larrabee Tricollector Station Point of Interconnection (POI).
  - The required maximum voltage and maximum ampacity that each system should be considered for the HVDC duct bank design. Provide the maximum cable cross section diameter.
  - A requirement that the duct banks should accommodate redundant fiber optic cables for each circuit (additional conduits).
  - A clarification on whether or not the BPU is requiring the duct banks to be designed as one duct bank per circuit, or if multiple circuits are allowed in one duct bank.
  - The maximum MW infeed loss limit is for a failure of a single component (for example, in the SAA there was a 1500 MW limit to avoid contingency modeling changes in PJM).
  - Basis for the engineering design including minimum burial depth, minimum bend radius, maximum pulling tensions, how to address utilities crossings, and preliminary routes.
  - How far into the Larrabee Collector Station the duct banks must enter
  - A clarification on whether or not a spare duct is required for each duct bank.
- Information the BPU should request from bidders to supply in their bid to the solicitation:
  - The preliminary route for the duct bank(s).
  - Specify the number of duct banks and splice vaults that will be used to run the four circuits.
  - Diagrams showing preliminary splice vault and duct bank arrangements, size and spacing of the splice vault and duct bank.
  - The locations where the duct bank(s) may need to take multiple paths due to concerns of Right of Way (ROW) not being wide enough to fit duct bank(s) for all four circuits.
  - Identify "Special crossings" (e.g. rail road crossings, stream crossings, etc.) and proposed technique to address each one of them.
  - The assumed design criteria of the cables the duct bank should be capable of housing. This should include assumed voltage, MW, conductor size, cable outside diameter, and assumed cable pulling direction.
  - A level 2 schedule including permitting, procurement, construction activities, and milestones.
  - The basis of design for how the bidder intends to design the duct bank size and spacing between duct banks considering the fact that the future awardee's cables will not be designed yet.
  - The plan for obtaining permits, inclusive of activities required for special considerations, considering the "full system" won't be designed at the time of applying for permits for the duct bank.

2. Are there major challenges or significant limitations to installing up to four circuits for

independent projects in a common ROW? If yes, please summarize the nature of these challenges/limitations.

Yes, there are challenges to installing up to four circuits for independent projects in a common ROW. These include but are not limited to:

- Width of Road: The Board should be aware that for a system of four 320 kV, 1,200 MW circuits, it would require 4 separate duct banks, each 3-feet wide, separated by 15-feet edge-to-edge spacing between each duct bank. This spacing would be required to prevent any thermal impact from one circuit on an adjacent cable. This results in a 57-feet span from edge to-edge of the two exterior duct banks. Considering some residential streets are only 30-35 feet wide, this span of 57 feet will make it difficult, and in some cases not possible, to route all 4 circuits in single ROW. PSEG would welcome the opportunity to meet with Board Staff to review design drawings that would likely be helpful to Board Staff's visualization of this aspect of the construction challenges.

- Splice vaults: Besides the duct banks, the splice vaults will need to be considered. These are typically installed every 1,500-2,000 feet per circuit. Each splice vault is larger than the size of a U-Haul box truck, with dimensions of 12 feet X 36 feet. The splice vault is wider than the duct bank it is associated with. Therefore these will create an additional impact when trying to layout four duct banks in one roadway.

- Underground obstructions: Most roadways have existing underground obstructions such as utilities (ex. Sewer, water, gas, power cables). These existing utilities will create obstructions when installing the four duct banks in the roadway. This will result in three options: Take multiple paths (all four circuits not installed on one roadway), relocate the existing utilities, or take a different route. Although these underground utilities are something that have to be dealt with even on a single circuit duct bank, the fact that there will be four circuits will exacerbate the issue and make it more difficult to resolve.

- Permitting: Approved projects will need assistance from the Board and Board Staff in coordinating early and continuous environmental agency consultation and public involvement at key decision-making junctures, particularly with respect to establishing project Purpose and Need by including additional circuits for independent projects. The concept of permitting an offshore wind generating facility and associated generation leads along with additional circuits needed for future projects may not be seen as a full and complete project justifying the "purpose and need" threshold that federal and/or state environmental regulators require to issue a permit decision. Generally, environmental laws and regulations require that projects first avoid, then minimize, and lastly mitigate negative impacts to the natural, cultural, and manmade environment on a full and complete project. In general terms, if an impact to an environmental resource (e.g., a wetland) can be avoided, then it should be avoided. If avoidance is not possible, then the least harmful project alternative (minimized impact) should be chosen. If the minimized impact remains adverse or unacceptable, then the impact should be mitigated to alleviate environmental harm. In practical application, during the environmental permitting process, the principle "avoid, minimize, and mitigate" steers a project toward selecting the most feasible and prudent alternative that results in the least environmental harm, in balance with other engineering and transportation considerations (e.g., design standards, costs, right-of-way), to best address the project purpose and need. Further, circuits for independent future projects may not meet the "Independent Utility" threshold for a full and complete project if applied for independently. The Board and Board Staff may need to be prepared to more actively support projects in required consultations with federal and/or state regulators who may struggle issuing permit decisions in this case under National Environmental Policy Act ("NEPA") regulations. Lastly, permitting concerns due to the fact that the duct bank installer will not have the design details of future cables at the time of permit applications will also have to be navigated as environmental regulators may raise concerns that this could be seen as permitting a non-complete design. As always, environmental permitting efforts that raise any appearance that applicants have not followed the regulatory process for a full and complete project also elevate the chance of litigation. The Board and Board Staff should recognize that this could introduce undue scheduling risks to the developer of the wind generation facility of a paused project while judicial proceedings occur.

B. Cost Recovery Structure for Costs Associated with the Prebuild Infrastructure

3. Board Staff expects to require applicants to submit separate an OREC schedule for their offshore wind project with and without the Prebuild Infrastructure included. Over what period of years should the cost of the Prebuild Infrastructure be recovered?

The Prebuild Infrastructure associated with this award should be recovered over a 20-year period consistent with the statutory and regulatory framework established in N.J.S.A. 48:3-87.1 and N.J.A.C. 14:8-6.5. The statute and regulation are instructive on this point as they both contemplate applicants incorporating into their bids transmission facilities and interconnection facilities to be installed in addition to establishing an overall 20-year cost recovery period. Ideally, the cost of the Prebuild Infrastructure work would be recovered over a period that is commensurate with the infrastructure life or the equipment it will house to minimize bill impacts to customers. In this instance, however, when asking for the Prebuild Infrastructure to be developed as part of the Phase 3 solicitation, the ideal mechanism for recovery becomes the OREC. In fact, under an offshore wind competitive solicitation approach, it is unclear that another statutory or regulatory mechanism currently exists to recover these costs through a vehicle other than the OREC.[2]

C. Construction and Operating Considerations for the Prebuild Infrastructure

4. What terms and conditions for construction of the Prebuild Infrastructure between the Board and constructor should be specified in the SGD?

The SGD should identify:

- That the solicitation awardee shall be responsible for obtaining land easements required for the installation of the duct bank.
- The required party that is responsible for annual land easement fee (if applicable).

[2] In this regard, it is worth noting that separate and apart from a competitive solicitation approach for offshore wind development authorized by N.J.S.A. 48:3-87.1, the Board has authority over renewable energy investments made pursuant to filings by regulated electric and gas public utilities, including the authority to establish a just and reasonable cost recovery mechanism. *See* N.J.S.A. 48:3-98.1.

- Whether or not the duct bank installer is responsible for installing the transition joint bay (TJB) and the horizontal direction drilling (HDD) at the landfall.
- Provide preliminary cable manhole design requirements, and cable riser structure design and location.
- Provide a responsibility matrix clearly defining interface responsibilities including the transition joint bay (TJB) and the horizontal direction drilling (HDD) at the landfall.
- Provide handover check list requirements for the completed duct bank.

5. What terms and conditions for operation of the Prebuild Infrastructure between the Board, constructor and future users should be specified in the SGD?

- The BPU should identify if the ownership of the duct bank will be assigned to the future user, or if it will be kept as two separate ownerships (One owner for duct bank, another owner for cable). (Note: Transfer is only feasible if the duct banks are built in a one duct bank per circuit design)
- An Operation and Maintenance Agreement should be created between the future user and the Duct bank Owner to identify roles and responsibilities between the two parties on what each party is responsible for:
    - The Duct bank Owner:
        - The Duct bank Owner should be responsible for the inspection, maintenance, repair, replacement, and decommissioning of the duct bank.
        - The Duct bank Owner should provide future user with a full set of design specifications and drawings of the duct bank.
    - The Future User (i.e. Cable Owner):
        - The Cable Owner should be responsible for confirming the duct bank is acceptable for installing their cable. The Cable Owner should confirm this by performing tasks such as inspection, design review, mandreling, etc…
        - The Cable Owner should be responsible for the operation, inspection, maintenance, repair, replacement, and decommissioning of the cable.
    - Both Parties (the Duct bank Owner and Cable Owner):
        - Both Parties should provide proper notification to each other for upcoming work, maintenance, repairs, or outages.
        - Both Parties should coordinate maintenance and outage activities with one another so to prevent or minimize impact on the other party.
        - Both Parties should notify the other party if they witness any abnormal conditions, damage, or safety concerns on the other party's equipment.
        - Both Parties should allow access to the other party to perform inspections, maintenance, repairs.
        - Liability provisions from one party to the other should be clearly specified.

6. Are there any potential challenges for cable installation in the Prebuild Infrastructure for future solicitation awardees? If yes, how might they be mitigated?

The challenge exposed by this question is that the primary way to mitigate the potential challenges for cable installation in the Prebuild Infrastructure for future solicitation awardees would be to overbuild in the present with today's best evaluation of the future users that will interconnect. This mitigation would obviously increase costs in the present in hopes of decreasing costs in the future. That said, overbuild would provide no guarantee that it would address all issues. What follows is a list of potential challenges.

- Design concerns: The duct bank will be designed/built with minimal to no input (e.g. design and installation requirements) from the future awardees. Therefore the future awardees may have concerns with the way the duct banks have been designed and/or installed. These concerns could include:
  - Spacing between circuits (If the circuits were not spaced apart from one another adequately, it could create impact on cable rating)
  - Bend radius (All cables have a bend radius limitation that if exceeded can result in cable damage)
  - Pulling tension (All cables have a pulling tension limitation that if exceeded can result in damage to the cable)
  - Size of conduits within duct bank (a cable's outside diameter is based upon many factors including voltage, MW, conductor size, insulation type, manufacturers, etc… The conduits in the duct bank need to be sized properly to allow a cable to be installed.)
  - Distance between splice vaults
  - Size of splice vaults (different companies may have different requirements about safe working clearances within a splice vault)
- Condition concerns: It is possible that the duct bank will be installed several years prior to a future awardee's cable being installed. Therefore the duct bank will need to be inspected for acceptable condition prior to installing the cable. If it is found that the duct bank is in poor condition (due to either poor installation or poor protection/maintenance) then the duct banks would need to be repaired prior to cable installation.
- Safety Concerns: If there are multiple circuits within a single duct bank then it may present safety concerns. For example, if one cable requires maintenance, there would be employee safety concerns with the other circuit in the duct bank remaining energized. To avoid this, all circuits in the duct bank could be de-energized during maintenance, however, that will significantly impact deliverability of energy from the offshore generators. One potential mitigation technique would be to require only one circuit per duct bank and per splice vault.
- Technology advancements: Equipment associated with offshore wind is constantly experiencing technical advancements. For instance, cable manufacturers are continually increasing the voltage class of cables. In addition, wind turbine manufacturers are constantly creating larger turbine capable of higher MW's. Therefore, there is a chance that a future awardee would want to take advantage of a future technical advancement that may have required the duct bank to be designed in a different way. To try to accommodate some of these advancements, the design should take into consideration the strongest solution available today, and make efforts to accommodate that in the duct bank and vault designs.

7. Please identify any potential adverse cost or schedule implications ascribable to the Prebuild Infrastructure as it relates to awardees of future New Jersey offshore wind solicitations. How might these impacts be mitigated?

- Schedule and Cost Implications:
  - Duct bank Completion: If duct bank were not completed in time, it would impact the cable's installation schedule. This would result in a delay in cable installation and a cost impact.

- Duct bank Condition: Prior to future cable installation, the duct bank will be inspected. If it is found that the duct bank is in poor condition (either to poor installation or poor protection/maintenance) then the duct banks would need to be repaired prior to cable installation. This would result in a cost and schedule impact to the cable installation.
- Duct bank Installation: If duct bank was not installed per the expected design, it could result in a cost and schedule impact to the cable installation and require potential re-engineering of the solution.
- Duct bank Permitting: As discussed further in response above, legal challenges associated with siting and permitting could pose adverse cost and schedule implications.

D. Enabling Potential Future Development of a Mesh Network

8. Do you have any general recommendations regarding how preparation for a future mesh network can be implemented in the Third Solicitation?

PSEG fully supports efforts to enable future development of a mesh network. An offshore backbone with collecting stations is the most reliable long-term solution to achieve New Jersey's 11,000 MW or more by 2040 goal. However, we recognize that 11,000 MWs of offshore wind generation does not exist yet. Consequently, the Board has taken an understandable approach pursuing onshore upgrades in the near term while continuing to pursue a more robust long term solution.

A properly implemented meshed grid can offer a reliable, resilient, and cost effective way to mitigate the high integration of intermittent, renewable resources. However, to achieve this holistically, and reap the benefits of a meshed grid, there must be diversification of Points of Interconnection (POI) onshore, a clear separation of transmission and generation assets, a clear operational philosophy, and an offshore grid code.

With that said, recognizing that the Third Solicitation is scheduled to open in a matter of months and a need for further dialogue with respect to promoting an understanding of the goals that are to be achieved with the concept of a meshed network, PSEG recommends the Board take a measured approach in considering the application of a meshed-ready design in the Phase 3 solicitation. Rather than seeking to implement such an approach in the Third Solicitation, PSEG strongly supports the Board continuing to aggressively explore a mesh network in parallel with the Third Solicitation.

As described in the Brattle report[3] the benefits of a meshed grid design include:

- Reducing curtailment of offshore wind resources
- Improving system reliability
- Reducing congestion
- Increasing capacity import limits on the onshore system

If the BPU moves forward with a single point of injection for the next several awards, the benefits of a meshed grid system identified above would be significantly limited. Of the benefits described above, all but "reduced curtailment" cannot be realized with a single common point of injection.

[3] New Jersey State Agreement Approach for Offshore Wind Transmission: Evaluation Report, page 39

Unfortunately, even that benefit will not materialize for customers, as a developer is not likely to "price in" improved reliability for a system that "may" be built at some point in the future.

That said, examination of a meshed approach in parallel with the Third Solicitation would be beneficial because such an approach would bring significant value to New Jersey customers when implemented as part of a holistic transmission solution.

PSEG recognizes that to reach New Jersey's 11GW offshore wind target, multiple POIs will be required as no single POI can or should accommodate the entire target amount. As the state migrates toward that solution, and further integrates renewables through its system, the value of grid control increases substantially – further elevating both the desire and need for a meshed grid design.

For these reasons, PSEG recommends more broadly considering the value a meshed-grid design can bring to the state for many decades to come, and consider pursuing the meshed-grid as part of the next transmission solution sought by the state so that a robust design could be positioned to accommodate the Phase 4 and subsequent solicitations.

9. What additional equipment would need to be specified and installed at the time of project construction in order to enable future connectivity to a mesh network, as opposed to equipment that would not need to be installed until the mesh network is implemented?

This question further illustrates the importance of moving forward with discussions targeted at implementing a mesh network approach in parallel with the Third Solicitation.

To answer the question of what equipment should be included in an offshore platform to support connectivity to a meshed network, it is important to understand what mesh technology the State of New Jersey would seek to implement in the future and a clear timeline for its implementation. Technology will drive the platform space allocation, while the timing will inform when the equipment should be installed. It is worth noting that this exact question was discussed at a recent Offshore Wind Grid and Transmission summit attended by industry experts, Board Staff, the US Department of Energy ("DOE") and others. The discussion there also highlighted the importance of taking the time to hold dialogue between Board Staff and industry experts with subject matter expertise. It is also worth noting that US DOE in collaboration with the Bureau of Ocean Energy Management ("BOEM") is conducting workshops focused on the siting of offshore wind transmission. Board Staff may wish to give consideration to forming a working group of its own to focus the discussion further on offshore wind transmission specific to the New Jersey region.

- For an HVDC Interlinked System:
    - In theory adding additional DC gas insulated system (GIS) cable terminations with associated gear (disconnects, instrument transformers, etc.) for future DC interlinks would not increase the size of an offshore platform significantly. However, HVDC valves and controls will require significant adaptation. If the timeline for implementation is ten years or more after production, it is likely that the valve controls and other intelligent electronic devices (IED)s will reach end of life support, and require replacement in which case, it would be recommended to delay any additional control hardware incorporation until such hardware replacement is due. If the timeline is 5 years after production, then it is recommended that the mesh-ready controls and protection be

adapted during production phase. Nonetheless, this could increase design and engineering of the system by 9 to 18 months.

- For an HVAC Interlinked System:
  - Adding AC Mesh-ready equipment is even more complex but it can also provide greater benefits such as increased reliability and availability and shorter deployment time over HVDC interlink if incorporated properly. In this case, it's not just about the integration of additional GIS, it also includes installation of transformers, shunt reactors based on interlink cable distance (if the desire is to use when HVDC is out of service), additional protection and revenue metering transformers, and potentially AC chopper (No commercial offshore AC chopper has been installed). It is critical to have a clear picture of the implementation strategy before adding additional platform space and equipment. Additionally, the lack of an offshore grid code makes it challenging to specify a mesh-ready design. In Europe, for example, governmental entities have engaged multiple consultants and Original Equipment Manufacturers (OEM's) to establish an offshore grid code. One example of these studies is the North Sea Power Hub study.[4] This offshore grid code needs to define operability jurisdiction -- how the offshore meshed grid system will be operated, what electrical parameters each wind farm must adhere to, and who is responsible for the studies. The need for extra equipment is necessitated by the design of the system and can be minimized if certain conditions are met. For example, the Coastal Wind Link project went through many design iterations before finding the right balance. During that effort, it was critical to maintain short and symmetrical distances between Offshore Converter Stations. In addition, Coastal Wind Link considered requiring HVDC manufacturers to increase the overload capability of the system to reduce the need to embed additional equipment such as AC choppers. PSEG mentions this merely to illustrate an example of the importance in identifying upfront the specific desired public policy offshore transmission mesh network interest so that applicants can better explore opportunities to optimize design to meet the state interest. Again, this topic could benefit from the opening of a dialogue or workshop forum by Board Staff.

10. What physical requirements would enable the offshore substation to support the additional equipment, including additional platform space?

As discussed in response to previous questions, a consolidated mesh network approach would likely best achieve New Jersey's offshore wind public policy goals in the most cost effective manner. However, in order to fully answer this question, PSEG and other industry experts need to know the design specifications associated with the mesh grid. PSEG would welcome the opportunity to discuss design specifications with Board Staff in parallel with the Third Solicitation. Physical requirements are driven by the design of the mesh grid system that the State of New Jersey selects and therefore cannot be specified here. Assuming an AC mesh grid design that includes multiple offshore platforms close to one another that target multiple lease areas, physical requirements could include space for additional shunt reactors, space for additional switchgear, space for additional control and protection equipment and possibly space for additional specialty electrical equipment (e.g. NYSERDA refers to this equipment as "AC choppers"). Additionally, the platform and

[4] See Transgrid Solutions – North Sea Power Hub – https://northseawindpowerhub.eu/

foundation would likely have to be larger than a standard non-mesh ready platform to accommodate this type of equipment.

11. How would your suggestions regarding what engineering, operational and/or regulatory information should be specified in the SGD to support a future mesh network differ if the mesh network includes (i) only New Jersey projects, (ii) New Jersey and other PJM states' projects, or (iii) New Jersey, other PJM states' and downstate New York projects?

- PSEG would welcome the opportunity for further dialogue with Board Staff recognizing that the Board needs to have a clear picture of what it envisions as the ultimate plan before asking developers to embed a mesh-ready concept in the SGD for the Third Solicitation.
- It is worth noting that PSEG and Ørsted developed a unique offshore meshed grid solution based on the requirements the Board set forth in the State Agreement Approach process. This encompassed, inclusion of all the lease areas in Hudson South and Central Bight as well as creating a centralized hub to reduce the interlink distance between offshore converter stations. The project also incorporated specifications customized to an offshore AC meshed grid and future proofing for DC meshed compatibility. As previously referenced, it seems too challenging to try to squeeze engineering, operational and regulatory information with respect to a future mesh network into the Third Solicitation SGD, based on what has already been accomplished through the Coastal Wind Link effort, PSEG remains confident that discussions with Board Staff in parallel with the Third Solicitation could lead to the implementation of a future mesh network approach flexible enough to include New Jersey projects, New Jersey and other PJM states' projects or New Jersey, other PJM states' and downstate New York projects.

12. What might be the advantages or disadvantages associated with the Board's adoption of the mesh network framework put forth by NYSERDA in ORECRFP22-1?

There are several challenges and opportunities that NYSERDA's approach to implement a mesh concept through ORECRFP22-1 creates. NYSERDA claims this will enable the overall system to be built in smaller pieces and at different timeframes which ultimately provide the opportunity for:

- **Smaller upfront investment** – cost for building the system can be passed on to customers gradually over longer periods of time.
- **Inclusion of technological advances** – by only implementing certain requirements at this time, there is opportunity to take advantage of technological advances as the later phases get implemented.
- **Additional time to evaluate evolving offshore market** – US offshore market is rapidly evolving creating notable obstacles such as lack of tax incentives for transmission developers, lack of Jones Act compliance vessels, supply chain congestion and lack of clarity in federal permitting process. Implementing a meshed grid at a phase approach allow more time for some of these obstacles to be resolved thereby minimizing implementation risks.

However, along with this phased implementation NYSERDA also identifies significant risks:

- **Missing need by date** – as requirements are implemented in phases, the ability to take advantage of the benefits a meshed grid system provides are further pushed out beyond where they might be needed
- **Developer's risk** - by imposing additional requirements on the developers, this generates higher OREC prices and creates additional burden on the developers to coordinate with different transmission entities in the developer's own lease areas.
- **Misaligned requirements** – implementation of the transmission solution by different entities creates a high risk that certain requirements won't be executed as needed, leading to additional delays due to rework and/or unnecessary litigation vs. a single entity implementing the system will be fully responsible and/or carry all the risks. Phase approaches doesn't necessary mean the most cost effective solution and/or sometimes turnout to be the most expensive solutions due to rework, increase in costs.

Although PSEG sees advantages to a regional approach to offshore wind transmission development, PSEG does not see advantages associated with the Board's adoption of the mesh network framework put forth by NYSERDA in ORECRFP22-1. NYSERDA chose to proceed on the basis that NYC and Long Island would benefit from an offshore meshed grid by reducing congestion onshore. However, NYSERDA's approach fails to put forth a clear vision of when the expected implementation would occur or if the meshed grid would be a transmission or generation asset. NYSERDA's meshed-ready generation design presents regulatory and operational concerns. Significantly, it is worth highlighting that there is a presumed expectation that future developers will agree to operate their HVDC systems, once integrated, as part of the transmission system – but those requirements do not currently exist and this could result in a reverse "Field of Dreams" moment – NYSERDA and ratepayers could build it and no one may come. Conversely, there would be no ambiguity if the system were developed as part of a transmission network backed by the state regulator in coordination with a regional grid operator. PSEG would welcome the opportunity to work with Board Staff, NYSERDA Staff, PJM, NYISO and other stakeholders to adopt an optimal mesh network framework that PSEG believes is achievable.

13. What voltage would you recommend for the future mesh network and why?

- PSEG recommends ±400kV for HVDC meshed grid. At this voltage developers have flexibility to optimize windfarm between 1200MW to 1600MW. At this voltage windfarms can interconnect to Larrabee or future POIs without experiencing significant de-rate. With new turbines coming to market PSEG feels that using ±320kV will limit the ability of wind farm developers to optimally develop their offshore lease area, costing ratepayers more. PSEG notes that moving above this rating to a ±525kV standard may better enable the future delivery off offshore MWhs, but notes that it may also increase PJM's contingency planning, which can have significant cost impacts throughout the PJM market.
- For an AC meshed grid, PSEG first recommends avoiding voltages above 275kV as it limits the capacity and distance. PSEG further recommends avoiding interlinking systems greater than 20 miles apart and recommends having symmetric distance between adjoining platforms.
- PSEG recommends further research and consultation prior to adding mesh-ready requirements to future solicitations.

E. Other

14. **Please provide any additional information that you would like the Board Staff to Consider in development of the SGD.**

PSEG fully supports Board Staff's continuation of its rational evaluation of the trade-off of near-term cost pressures and long-term benefits associated with pursuing offshore wind transmission in coordination with offshore wind generation solicitations. As the questions in Part D above perfectly highlight, while continuing to advance offshore wind generation solicitations, the long-term economics for offshore wind would be significantly aided by the selection of a mesh network approach, ideally before commencement of the Fourth Solicitation in Q3 2024.

Flexibility in the ultimate transmission solution is the critical aspect that must be at the front end of any selected proposal to maximize long-term reliability and ensure project economics are viable. Ideally, any offshore wind generation project and/or transmission solution in the future needs to be designed in a way so that future technological advances can be incorporated, additional megawatts (from initial goals) can be brought onshore, and benefits from newer technologies can be realized without rework. For example some aspects of optimal offshore wind transmission design that the Board may wish to consider in development of a transmission solution include:

- Future HVDC Interlinks
    - Although currently not commercially available yet, this technology should become available in the next few years. The BPU should require provisions for a future HVDC interlink for all upcoming solicitations. In the design of Coastal Wind Link, although the interlink system proposed was HVAC to achieve higher efficiencies, the project considered the advancement in the technology and also included provisions for accommodating HVDC interlinks when they become commercially available.
- Increased Lease Areas Output
    - As wind turbines increase in size so do the voltage for array cables, and the number of MWs they can export. This means the technology selected in the next couple of years should be flexible enough to incorporate these changes. The Coastal Wind Link design utilized 275kV WTG feeder cables that allows for the system to be future-proof, enabling offshore wind generators to choose the most efficient WTG design and ultimate array cable voltage. Furthermore, the design utilized a 400kV HVDC technology to deliver more MWs, reduce losses over long distances and minimizes cabling, delivering multiple efficiency gains. Although higher export voltages are available, going beyond this technology may create a larger contingency than PJM currently manages to.
- Inclusion of items to extend project life
    - Spare parts and extra reliability items such as additional switchgear should be maintained
    - Incorporating additional steel thickness into platform designs – that will extend the life of the assets 25 to 40 years should be considered.
- Dynamic Grid Support
    - As renewables become an increasingly greater mix of the PJM generation mix, the need to effectively deal with higher renewable penetrations and the intermittent nature of the supply increases. This makes it important that any long

term plan include dynamic control capability. This is a major benefit that can be achieved with a meshed grid design if implemented properly.

- Regarding the Pre-build duct banks:
    - We would recommend the Board consider the reliability and resiliency implications of using four circuits in a single ROW, delivering into a single station. PJM in its analysis cited concerns over a single point of failure that may need to be addressed as part of the Board's ultimate Prebuild Infrastructure solution.
    - Spacing of adjacent duct banks is a critical design consideration. This due to the fact that each cable generates heat, and this heat can impact the load carrying capability of the adjacent cable if there is not enough spacing. Without having the design of the future cables (voltage, MW, cable size, etc.), the duct bank designer will need to make assumptions that could end up being insufficient for the future awardee's cable.
    - We are not sure how local authorities/agencies will respond to permit requests in which the entire systems is not designed. Specifically, the duct bank installer will be submitting permit applications for their duct banks without being able to identify the cable that will be installed in it.
        - As the offshore wind developer installs the cables into the pre-built duct banks, any additional permitting requirements will need to be identified.
    - Typically when a submarine cable makes landfall, there will be a vault called a Transition Joint Bay (TJB) installed at the landfall. In addition, there will be an HDD from the TJB out into the water. The entity installing the TJB and HDD will need to be established and the prebuild scoped appropriately.
    - If the duct banks are designed/installed as 4 separate duct banks (with one duct bank per circuit):
        - It would eliminate some of the safety concerns
        - It would reduce the amount of repair/outage coordination require between owners of the circuits in a duct bank.
        - It would allow ownership of the duct bank to be transferred to the Cable Owner in the future. This would reduce the number of issues regarding roles and responsibilities between the Cable Owner and the Duct bank Owner.
        - The more detail and requirements that the BPU can put in the SGD, will help prevent the bidders from making incorrect assumptions that may result in an unrealistically low bid.

F. Conclusion

PSEG appreciates the extensive time and effort the Board and Board Staff has invested to help make the NJ offshore wind industry the most successful in the nation. Planning carefully and acting deliberately have allowed the state to successfully secure three offshore wind projects as well as advance a meaningful step towards addressing the critical transmission needs. PSEG offers and reiterates the following recommendations to support Board Staff in this next phase of activity:

1. PSEG recommends a measured approach with the prebuild infrastructure. The feasibility of siting multiple circuits in a single duct bank presents both logistic and operational concerns, while ownership issues will significantly complicate the agreements. Most importantly, we believe there

are reliability and permitting issues that must be resolved at both the state and federal level to ensure any such joint project is not delayed, potentially impacting the schedule of the Phase 3 project. For these reasons, PSEG recommends proceeding with Phase 3 as a stand-alone project until these issues can be adequately addressed.

2. If the Board determines a mesh ready requirement should be included in the SGD for Phase 3, then PSEG recommends that Phase 3 projects be designed to accommodate a potential future HVDC interlink and avoid an HVAC interlink. Although not ideal, given the distance to potential other platforms, and the fact that HVDC interlink equipment will not require significant modification to the offshore platforms, the capability can be designed into Phase 3 proposals at minimal cost.
3. PSEG recommends that Board Staff open up a dialogue with PSEG and other industry experts as well as work with other state agencies and the DOE to understand the benefits and tradeoffs of a meshed grid design and if merited pursue the design as part of a future integrated transmission solution.

Thank you for your consideration and attention to this matter.

Respectfully submitted,

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