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May 20, 2022

Board of Public Utilities
44 South Clinton Avenue, 1st Floor Post Office Box 350
Trenton, NJ 08625-0350

RE: In the Matter of Declaring Transmission to Support Offshore Wind a Public Policy of the State of New Jersey, Docket No. QO20100630, Comments Following the Request for Additional Information

Dear New Jersey Board of Public Utilities,

Attentive Energy LLC ("Attentive Energy") appreciates the opportunity to provide comments to the New Jersey Board of Public Utilities ("NJBPU") regarding the State Agreement Approach ("SAA") Proposal Window to Support New Jersey Offshore Wind.

Attentive Energy is a wholly owned subsidiary of TotalEnergies Renewables USA, LLC ("TotalEnergies"), a global multi-energy company that produces and markets energies – with a total capacity of more than 11GW offshore wind development portfolio globally and major interest in expanding within the U.S. market. TotalEnergies has an ambition to install 100GW of global renewable power generation by 2030 and reach carbon neutrality in global business operations by 2050.

As of May 2022, Attentive Energy is the leaseholder of OCS-A 0538 in the New York Bight, establishing its long-term presence in the region and commitment to deliver a community-first approach following years-long stakeholder engagement. Attentive Energy is focused on delivering offshore wind opportunities to empower communities today and tomorrow. Our team is guided by deep experience in the offshore sector and a forward-thinking commitment to put people first. Attentive Energy appreciates the opportunity to engage in recent public SAA stakeholder sessions, learn about local stakeholder needs, and understand how to best strengthen our communities while achieving New Jersey's offshore wind goals. Attentive Energy applauds the NJBPU for taking a proactive approach to transmission buildout that will facilitate the interconnection of clean energy to the State. We are eager to continue to listen and engage with the State and relevant stakeholders as New Jersey advances the "first-of-its-kind" offshore wind transmission program.

In response to the request for additional information, Attentive Energy would like to reinforce the following items for consideration as NJBPU continues to evaluate SAA proposals and their integration to the upcoming New Jersey Phase 3 Offshore Wind Renewable Energy Certificate ("OREC") solicitation.

1. What are the most significant risks to completing your offshore wind ("OSW") generation project(s) on time and within budget if your project relies on one or more SAA transmission projects? How can those risks be best mitigated?

The traditional Generator Lead Line ("GLL") approach has proven to be a cost-effective method for transmission development because the developer has full control in optimizing the transmission system to suit the location of the export cable route relative to the location of the offshore wind farm. The level of developer control as well as the developer's project design envelope will be impacted depending on the SAA option selected.

From a project execution perspective, the GLL approach allows for the technical, permitting and stakeholder interfaces to be wrapped in the developer's envelope of delivery. When introducing additional owners into the transmission asset chain, as proposed within the SAA options, there is inherent risk for breakdown in the coherency of the technical and commercial interfaces. For this reason, Attentive Energy recommends that any transmission assets that are provided by the state of New Jersey include a clear, all-encompassing interface specification which is developed in coordination with the OSW industry to ensure all applicable interfaces are properly accounted for so risks can be properly mitigated. Such specifications should be identified in advance of New Jersey's Phase 3 OREC solicitation.

If such a specification is not available in advance of the Phase 3 OREC solicitation, offshore wind developers will inevitably provide OREC bids with varying technical assumptions that will skew an apples-to-apples project comparison. Depending on the project scope and assets provided by New Jersey, specific operational, technical and design considerations will need to be defined by all impacted parties (OSW developers, SAA transmission developers, NJBPU, transmission operators and PJM) to allow for common understanding of project principles across the New Jersey and developer-owned transmission assets. The following areas are recommended to be further investigated by New Jersey when developing an interface specification:

- Transmission technology selection and operational impact.
    - HVAC: Number of cables and voltage class will broadly define onshore and offshore transmission system.
    - HVDC: Interconnection requirements of the converter station will define the onshore and offshore transmission system.
    - Losses: System losses are technology and cable distance / design dependent. Depending on how the provided lead lines are designed, there could be significant losses impacting the developer's ability to efficiently export their capacity.
    - Grid stability and the impact each technology may have on the onshore network. This should include system studies to evaluate harmonic and dynamic performance, black start capability and how the OSW interconnections will interact with future load growth and renewable integration.

- Equipment and operational redundancy to ensure common design philosophy across all aspects of the OSW transmission system.
- System integration and operational transmission planning considerations between the OSW project, New Jersey transmission assets, interconnecting utilities and PJM.
- Communication and IT coordination across onshore and offshore asset owners to ensure robust and safe operation of the entire transmission systems, including:
  - SCADA communication
  - Protection and control
  - Cyber security and asset protection i.e., NERC CIP compliance and monitoring
- Coordinated outage considerations across transmission assets along with testing and commissioning protocols.
- Clarify how the developer's onshore OSW control center will interface with any New Jersey owned transmission assets.

- Permitting and stakeholder continuity across a multi-party onshore/offshore transmission system. In additional, any assets outside of the 3-mile state waters will require additional coordination with federal requirements.
- Commercial, regulatory, and contractual provisions providing clarity to the following areas:
  - Discernible construction milestones and interconnection timelines.
  - Reliability and availability guarantee to ensure New Jersey sourced transmission assets will not impact the OSW developer's ability to meet all OREC obligations and financial contracts connected to project COD.
  - Compensation models for risk mitigation with the understanding that any delay in construction of such facilities impacts the project's entire construction schedule, projected COD, and possibly the project financing. The best way to mitigate inherent risk delay is to include adequate contingency in project timelines. Any LD's should primarily be used for delay avoidance rather than damage assessment.
  - Interconnection procedures and the involvement from PJM.

2. For new Bureau of Ocean Energy Management ("BOEM') leaseholders, are there concerns about obtaining a PJM queue position given that a Board decision on the SAA may constrain the potential points of interconnection ("POIs") for future New Jersey OSW projects? Please describe the considerations related to utilizing SAA POIs and how OSW developers might switch from their queue positions (if already acquired) to the SAA-provided POI.

   Developer interconnection strategy will remain uncertain until a Board decision on SAA POIs, including associated onshore and offshore transmission asset decisions. Attentive Energy is actively performing an analysis of commonalities across SAA project proposal components and upgrades to understand internally how to alleviate certain concerns about SAA POIs. However, concerns about costs, technology, location, and COD remain, such

that developers are likely to pursue their own interconnection strategy independent of the SAA until further clarification on final SAA solutions are provided. When deciding to select or switch to an SAA POI, developers will need to consider the effects on project schedule (e.g., will queue position be affected) balanced against any project cost reductions and status of developer's existing POI advancement. Under proposed PJM queue reform changes, it may be possible to change POIs until the closure of the first cycle of the new, reformed application submission period.

Attentive Energy understands that NJBPU requires time to determine the optimal SAA solution, however, as an OSW developer it is paramount that project development continues to support the respective permitting, public engagement, and design process. It is not in the interest of either Attentive Energy or New Jersey if the stakeholder engagement, design consideration, and permitting strategy is subject to change as the SAA develops. Such a strategy results in confusion to the engaged public and comes with the potential for rework and unnecessary spend by developers. For these reasons Attentive Energy is cautious around early engagement and POI development until transparency around a final solution is provided.

3. If the Board were to select one or more Option 2 proposals under the SAA—onshore substations to offshore collector platforms (see, the November 18, 2020 Board Order under this same docket for more information on the Options1)—please provide additional details and considerations for connecting and coordinating OSW generation projects in terms of the costs, timing and operability of the OSW generation projects.

   An Option 2 proposal will reduce the CapEx and DevEx requirements as much of the transmission offtake system and respective permitting costs will be captured by the SAA developer. This should in theory result in lower OREC offers which reflect the reduction in scope. However, if commercial protections are not put in place to ensure against delays in development of SAA assets or those assets not being available, the risk will be represented in the OSW developers' proposals. This commercial transparency will need to be addressed in the Phase 3 solicitation to avoid unnecessary added costs.

4. If the Board were to select one or more Option 3 proposals under the SAA—offshore network connecting lease areas and substations to each other—please provide additional details and considerations for connecting and coordinating OSW generation projects in terms of the costs, timing and operability of the OSW generation projects.

   To the OSW developer an Option 3 meshed solution would not be materially different from an Option 2 solution as the scope of the OSW developer is anticipated to be limited to landing the export cables at the NJ offshore collector station. The locational considerations addressed in question 6 would need to be taken into consideration, along with the technical considerations addressed in question 1. It should be noted that the technical solution for Option 3 becomes increasable complex due to the coordination required for the protection

and control schemes between the developers OSW farm and the meshed system. Robust design standard and testing protocols will need to be developed to ensure the design and buildout of a reliable and available networked solution.

5. If an SAA Option 2 or Option 3 proposal is selected, is there any situation in which an OSW generation project would not be able to use the SAA Option 2 or Option 3 solution?

   The goal of SAA Option 2 or Option 3 is to increase interconnection reliability; therefore, the infrastructure and control systems should be designed to ensure reliable operation of OSW generation during normal conditions, system faults, and other major events that impact the dynamic of the system. These complex system solutions do not fall entirely within the control or development of the OSW developer. Additionally, lack capacity access/guarantees and the geographical considerations addressed in Question 6 may present unfavorable business cases. As such, it is paramount that the appropriate commercial and reliability guarantees are in place to ensure long term offtake certainty. Absent these guarantees, an OSW developer would select a traditional generator lead line as the more commercially viable solution.

6. How should the Board consider the optimal locations for Option 2 substations? Should such determinations occur at the time of the Board's SAA decision or following the Board's OSW generation solicitations? If the location is determined after the generation solicitations, what type of coordination between generation and transmission developers would be required?

   The complicating factor with the Option 2 substation location is that depending on the selected location, it could be more or less advantageous to one leaseholder over another. Attentive Energy's recommended solution to avoid this discrepancy is to make the locational determination following the NJBPU's Phase 3 OREC solicitation. This would allow an SAA project and the respective OSW solicitation winner to work in a coordinated effort to deliver an efficient solution. However, it should be noted that for such an approach the technical and commercial interfaces would need to be clear enough at the time of the Phase 3 OREC solicitation to allow for solution and price certainty. There should be a mechanism in which all bidders assume a standard export cable distance from the developers OSS to the Option 2 substation and, upon award, OREC prices could be adjusted to account for the final distance based on a detailed engineering solution between the OSW and SAA developers.

7. Describe if and how the primary transmission line technology used for the Option 2 proposal, HVAC or HVDC, affects the development – timing, sizing, locational considerations and costs –of new OSW projects.

   The maturity of OSW transmission technology combined with economies of scale are resulting in lean design concepts for both HVDC and HVAC. HVAC systems are becoming highly standardized around 400MW blocks. These design considerations around capacity should be analyzed to align with the optimal offtake scenarios for OSW developers to ensure rate payers are paying for solutions that maximize generation, while taking into consideration standard designs concepts to leverage cost efficiency. Additionally, HVAC

system traditionally result in higher losses, therefore the metering location is critical for the OSW developer to understand the potential impact to revenue. If the OREC meter is located offshore upstream of the SAA offshore assets, then this concern can be mitigated.

The global demand for HVDC systems is driving lead times to historical highs. These systems are now taking minimum 6 years from purchase to installed, requiring design and procurement schedules which will need to align with OSW developer schedules. NJBPU should review this timing with the market to ensure that SAA proposals take this into consideration so OSW developers can account for the respective impact on financing schedules etc. Additionally, offtake and injection capacity of the SAA project will be primarily driven by the HVDC technology selected (symmetric monopole vs bi-pole) in combination with voltage class (320kv vs 400kV vs 525kV). An OSW developer's ability optimize offtake of their lease areas may be limited by these criteria as each combination of voltage and technology defines how much power can be pushed through the system. Consideration should also be made for the PJM single contingency limit of 1500MW. If projects are to stay below this limit, they are likely to do so with 400kV solutions, which are currently not type tested on the market. Attentive Energy strongly encourages NJBPU to have a detailed discussion with HVDC OEMs to better understand these limitations.

Please refer to question 1 for more details on the importance of technical requirements to be defined and refer to question 6 for locational considerations.

8. For an Option 2 or Option 3 scenario, do you believe that the selection of HVAC or HVDC will affect the ability to receive federal funding that may prioritize "innovative" technologies? Please address availability of federal funding for transmission and/or federally-backed loans/loan guarantees.

Attentive Energy has no comment at the moment.

9. Describe how risks of cable outages are managed with HVAC versus HVDC technology, particularly where using large single HVDC lines for any offshore segment.

Subsea HVDC export cable arrangement and installation concepts are very similar to HVAC. The primary difference between the two technologies is that HVDC requires fewer cables to transfer the same amount of power as HVAC which naturally reduces the overall scope of the cable corridor design and installation. Often the HVDC cables are bundled into a single cable assembly, which increases the benefits of reduced environmental impact, etc. Although this can prove beneficial from an installation and environmental perspective, a bundled HVDC cable solution is inherently at greater risk for full windfarm outage if the cable is the damaged. As HVAC cable systems are typically not bundled and the 3 phase cables are separated by a physical corridor, there is naturally less risk for total system outage. For this reason, there is naturally greater outage management through the diversification of the cables' paths. It should be noted that outage risk for HVDC solutions is dependent on the HVDC topology, i.e., Symmetric Monopole ("SMP") versus a Bi-Pole solution. A SMP link has a single conductor and uses earth or sea for the currents return

path. As opposed to the Bipolar link, which has two conductors (one positive, one negative/earth) where the converter stations are located at each end of the link and the midpoints of converter stations are earthed through electrodes. If any of the link conductors stop operating, the Bi-Pole becomes monopole and therefore 50% of supply power can still be transferred resulting in a more robust outage or derated solution.

10. For an Option 2 or Option 3 scenario, please address whether an HVAC or HVDC would better integrate into a multi-state or multi-regional offshore wind transmission grid? Should coordination or future computability opportunities affect the Board's evaluation of proposals?

    HVDC is the recommended solution to integrate into a multi-state approach. New York is now prescriptively requiring HVDC and it is prudent to align around common design and commercial considerations based on an HVDC platform. In general HVDC is a superior solution based on the distances required to integrate a regional system.

11. How does the selection of an Option 2 transmission solution affect the permitting risk for OSW generation projects? What about an Option 1b?

    Both Option 1b and Option 2 transfer the respective permitting risk from the OSW developer to the SAA developer. However, overall project risk is best mitigated by aligning the SAA and OSW developer permitting timelines. It is important that the SAA permitting scope is running in parallel to, or is ahead of, the OSW developer's scope.

    Currently transmission related Right of Way ("ROW") for federal waters is captured under the jurisdiction of the BOEM Construction and Operations Plan ("COP"). It is unclear as to the how the SAA permitting will be sited in relation to respective BOEM process. This needs to be further clarified before a detailed response can be provided for Option 2. For Option 1b, it is generally understood by Attentive Energy that the permitting of respective assets would be carried out by the SAA developer and the OSW developer would be responsible for any state / federal permitting up to that point. However, it would be beneficial to receive further guidance on all permitting considerations in the New Jersey Phase 3 OREC solicitation.

12. Please share any other important risks associated with an Option 2 solution that can impact project development.

    Route selection from Option 2 collector station to onshore landing can significantly impact the risk profile of the respective solution in terms of feasibility, constructability, and risk of delays due to permitting complexity, etc. Stakeholder impact should also be fully considered to ensure proper attention has been taken to minimize project risk.

13. Through what mechanisms should the risk of Option 2 or Option 3 cable failures be allocated? Does the potential risk for failure impact the preference for HVAC versus HVDC cables?

    Risk for Option 2 or Option 3 cable failures should be taken by the respective owner/operator. Technical and commercial guarantees should be made available to the OSW developer to ensure no unnecessary risk is carried in the OSW developer's OREC offer. It is suggested that the selection for HVAC vs HVDC should not be decided by failure impact, instead proper precautions and risk mitigations should be made to ensure the highest levels of manufacturing and installation standards are specified in addition to proper cable burial risk assessment and mitigation measures to prevent potential failure exposure at time of design.

14. If an Option 2 or Option 3 proposal is selected, please detail the potential reliability and economic benefits.

    Attentive Energy is unable to provide comment until further details are provided on the respective solutions.

15. For the build out of transmission facilities under the current generator radial lines approach, please provide additional details and considerations on the costs, feasibility, timing and operability of requiring OSW developers of future projects to utilize certain specified technology types, including potentially identifying common Original Equipment Manufacturers, requiring mesh-ready2 offshore substations, or other future-proofing specifications. Further, please detail the anticipated coordination that would be required to eventually interconnect between mesh-ready substations, including any anticipated unavailability of OSW generation or other foreseeable risks.

    Please refer to Attentive Energy's response to Question 1.

16. For an Option 2 and Option 3 proposal, please provide additional details and considerations on the costs, feasibility, timing and operability of requiring OSW developers of future projects to utilize certain specified technology types, including potentially identifying common Original Equipment Manufacturers, requiring mesh-ready offshore substations, or other future-proofing specifications. Further, please detail the anticipated coordination that would be required to eventually interconnect between mesh-ready substations, including any anticipated unavailability of OSW generation or other foreseeable risks.

    It is critical for the commercial and operational conditions of a future projects/meshed-grid system be defined before any OREC contracts for associated offshore wind farms are established. Attentive Energy has identified the following requirements as critical to be prescriptive to all bidders:

- Clear interface equipment requirements: To ensure that all bids received are based on level CapEx assumptions, Attentive Energy recommends NJBPU provide prescriptive guidance on the exact design requirements to be included in proposals at time of OREC submittal. This allows developers to be evaluated and compete on a level playing field, while any NJBPU proposed changes in scope can be addressed later in the bid process. Phase 3 documentation should clearly identify any specific HVAC/HVDC equipment required for OSW developer at interface (regardless of Option 2 or 3), e.g., sizing of reactive compensation equipment should be specified to all bidders based on longest possible cable distance between future interconnecting substations.
- Specific control, protection, and communication considerations: The respective control, protection, and coordination testing of either an Option 2 or Options 3 solution is extremely complex. Attentive Energy recommends this is coordinated by a central independent entity to ensure all parties are properly coordinated from time of design through commissioning. Real time testing, such as Real Time Digital System ("RTDS") will be required at the time of initial design to verify a robust solution and proper coordination between all parties included OEMs, developers (OSW and SAA), PJM and respective transmission operator. These systems will need to be updated over the asset lifetime to ensure proper coordination with all software upgrades, IT patches, relay setting changes to ensure no material impacts. This should be coordinated through a central party though the use of replica control systems.

Thank you for your consideration of these comments. If you need additional clarity on our responses or have other questions, please do not hesitate to contact me at jonathan.howie@totalenergies.com or 919-345-7494.

Sincerely,

Jonathan Howie
Technical Director