October 28, 2022

Re: NextEra's comments on changes and upgrades to the regional electric transmission system needed to integrate renewable energy resources

To the Participating States of New England States Transmission Initiative:

New Hampshire Transmission, LLC ("NHT"), an indirect subsidiary of NextEra Energy Transmission, LLC ("NEET"), is pleased to be able to offer these comments in response to the New England States ("Participating States") Transmission Initiative – Request for Information to Integrate Clean Energy Resources. NEET is one of the largest competitive transmission companies in the United States and has participated in competitive transmission processes all over North America. As a result, NEET offers a developer's experience that encompasses lessons learned from different competitive processes.

NEET looks forward to participating in future stakeholder processes to work toward the best solution to enable the region's clean energy goals.

Sincerely,

/s/ Richard W. Allen

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Comments on Changes and Upgrades to the Regional Electric Transmission System Needed to Integrate Renewable Energy Resources:

Question #1:
Comment on how individual states, Participating States, or the region can best position themselves to access U.S. DOE funding or other DOE project participation options relating to transmission, including but not limited to funding, financing, technical support, and other opportunities available through the federal Infrastructure and Investment Jobs Act.

NHT Response:

The Participating States or the region can best position themselves to access U.S. DOE funding through the Transmission Facilitation Program (“TFP”) and the Grid Resilience and Innovation Partnerships (“GRIP”). Both programs were created as part of the Infrastructure Investment and Jobs Act (“IIJA”), and aim to expand transmission to boost resilience, reliability, and renewable integration. For example, the New England States could form a coalition to apply for the DOE funding programs. TFP provides two core benefits: it provides access to loans at a low interest rate, and allows DOE to become an anchor tenant in a transmission project. Low interest rate loans can lower overall project costs and facilitate the onboarding of customers. The grants offered under the GRIP program can lower the cost of transmission projects through a one-time award. Participating states should also consider the grants for public entities under section 40103 (b) of the IIJA.

Question #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.

NHT Response:

In the context of the contemplated solicitation by the Participating States, competitive process with well-identified criteria should be conducted. A competitive process should also allow developers to provide innovative solutions and offer cost containment to protect customers from cost overruns. For example, a range or specific amount of MW should be defined to allow developers to focus on the right solutions. If no range is specified, developers will pursue any number of transmission solutions that evaluators would give little consideration because either the MW amount was too little or too high. NHT has identified some key considerations where additional guidance from the evaluators can help focus developer solutions to be tailored to the regions’ needs:

- Preference regarding different cost cap structures including hard caps and soft caps, revenue requirement concessions, and schedule incentives;

- Views on different environmental impacts and community impacts and what might be considered fatal flaws;
- Establishing processes on how transmission designs might interact and minimize costs for offshore wind generation developers to connect to the offshore platforms; and
- Consideration for expandable designs to allow for modular construction of additional HVDC systems, while minimizing costs and community disruption by utilizing a common corridor onshore.

If a process does not have clear evaluation criteria, the process is likely not to be efficient and may not result in reasonable, low-cost proposal(s) for the Participating States to evaluate.

Question #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?

NHT Response:

In the context of offshore transmission, the primary benefit of HVDC compared to HVAC is that significantly more power can be transferred through a single cable, thereby reducing the number of cables needed. Fewer cables will result in fewer environmental impacts, fewer cable landings needed, and fewer cable installations underground. As a result, if New England were to holistically design a transmission solution to address a large amount of offshore wind, HVDC will allow developers to minimize and optimize the cables needed to interconnect to the grid. Where smaller megawatt (“MW”) amounts of offshore wind are desired, HVAC can be a more cost effective alternative if physical space constraints, landings, and routing are not a concern. Table 1 demonstrates the difference in the number of cables, equipment, and platforms needed to accommodate an approximately 4,800 MW design.

Table 1 - HVDC vs HVAC Summary Comparison

Typical Design for 4,800 MW of Offshore Wind	HVDC Design	HVAC Design
Submarine Cables Needed	Four pairs of symmetrical monopoles	12 Tri-Core cables – each cable installed within its own trench
Offshore Platforms Needed	Four	At least 12 – possibly more to install reactive compensation depending on transmission distance

Typical Design for 4,800 MW of Offshore Wind	HVDC Design	HVAC Design
Terrestrial Cables Impact	All four pairs of symmetrical monopoles can be installed within the same duct bank	36 single core cables will need to be split across four duct banks.

Question #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

NHT Response:

A key consideration in prioritization of projects whether proposed projects should be the costs of the proposed transmission project on a stand-alone basis, and potential generator costs to interconnect to the transmission project. NHT favors a holistic view as the evaluation of all costs are critical to ensuring offshore wind can be delivered to the grid at the least reasonable cost to consumers.

For example, a proposed offshore HVDC transmission project which proposes to site its offshore platform further away from an offshore wind lease area will entail greater costs than a project located in the immediate proximity of the lease area (or within the lease area). Greater costs would be incurred because the offshore wind generator may not be able to interconnect to the transmission project at 66 kV (or another lower voltage)[1] as the distance required from an individual offshore wind turbine to the transmission developer's offshore platform is too great. Therefore, to reliably connect to the transmission developer's offshore HVDC platform, an offshore wind developer would be required to install an additional offshore AC substation to "step up" the voltage from the offshore wind turbines and site additional cables from the offshore wind developer platform to the transmission developer's offshore HVDC platform.

Similarly, land-based upgrades from an offshore HVDC transmission project may vary significantly. For example, a project with no system upgrades may still cost significantly more than a project that requires significant transmission upgrades because the distance and cost to construct the export cable for the project requiring transmission upgrades was considerably less expensive.

Therefore, from a cost perspective, it is important to evaluate projects holistically, including the impacts of system upgrades, the export cable, and what it would cost for an offshore wind developer to connect to the export cable. It is also prudent to evaluate projects based on impact to the queue and what the expected or desired "final state" of the offshore wind transmission

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[1] Currently, the standard inter-array voltage for offshore wind is 66 kV. However, studies are ongoing to assess an inter-array voltage of 132 kV as the standard voltage parameter due to technological advances in offshore wind turbines and cables. See https://ctprodstorageaccountp.blob.core.windows.net/prod-drupal-files/documents/resource/public/Hi-VAS-Report-June2022.pdf

system will be. In other words, evaluators should take into consideration current project scope impact on future project opportunities to continue developing offshore wind and transmission.

Question #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

NHT Response:

NHT has no comments at this time on this question.

Question #6:
Identify the benefits and/or challenges presented by using land based HVDC lines or other infrastructure to increase the integration of renewable energy (other than offshore wind) in New England to balance injections of offshore wind

NHT Response:

NHT has no comments at this time on this question.

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

NHT Response:

NHT believes that ISO-NE has the ability to use offshore HVDC transmission lines to facilitate interregional transmission in the future—particularly within the NYISO control area. ISO-NE can utilize a coordinated approach to account for a potential future grid between states/regions for little-to-no incremental cost by requiring a "mesh-ready" design whereby offshore converter stations have the capability of interconnecting to each other on the AC side of the platforms. This approach has been outlined in several studies performed in the US[2,3] and Europe[4] which conclude that there can be economic and reliability benefits recognized by an offshore grid. Also, on January 20, 2022, the New York Public Service Commission issued an order directing the New York

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2 Brattle *et al*, "The Benefit and Cost of Preserving the Option to Create a Meshed Offshore Grid for New York".

3 Brattle *et al*, "Initial Report on the New York Power Grid Study".

4 Promotion – Progress on Meshed HVDC Offshore Transmission Networks, *Final report.*

State Energy Research and Development Authority (“NYSERDA”) to require all proposals to utilize HVDC technology to minimize the number of cables needed, but to also include a “mesh-ready” design in its future offshore wind procurements[5]. NYSERDA’s current request for proposal for offshore wind seeks to integrate projects into a future mesh network system, requiring bids to include a “mesh-ready” design whereby offshore converter stations have the capability of interconnecting to each other on the AC side of the platforms.[6]

The ability to optimize the benefits of an offshore transmission grid will be dependent on coordination between the interregional transmission operators. A key parameter to realize the benefits is dependent upon granting grid-operators the ability to control power flows between the different regions or states. Such power flow control will address grid-operators’ concerns regarding unintended loop flows and the control of power into a region or state as desired. This allows for increased reliability, grid flexibility, and operational control. The VSC HVDC technology with HVAC interlinks provides dynamic reactive power which helps improve frequency and/or voltage instability concerns.

Question #8:

Comment on any just-transition, environmental justice, equity, and workforce development considerations or opportunities presented by the transmission system buildout and how these policy priorities are centered in decisions to develop future infrastructure

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NHT Response:

Enabling offshore wind allows for the retirement of fossil generators, benefiting those communities who have been burdened by the air pollution emitted by those generators. In addition, offshore transmission provides for additional opportunities for just-transition, environmental justice, equity, and workforce development as follows:

- Adopting an offshore transmission network approach minimizes the number of landfalls and thereby reduces the number of impacted communities;
- An offshore transmission network utilizing HVDC technology minimizes the total installation footprint on the seafloor and reduces the total amount of installed cables. This approach shows the industry’s commitment to comprehensive planning and to design and develop projects that limit the locations that may be an area of concern for the New England fishing industry;
- Upgrades to the transmission system to support the integration of energy from offshore wind can create a significant number of jobs and opportunities for training programs that connect the utility industry to communities that have traditionally been underrepresented in the workforce. Through partnerships among local labor

5 Order on Power Grid Study Recommendations, January 20, 2022, page 14.

6 *DRAFT - Appendix G - Meshed Ready Technical Requirements* (https://www.nyserda.ny.gov/offshore-wind-2022-solicitation).

organizations and other stakeholders, developers can help ensure the workforce has the required training and credentialling; and

- As projects enter construction, a significant number of workers will be required to construct new transmission infrastructure, providing new job opportunities and supporting a just transition to a green economy. After construction, new jobs are created for the operations and maintenance of the new infrastructure.

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

NHT Response:

See response to Question #2. A robust and competitive process with defined evaluation criteria will allow developers to provide creative solutions to maximize reliability and economic benefits.

Question #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

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NHT Response:

See response to question #2. NHT recommends developers be given the flexibility to provide transmission solutions that will integrate the required amount of offshore wind. Without a better understanding of which states are participating, and the criteria that will be used to evaluate projects, NHT is not in a position to provide an assessment of the benefits and weakness of points of interconnection.

Question #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

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NHT Response:

There are potential benefits to integrating offshore wind deeper into the regions' transmission system such as:

- Lower costs (terrestrial UG cable installation is more expensive than submarine cable or overhead transmission installation);
- Potentially lower system upgrade costs; and
- Reduced impacts to shoreline communities.

However, each approach to where to site infrastructure will have a different set of benefits and challenges that will need to be balanced, and this will be unique for each landing and their circumstances. Therefore, unless certain state agencies provide clear guidance that developers should avoid certain landing locations or routes, developers should be given the flexibility to identify their preferred route for their proposed transmission solutions.

Question #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

NHT Response:

NHT has no comments at this time on this question.

Question #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

NHT Response:

At this time, NHT believes that HVAC interconnection between HVDC offshore platforms is the preferred technology to reliably and cost-effectively transfer offshore wind generation. As outlined in Table 2, AC-to-AC platform connections have distinct advantages over DC-to-DC platform connection. Currently, the standard inter-array voltage for offshore wind is 66 kV. However, studies are ongoing to assess an inter-array voltage of 132 kV as the standard voltage parameter due to technological advances in offshore wind turbines and cables.[7]

7 Unlocking the next generation of offshore wind: step change to 132kV array systems, Carbon Trust, 2022

Table 2 - HVAC vs HVDC Connections to Offshore Platforms

Item	AC-to-AC Platform Connections	DC-to-DC Platform Connections
Viable Proven Technology Today	Yes	No – DC breakers are expected to be commercially available after 2030[8]
Can accommodate different converter OEMs	Yes[9]	No – Not Currently[10]
Can be located on same platform as converter	Yes	Not likely – DC circuit breakers are significantly larger
Redundancy for fault at offshore converter station	Yes	No
Redundancy for fault at onshore converter station	Yes	Yes
Redundancy for fault on DC cable	Yes	Yes

Question #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

NHT Response:

NHT has no comments at this time on this question.

8 Promotion – Progress on Meshed HVDC Offshore Transmission Networks, Final Deployment Plan, September 14, 2020, p. xxxvii.

9 Cigre publication B4-138, Paris 2020.

10 Promotion – Progress on Meshed HVDC Offshore Transmission Networks, Final Deployment Plan, September 14, 2020, p. xxxvi.

Question #15:

Comment on cost allocation mechanisms that would prevent cost-shifting between the states based on their policy goals and ensure that local and regional benefits remain quantifiably distinct. How should any future potential procurement identify and distinguish local, regional, and state-specific benefits (e.g., reliability) such that ratepayers only pay for services that they benefit from?

NHT Response:

A hybrid cost allocation mechanism that allocates a percentage of total costs to states based on the magnitude of their offshore wind public policy goals, and a percentage of total costs based on other system benefits created by the transmission upgrades. For example, 50% of project costs could be allocated according to the amount of offshore Wind MWs each state would utilize of the proposed project's transmission capacity. The other 50% would be based on the benefits each load zone receives as a result of the transmission project, such as production cost savings, lower capacity prices, or improved reliability or resiliency. These benefits can be quantified through modeling analysis, with assumptions, methodologies, and scenarios agreed upon by stakeholders and ISO-NE.

Question #16:

Comment on the benefits and/or weaknesses of using a public-private partnership that might include one or more states or U.S. DOE as part owners with private developers or other sources

NHT Response:

NHT has no comments at this time on this question.

Question #17:

Comment on the co-benefits of landfalling offshore transmission lines, such as improvements to reliability and/or resilience (i.e., through the use of HVDC converters or otherwise), economic development (e.g., port development, hydrogen production, etc.) and any local system benefits. Identify ways to measure and maximize these co-benefits when evaluating transmission buildout.

NHT Response:

Intangible and economic benefits are difficult to quantify. A project could be less efficiently designed and cost more but claim more intangible and economic benefits than a more efficient design that saves New England ratepayers significant dollars. The claim is hard to substantiate until the benefits are realized and could lead to an inefficient project decision for New England. However, NHT understands that economic and community benefits are an important part of any large infrastructure project. Such projects often bring local jobs, ancillary investments in the community's quality of life, and sometimes investments in local schools, local academic institutions, and other local organizations. While these secondary investments are important, the evaluators should not make a potentially multi-billion dollar and complex project decision based on those factors. Bringing on a trusted and financially capable partner will naturally bring these benefits to bear in any large infrastructure project.