HQUS
A subsidiary of Hydro-Québec

October 28, 2022

RE: Regional Transmission Initiative Notice of Request for Information

Via e-mail to **transmission@newenglandenergyvision.com**

In response to the Notice for Request for Information (RFI) issued on September 1, 2022, Hydro-Québec ("HQ"), through its U.S. subsidiary H.Q. Energy Services (U.S.) Inc. ("HQUS"), submits the following comments for consideration by the Participating States.

Introduction

HQ is the largest generator of clean energy in North America, with a generation portfolio comprised of close to 37,000 MW (nearly 100% of which is renewable energy) and operates a system with the ability to store up to 177 million MWh of energy. HQ is committed to the goal of deep decarbonization, with a corporate commitment to sustainably developing renewable energy resources in the Province of Québec and to pursuing cooperation with neighboring markets to achieve GHG reduction and decarbonization goals.

HQ has played a significant role in the continuing decarbonization of the New England region through the delivery of clean and renewable electricity and electricity products, providing an average of over 16 TWh to New England annually over the last five years, representing 12% of the region's total electricity demand in 2021.[1] These deliveries have not only contributed to New England's clean energy and decarbonization goals, but have provided considerable reliability and economic benefits to the region.

Looking forward, there is an opportunity to expand this collaboration, and to further leverage the unique characteristics offered from the HQ system to facilitate New England's clean energy transition while simultaneously helping to address critical risks and system vulnerabilities that continue to present challenges to the energy system. This can be achieved through a comprehensive regional approach which includes both interregional HVDC transmission to access HQ's controllable generation, along with infrastructure investments to integrate offshore wind into the New England system. The two efforts are fundamentally linked, and through prudent resource planning, will harness the benefits and synergies of a complementary portfolio of resources and transmission investments needed to reliably and cost effectively achieve New England's clean energy policy targets.

Facilitating greater two-way trading of electricity between the regions is fundamental to HQ's future vision, where the unique advantages offered by each region can be more broadly

[1] Average HQ exports to New England between 2017 and 2021 were 16.2 TWh, which represents 12% of the 137 TWh of net load published in the ISO-NE 2022 CELT Report.

shared in order to maximize benefits for both Québec and New England. For example, surplus offshore wind production can be imported into the HQ system during periods of high production. This can help to accelerate the development of an offshore wind industry in New England by creating an additional market for offshore wind generation and preventing potential curtailments. While the highly controllable features of the HQ system can ensure that adequate clean supply is available to serve New England's demand, reducing the need to dispatch expensive and high emitting resources.

HQUS submits the following comments in response to the RFI topics that relate to overall regional transmission planning and integration.

Answer to 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?*

High voltage DC transmission projects offer many advantages, including the capability to deliver large volumes of baseload clean energy supply with minimal losses, and the ability to provide unique operational and reliability benefits when connecting neighboring control areas. In this context, HVDC seems more appropriate than HVAC because it offers more options for future build-out and integration of the regional transmission system. The bidirectional capability of HVDC transmission will enable the optimal use of hydropower and large-scale renewables like offshore wind, reducing curtailments, and thus, supporting greater renewable development at a lower cost to ratepayes.

Increasing New England's access to large volumes of clean electricity through new HVDC projects will be crucial to achieving regional clean energy targets,[2] as these projects provide the scale of supply necessary to achieve the State's decarbonization goals. Transmission can also provide geographic and resource diversity to complement and more efficiently integrate high penetrations of domestic renewables such as utility scale solar and offshore wind. As part of a comprehensive clean resource adequacy planning approach, reservoir hydropower resources can deliver a clean alternative with the required flexible and dispatchable operating characteristics to replace the products currently provided by fossil-fuel generation. HQ's vast interconnected system of controllable hydropower is able to provide these services using proven and cost competitive resources. HVDC technology also would be appropriate to strengthen the interregional connections to access HQ's resources and related system benefits.

New HVDC transmission interconnections also provide reliability benefits by helping to ensure adequate electricity supply is available to meet consumer demand during peak periods.

Answer to 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*

[2] Five of the six New England states have committed to reducing their carbon dioxide emissions by at least 80% in the coming years, ISO-NE Future Grid Reliability Study, page 1.

load shedding or other emergency event and particularly from using the black start capabilities of HVDC lines in the event of a blackout

HVDC technology offers a number of unique benefits, including the technical capability to provide blackstart service, dynamic reactive power, fast frequency response, as well as other ancillary services increasingly required as the region progresses on policy goals.

The ability of interregional HVDC lines to provide blackstart capabilities and assist in system restoration is a valuable feature unique to HVDC technology and should be duly recognized. The HQ system is asynchronous to the New England system, and sources power from a portfolio of geographically diverse resources. Because of these factors, there is a greater likelihood that blackout events which impact New England will not affect Québec, and HQ will remain available to provide the restoration services necessary to restart the New England electricity grid as expeditiously as possible and minimize the associated public health and economic consequences (which are often substantial).

It is important to consider as part of interregional transmission planning that transmission interconnections between HQ and New England can help to prevent these blackout events from occurring in the first place, by linking New England to a source of highly reliable generation with abundant fuel security. Expanding this interconnectivity through new and expanded transmission interties will also increase New England's access to HQ electricity supply, offering greater fuel diversity and reducing the region's overreliance on natural gas.[3] New HVDC interties between the New England and HQ systems will leverage the complementary relationship between controllable hydro generation and intermittent resources like wind and solar.

Answer to 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*

Comprehensive planning should consider transmission upgrades necessary to access the HQ system at the same time as preparing for the injection of offshore wind. New HVDC transmission between HQ and New England will provide a host of economic, environmental, and reliability benefits, and work in concert with the current clean energy initiatives. For example, HVDC projects connected to the HQ system can provide the operational characteristics needed to reliably integrate high penetrations of renewable energy into the New England system.

New England is expected to experience a major shift in the resource mix towards renewables, with a substantial increase in renewable generation and storage in the range of 90,000 MW by 2040, compared to 5,600 MW in use today.[4] HQ is able to provide the

[3] https://www.iso-ne.com/static-assets/documents/2022/08/isone_energy_security_letter_to_us_doe_and_statement_for_ferc_winter_forum_2022_08_29.pdf.
[4] ISO-NE Future Grid Reliability Study, page 11.

controllable and operational services necessary to balance and operate an electricity system predominantly sourced from renewable resources. However, because demand for these services is expected to grow rapidly as annual electricity consumption and peak demand increases due to electrification of the heating and transportation sectors,[5] the capacity of existing interties will be quickly subscribed, requiring additional transmission interconnections.

Increasing access to non-emitting generation resources with the operational capabilities to provide dispatchable and on demand production will be critical to achieving New England's clean energy objectives and integrating this level of renewable generation. These resources will be necessary to ensure not only continued grid stability as fossil-fuel based generation is progressively phased out of the system, but also that energy remains available to serve demand under a range of weather and system conditions. Cost savings will also be achieved as adding targeted dispatchable capacity would significantly reduce the need for additional investments in renewable resources, as indicated by ISO-NE in the Future Grid Reliability Study: 3,000 MW of dispatchable units (including Québec hydropower) would reduce the need of additional new wind, solar and storage units by 17,000 MW. [6]

While dispatchable capacity may, in the future, be supplied by a number of emissions free technologies, HQ hydropower is a currently available and proven resource. Studies have concluded that increased transmission between Québec and New England which leverage the HQ system to balance domestic renewables can produce substantial benefits in the form of: (1) reducing curtailments of wind and solar resources in New England, (2) lowering wholesale electricity costs, and (3) decreasing emissions and reliance on fossil-fuel resources.[7] New bi-directional tie-lines can optimize renewable production by enabling the banking of excess energy produced during periods of low demand and high renewable output, where excess renewable energy would otherwise be curtailed. Energy banked in the HQ system can then be reimported to New England in future periods to displace fossil-fuel resources and reduce locational marginal prices.[8]

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

Including HVDC transmission solutions as part of a clean energy portfolio will maximize regional benefits and complement local renewable energy investments and demand side efforts, enabling the Participating States to achieve decarbonization targets sooner and more affordably.

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[5] https://www.iso-ne.com/static-assets/documents/2022/05/lf2022_energy_seaspeak.pdf.
[6] ISO-NE Future Grid Reliability Study, page 11.
[7] "Banking energy in Québec can be utilized to decrease overall system electric sector emissions and production costs. Given the large amount of renewable energy that is curtailed in future studies such as this one, mechanisms like long-duration storage in Québec have an opportunity to better utilize variable energy resources in the New England power system." ISO-NE, 2020 Economic Study: Interregional Storage's Capability to Facilitate the Effective Use of Clean Energy Resource (June 2022) at p 29.
[8] ISO-NE, 2020 Economic Study: Interregional Storage's Capability to Facilitate the Effective Use of Clean Energy Resource (June 2022) at p 1.

Notably, transmission solutions can simultaneously help address the persistent challenges facing New England that may undermine the State's clean energy initiatives.

New England's overreliance on natural gas represents a significant challenge to the region, especially in winter periods where limited natural gas supply is needed to serve both electricity generation and consumer heating demand.[9] This dependence has resulted in significant adverse economic and health consequences when natural gas demand exceeds regional supply and delivery capability, resulting in greater deployment of high emitting generation sourced from oil and coal to serve electricity needs when natural gas is unavailable. The dispatch of high emitting generation often has significant environmental justice implications which disproportionately affect disadvantaged communities residing in close proximity of these resources. In addition to the negative public health impacts experienced by these communities, there are also economic burdens as a higher percentage of their income is dedicated to rising energy expenses.

New HVDC transmission projects which provide New England access to large volumes of clean and dispatchable supply offer significant and immediate fuel diversity and fuel security benefits. These transmission projects will deliver economic and reliability benefits by directly reducing the region's overreliance on a single fuel source, resulting in more stable electricity costs. These investments also are consistent with the region's environmental goals by decreasing the need for, and dispatch of, high emitting generation.

New HVDC projects also provide considerable economic benefits. As mentioned previously, greater two-way exchange of energy can enable and accelerate deployment of large-scale renewable generation in New England and support decarbonization efforts at a lower cost. A 2020 MIT study which found that transmission expansion between Québec and New England resulted in significant savings, with up to a 24% reduction in power system costs.[10] System cost savings from increased HVDC transmission investment was also shown in a 2020 Economic Study conducted by ISO-NE for National Grid, which concluded that the addition of new tie lines drove down system wide production costs significantly compared to a base case without these transmission additions.[11]

Conclusion

Effectively integrating the necessary scale of new renewable energy resources into the New England grid will require a coordinated approach which includes a broad set of complementary solutions. New and expanded HVDC interconnections between Québec and

[9] Natural gas represented 53% of New England generation in 2021 (https://www.iso-ne.com/about/key-stats/resource-mix/).
[10] Emil Dimanchev, Joshua Hodge& John Parsons, MIT Center for Energy and Environmental Policy Research, Two-Way Trade in Green Electrons: Deep Decarbonization of the Northeastern U.S. and the Role of Canadian Hydropower (Feb. 12, 2020) at p.42, available at https://ceepr.mit.edu/wp-content/uploads/2021/09/2020-003.pdf
[11] ISO-NE, 2020 Economic Study: Interregional Storage's Capability to Facilitate the Effective Use of Clean Energy Resource (June 2022) at p 20.

New England should be part of this approach, as new transmission projects will deliver a number of environmental, economic, and reliability benefits. These projects will also allow New England to leverage the unique characteristics offered by the HQ system which are becoming increasingly valuable as the region actively pursues decarbonization. Throughout this initiative, HQ remains committed to further collaboration with the Participating States, policy makers, and stakeholders to explore solutions and opportunities to expand interregional collaboration.

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