



*Hydro-Québec
Response to
The New York Energy Highway
Request for Information
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Respondent Information

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Respondent Background

For over 50 years Hydro-Québec, a Crown corporation wholly owned by the province of Québec, has been successfully developing and operating Québec's vast hydropower resources. Hydro-Québec generates, transmits and distributes electricity and is made up of four divisions: Hydro-Québec Production, its power generation division; Hydro-Québec TransÉnergie, its transmission division; Hydro-Québec Distribution; and, Hydro-Québec Equipment and Services, its construction division. At the end of 2011, the company operated a fleet of nearly 37,000 Megawatts (“MW”) of installed capacity with hydropower accounting for 98% of its output. Since 2005, approximately 2,500 MW of new hydropower capacity has been commissioned. An additional 1,550 MW is currently under construction, and will be put in service progressively starting in 2015¹.

In developing these resources, Hydro-Québec applies the principles of sustainable development from the planning phase all the way through to construction and operation. Hydro-Québec does not undertake a project unless it is profitable under market conditions, environmentally acceptable and favorably received by local communities. As a result, Hydro-Québec is able to provide a renewable, low-carbon, reliable and affordable supply of electricity for both its domestic and export markets.

As Canada's environmental regulations are among the most stringent in the world, all of Hydro-Québec's hydropower projects undergo rigorous and extensive environmental and ecological impact assessment². For example, the environmental impact assessment for the Romaine hydropower project evaluated all the potential environmental and social effects of the project. Based on the results, mitigation and compensation measures have been designed to reduce the environmental impacts and enable land users to continue their traditional activities. The extent of the studies, mitigation measures and environmental monitoring is estimated at nearly \$320 million for this project alone.

¹ This represents new capacity from the Romaine project.

² <http://www.hydroforthefuture.com/approche/6/the-hydropower-development-process>

In addition to our environmental stewardship, Hydro-Québec works in close concert with all of the host communities for its projects, Aboriginal and non-Aboriginal. Québec recognizes 11 Aboriginal nations in 55 communities throughout the province and endeavors to develop mutually beneficial partnerships with all of these communities. Host communities are consulted at the very start of a project, and when possible, participate in all phases of a project – from conducting environmental impact studies, through construction, to the on-going environmental monitoring that follows every project. Since 1975, Hydro-Québec has signed more than 30 agreements with Aboriginal communities to promote their long-term development well after its hydropower projects are completed. Furthermore, every effort is undertaken to ensure that the host communities benefit from the economic spin-offs of a project, usually through comprehensive agreements in the case of Aboriginal communities.

H. Q. Energy Services Inc. (“HQUS”) is the U.S. energy marketing and business development subsidiary of Hydro-Québec and has been an active participant in the New York electricity market since the inception of the New York Independent System Operator (“NYISO”) in 1999. Prior to establishing HQUS, Hydro-Québec and its predecessor companies sold power to New York State for decades following the construction of the Cedars-Dennison intertie in the late 1910s, and more recently following the construction of the Chateauguay-Massena intertie in the early 1980’s. Since this time, Hydro-Québec has provided New York with large quantities of energy and displaced a considerable quantity of greenhouse gas (“GHG”) emissions³. Today, Hydro-Québec is committed to annually providing 900 MW of capacity into New York State through 2030.

Submission Description

Hydro-Québec is pleased to make this submittal to the Request for Information for the New York Energy Highway Initiative. This submission is comprised of two distinct projects that offer the potential for significant improvements to the reliability, efficiency and environmental performance of the New York State power system.

Project 1 consists of Hydro-Québec’s participation in the proposed new Champlain Hudson Power Express (“CHPE”) HVDC transmission line⁴, combined with a renewable, low-carbon supply of electricity into the downstate area.

Project 2 outlines Hydro-Québec’s commitment to work closely with the state to evaluate opportunities that enable increased power flows from Québec into and throughout the State of New York.

³ Hydro-Québec estimates that in 2011 alone, up to 12 million tonnes of CO2 emissions were avoided as a result of the export of energy from the Hydro-Québec system into neighboring systems.

⁴ Project 1 should be considered in combination with the submission from TDI-USA Holdings, which is developing the transmission infrastructure for the US portion of the CHPE project.

Hydro-Québec requests that the two projects be evaluated individually since they are not mutually exclusive and could therefore both be pursued, although they would likely advance and be implemented on significantly different time horizons.

Project 1: Hydro-Québec participation in the Champlain Hudson Power Express

Project Description

The CHPE is a 1,000 MW high-voltage merchant transmission line being proposed to interconnect the province of Québec with the State of New York in the New York City area. The CHPE project would provide a wide range of benefits to the state because it consists of both an HVDC transmission line, and a renewable, low-carbon supply of electricity. Hydro-Québec proposes to become the “anchor tenant” for the project by committing to up to a 40-year purchase of 75% of the transmission rights, effectively paying for the construction of the line⁵.

Project Justification

The CHPE project would simultaneously address several of the primary objectives of the New York Energy Highway Initiative including to promote long-term power system reliability, environmental sustainability, power supply diversity in the downstate area and ratepayer value in the operation of the grid. Additional information about how the project meets each of the objectives contained in the Request for Information is provided below.

1. Reduce constraints on the flow of electricity to, and within, the downstate area; and expand the diversity of power generation sources supplying downstate.

CHPE would provide the State of New York with access to another fuel and delivery source for electricity. In particular its potential to deliver significant quantities of hydropower and alter the resource mix in the downstate area is unique for a single project. Today the downstate area relies primarily on natural gas generation, with a limited ability to switch to oil under certain conditions. The recent New York State Transmission Assessment and Reliability Study (“STARS”) report indicates the expectation that the downstate area will continue to rely heavily on natural gas for power generation through 2030. In addition, the City of New York is promoting the replacement of its inefficient oil generators. Inevitably, the addition of new gas capacity to meet growing demand, or replace retiring capacity, will advance the need for additional investment in upgrades to the natural gas transmission system and could create electric system reliability issues during peak periods. The addition of a significant energy and capacity source that is independent from natural gas supply needs and pipeline delivery systems to the area will significantly improve fuel diversity and reliability and mitigate the need for new gas system infrastructure. Additionally, the CHPE

⁵ Hydro-Québec will also invest in new transmission necessary in Québec to support the full 1,000 MW capacity of the new interconnection.

provides significant quantities of renewable electricity to the state without exacerbating the constraints that currently exist for the delivery of upstate resources.

2. Assure the long-term reliability of the electric system is maintained in the face of major system uncertainties.

While capacity levels in New York are reported by the NYISO and others to be adequate today, the state's traditional capacity resources face an uncertain future in the coming years due to the combination of pending federal environmental regulations, market conditions and public concern for continued operation of certain facilities. The CHPE would provide a highly reliable source of capacity to make up for a loss of capacity that could result from these uncertainties. To the extent that capacity losses occur in supply constrained areas, the CHPE would be particularly valuable since the area is limited in its ability to transfer power from other areas of the state, and generally, to develop large infrastructure projects.

Over the long-term, CHPE would provide the New York power system with an additional interconnection to Hydro-Québec's vast resource base of close to 37,000 MW that could be accessed under a variety of system operating conditions. All interties between Québec and New York are fully controllable, either with HVDC technology or with generation radially connected to the New York system. As a result, the Hydro-Québec system operates independent of system operating conditions in New York. In turn, disturbances in either area do not affect one another and system reliability is enhanced in both. For example, Hydro-Québec assisted New York during the 2003 blackout and continues to be available to provide support during abnormal and emergency power system events. CHPE would enhance Hydro-Québec's ability to provide this type of support into the future.

3. Encourage development of utility-scale renewable generation resources throughout the State.

Hydro-Québec's hydropower facilities are extremely valuable as dispatchable sources of energy. In other words, Hydro-Québec's hydropower resources can be ramped up or down to balance the output of intermittent resources such as wind and solar facilities. The CHPE project would support the integration of greater quantities of utility-scale renewable generation in New York because of the dispatchability and size of the resource base in Québec. Hydro-Québec's ability to provide this type of balancing service for intermittent renewable resources would be further enhanced by adding the CHPE project as an additional interconnection point into the New York control area. In addition, the HVDC transmission technology being used to construct CHPE is highly controllable, further enhancing its ability to provide balancing support for intermittent resources. Although it has been employed between Québec and its neighboring markets for decades, HVDC transmission technology has become increasingly

attractive to deregulated energy markets in recent years due to its operating characteristics in comparison with AC transmission. In contrast to AC transmission lines where the power flows freely, an HVDC line's flow is completely controllable allowing the system operator to precisely adjust the flow at the delivery point to the amount needed. An approach that combines utility-scale renewables balanced with Québec hydropower presents a unique opportunity for the state to contribute to its renewable and carbon reduction goals.

4. Increase efficiency of power generation, particularly in densely populated urban areas.

CHPE has the potential to improve the efficiency of existing power generators serving the New York City area indirectly. Because New York relies on competition among suppliers to serve the electric needs of consumers and CHPE would be an additional supplier, existing power generators will be motivated to improve the efficiency and performance of their resources to continue to compete in the market. In fact, it is these market dynamics that have made New York's wholesale electric markets successful and beneficial for consumers by promoting investment in existing and new resources.

5. Create jobs and opportunities for New Yorkers.

Large incremental supplies of competitively priced energy and capacity will result in significant downward pressure on wholesale market prices in congested areas, enabling access to reliable and affordable energy; a critical driver for economic development. While the construction and operation of the CHPE project will create direct jobs and opportunities for New Yorkers, equally important are the indirect jobs that will be created through the access to competitively priced, renewable and low-carbon energy that the project will bring to New York State and the downstate region.

6. Contribute to an environmentally sustainable future for New York State.

CHPE would have the capability to deliver up to 1,000 MW of additional renewable, low-carbon power into New York. Using a life-cycle analysis approach, Québec hydropower emissions are similar to those from wind power, a quarter of those from photovoltaic solar facilities, and 40 times less than those from a natural gas plant. Therefore, when coupled with supply from Hydro-Québec, CHPE would assist the state in making significant progress towards reducing carbon emissions as well as reduce other effluents such as SO₂, NO_x, heavy metals, and particulate matter. This will be particularly beneficial for air quality in New York City during peak summer and winter periods when the existence of the project could displace the use of higher-emitting resources on the power system. Additionally, as state and federal energy policies evolve and policymakers and stakeholders consider broader approaches to the use of

renewable technologies, CHPE would assist New York in meeting, and potentially increasing, its commitments to renewable energy supplies.

7. Apply advanced technologies that benefit system performance and operations.

Please see the submission from TDI-USA Holdings.

8. Maximize New York State electric ratepayer value in the operation of the electric grid.

CHPE would enhance value to New York ratepayers in several ways. First, significant new quantities of competitively priced energy and capacity will be delivered directly to the higher-priced areas of the state. This will lower wholesale prices and save money for New York consumers⁶. Moreover, the project allows wholesale prices to remain low in the upstate region because it will not cause prices throughout the state to converge⁷. In fact, a recent analysis conducted by the staff of the New York Public Service Commission estimates hundreds of millions of dollars in wholesale market savings that will flow to ratepayers⁸.

Secondly, the addition of the CHPE line will increase competition in the downstate area by increasing the number of suppliers able to serve New York City electric demand. This is important since the downstate area currently relies on a limited number of suppliers. As a result these suppliers will be motivated to enhance the efficiency and performance of existing facilities that operate in the area. Additionally, competition from a lower-cost, highly available resource such as hydropower will minimize price spikes that add to the cost of electricity.

Finally, the project requires significant transmission infrastructure investment in New York, and to a lesser extent Québec, that would be funded by Hydro-Québec's long-term transmission reservation on the line and therefore would not affect transmission rates in New York. Current investment projections estimate that the U.S. portion of the project will cost approximately \$2.2 billion. With this project, New York ratepayers stand to benefit from a significant energy infrastructure addition at no cost.

9. Adhere to market rules and procedures and make recommendations for improvements as appropriate.

⁶ Lower wholesale prices will result in lower retail rates based on the retail ratemaking structure in the state.

⁷ Price convergence is common in wholesale markets as a result of transmission investment that increases the deliverability of low priced resources to higher priced areas.

⁸ NY PSC comments in support of TDI-USA Holding's CHPE project filed in article VII Case 10-T-0139 on March 16 and March 30, 2012. In the March 16, 2012 filing, page 25: "Staff estimated the long-term production cost savings of the Facility as the cost of the Facility plus the cost of the hydropower (dams), less the cost of the combined cycle plant and the present value of the plant's fuel and other operating and maintenance costs. Over a 35-year period, the savings (net present value) ranged from approximately \$1.2 billion to \$3.2 billion in 2015".

Hydro-Québec has a long history of involvement in New York’s wholesale electricity markets as a committed participant in the stakeholder process for market design and long-term power system planning. In this regard, Hydro-Québec experts actively engage in the various process steps with the staff of the NYISO, representatives of the various state agencies and stakeholders to appropriately design transmission facilities as well as market rules and transact in the market for the delivery of energy and capacity. Hydro-Québec suggests that clarity of the capacity market mitigation rules for merchant entry in the New York City area is very important for projects such as CHPE to be successful and to maximize the value of the facility for New York. This includes how the state may value the entry of supply that will contribute to New York State’s public policy objectives.

Financial

Prospects for an Energy Partnership

CHPE will assist New York in resolving traditional power system challenges such as maintaining reliability, security and adequacy, as well as address many of the newer challenges in the marketplace such as the need to increase the use of renewable power sources, lower carbon emissions and ensure appropriate levels of fuel diversity to achieve balanced market outcomes for New York consumers.

Hydro-Québec expects the CHPE project to be economic despite significant market uncertainties that currently exist. However, Hydro-Québec also recognizes that the characteristics of the energy to be delivered have significant value for New York and are likely to have increasing value into the future.

Hydro-Québec proposes to work creatively with New York State to explore options for ensuring that as the value of the energy becomes increasingly important to New York in meeting its evolving policy goals for clean, affordable and renewable energy that there will be opportunities to consider how the various energy benefits enabled by CHPE may be utilized by the state. In addition, to the extent that the state desires to take a continued leadership role in the development of renewables and reduction of carbon emissions, CHPE offers such an opportunity. In this regard, Hydro-Québec proposes that the state of New York consider a stakeholder process that would consider innovative ways in which policy and regulation might prioritize and promote incremental hydropower deliveries.

General Financial Structure

The CHPE project uses a Federal Energy Regulatory Commission (“FERC”) approved⁹ merchant transmission funding structure, which allows the developer to subscribe up to 75% of the transmission rights to an anchor tenant, and subscribe the remaining transmission rights through an open season solicitation. Transmission development costs

⁹ 132 FERC ¶ 61,006 (2010)

in New York will be funded by Hydro-Québec's long-term transmission reservation on the line and therefore would not affect transmission rates in New York.

Permit/Approval Process

Please see the submission from TDI-USA Holdings.

Other Considerations

CHPE is consistent with Governor Cuomo's vision that New York's power system be comprised of a broad range of projects because it uses technology that can operate efficiently and reliably within an integrated system of diverse supply and demand resources. Commercialization of CHPE is also consistent with the state's goal of maintaining the benefits of wholesale markets that are open to all resources and provide incentives for performance and new investment.

CHPE would provide significant quantities of renewable electricity to New York without exacerbating the constraints that currently exist for the delivery of upstate renewable resources. Similarly, CHPE will add a new source of energy and capacity to the downstate area without adding to the infrastructure needs of the gas transmission system that may increase overtime with continued reliance on natural gas for reliable system operations.

Additional Information

For all additional information related to the development of the CHPE please see the submission from TDI-USA Holdings. For any other information, please contact Hydro-Québec.

Project 2: Increasing Hydro-Québec Power Flows into New York

Project Description

In addition to Hydro-Québec's proposed participation as the anchor tenant for the CHPE project, Hydro-Québec proposes to work in conjunction with the New York State transmission owners to optimize and expand the existing upstate New York – Québec transmission interconnections and relieve key New York congestion points.

In addition to transmission upgrades in Québec, substantially increasing power flows from Hydro-Québec would likely also require transmission upgrades in New York to remove existing deliverability constraints. Increasing the transfer capability over existing interfaces would increase deliverability of upstate generation into downstate areas, including new in-state renewable generation. As identified in the STARS report, the benefits from this type of new transmission investment can be maximized with increased imports from Hydro-Québec¹⁰.

¹⁰ http://www.nyiso.com/public/webdocs/services/planning/stars/Phase_2_Final_Report_4_30_2012.pdf

Hydro-Québec proposes a coordinated transmission development approach to increase transfer capability between Québec and New York, while resolving internal constraints within the New York control area. We envision Project 2 encompassing a joint study to first identify the most economic and beneficial upgrades, changes to operating practices, etc; followed by a joint development agreement to ensure optimal coordination and implementation of the resulting recommendations.

As with Hydro-Québec's participation in the CHPE project (Project 1), this project would increase New York State's interconnection capability with the Québec control area and Hydro-Québec's vast portfolio of hydro resources, providing the state with increased access to competitively priced, renewable and low-carbon energy.

Project Justification

1. Reduce constraints on the flow of electricity to, and within, the downstate area; and expand the diversity of power generation sources supplying downstate.

A coordinated initiative to increase imports to New York and relieve constraints within the New York system would directly address both congestion and fuel diversity concerns in the downstate area. Enabling power flows across the New York grid will allow diverse resources such as in-state wind and hydro to access natural gas reliant regions in constrained areas, increasing reliability and reducing wholesale energy costs throughout New York.

2. Assure the long-term reliability of the electric system is maintained in the face of major system uncertainties.

Accessing incremental energy and capacity sources is critical in assuring the future reliability and efficiency of the grid. In addition, reducing constraints throughout the system will increase reliability by enabling power to flow freely and efficiently from generators to consumers. Constrained interfaces impede these flows, requiring the dispatch of less economic resources in order to maintain reliability requirements. Power supplies from Hydro-Québec can be available very quickly in the event of an emergency or contingency that may occur, helping further bolster reliability on the New York energy system. All interties between Québec and New York are fully controllable, either with HVDC technology or with generation radially connected to the New York system. As a result, the Hydro-Québec system operates independent of system operating conditions in New York. In turn, disturbances in either area do not affect one another and system reliability is enhanced in both. For example, Hydro-Québec assisted New York during the 2003 blackout and continues to be available to provide support during abnormal and emergency power system events. An increased ability to flow energy into New York would enhance Hydro-Québec's ability to provide this type of support into the future.

3. Encourage development of utility-scale renewable generation resources throughout the State.

Hydro-Québec's hydropower facilities are extremely valuable as dispatchable sources of energy. Therefore, Hydro-Québec's hydropower resources can be ramped up or down to balance the output of intermittent resources such as wind and solar facilities. Increased power flows from Hydro-Québec would support the integration of greater quantities of utility-scale renewable generation in New York because of the dispatchability and size of the resource base in Québec. An approach that combines utility-scale renewables balanced with Québec hydropower presents a unique opportunity for the state to contribute to its renewable and carbon reduction goals.

In addition, optimizing the transmission system and eliminating bottlenecks will enable in-state utility-scale renewable generation projects in remote and oversupplied areas to access higher-priced load centers, which will both aid in the continued development of these projects, as well as increase reliability and lower costs and price volatility.

4. Increase efficiency of power generation, particularly in densely populated urban areas.

Reducing bottlenecks within the state will eliminate the need to dispatch less economic resources in order to meet reliability standards in constrained areas. This will result in a more efficient and economic energy grid, allowing companies to make more informed and predictable investment decisions, allowing newer and more efficient generation and generation technologies to be integrated into the grid.

5. Create jobs and opportunities for New Yorkers.

Large incremental supplies of competitively priced energy and capacity will result in significant downward pressure on wholesale market prices in congested areas, enabling access to predictable and affordable energy; a critical driver for economic development. Equally important are the indirect jobs that will be created through the increased access to competitively priced renewable, low-carbon energy that is made available to New York State.

6. Contribute to an environmentally sustainable future for New York State.

Increased import/export capacity with Québec will allow incremental renewable, low-carbon power to flow into New York, which can be dispatched to aid in the integration of new intermittent renewable resources.

Using a life-cycle analysis approach, Québec hydropower emissions are similar to those from wind power, a quarter of those from photovoltaic solar facilities, and

40 times less than those from a natural gas plant. Therefore, increased deliveries would assist the state in making significant progress towards reducing carbon emissions as well as other effluents such as SO₂, NO_x, heavy metals, and particulate matter

7. Apply advanced technologies that benefit system performance and operations.

If identified as a preferred opportunity, new transmission development will utilize the most up to date technology, which will increase efficiency and assure compatibility with the latest innovations in generation, transmission and smart grid technologies.

8. Maximize New York State electric ratepayer value in the operation of the electric grid.

Optimizing the power flow capability between Québec and New York will ensure the most effective and efficient use of the energy system, resulting in increased reliability and predictable and competitive wholesale energy costs for New York ratepayers. As recognized in the STARS report, increasing energy flows from Québec would increase the economic benefits of upgrades developed within New York.

9. Adhere to market rules and procedures and make recommendations for improvements as appropriate.

As outlined in the recent STARS¹¹ report, due to current NYISO operating practices regarding the treatment of a single external source, the import limit from Hydro-Québec's Chateauguay station into New York is nearly 1,000 MW below the facility's approved limit. A review of the relevant NYISO operating practices could lead to low-cost economic solutions for increasing power flows from Hydro-Québec.

Financial

Prospects for an Energy Partnership

Hydro-Québec proposes an iterative partnership with New York and applicable transmission owners, and in conjunction with NYISO's long-term planning process, to assess the various operating practices and transmission infrastructure options that would enhance deliverability into and throughout the state. This would include

¹¹ The export limit from Hydro-Québec's Chateauguay station to New York is approved at 2,370 MW with all equipment in service, which includes four 765/120 kV transformers. The New York Control Area ("NYCA") import limit from the Québec Chateauguay-Massena single 765 kV interconnection is, however, limited to 1,380 MW per current NYISO operating criteria, which prevents a single external NYCA source from exceeding the largest internal contingency, in this case Nine Mile Point Station #2 at a projected capacity of 1,380 MW. If there is a desire, from a public policy perspective, to increase the import capability of hydro generation from Québec, additional analysis would be needed to determine how to best address the loss of single source contingency.

collaboration on the scope, design and assumptions for the necessary studies as well as transmission funding mechanisms and agreements for treatment of new capacity.

In order to facilitate increased power flow capabilities between New York and Québec, partnership opportunities would need to be evaluated to ensure equitable long-term value for both Hydro-Québec and New York. One way to achieve this is to build on the current partnership with the State of New York, which commits long-term capacity sales from Hydro-Québec into the state. However, Hydro-Québec is open to all ideas and concepts.

General Financial Structure

Hydro-Québec is open to traditional and innovative funding structures, including structures in which the cost of the initial study is shared equally between Hydro-Québec and the New York transmission owners. Actual upgrade costs could be borne by Hydro-Québec for the upgrades needed in Québec and the appropriate transmission owners for the upgrades required in New York.

Permit/Approval Process

N/A at this time

Other Considerations

N/A at this time

Additional Information

Please contact Hydro-Québec for questions regarding additional information.