



NEW ENGLAND CLEAN POWER LINK



LAKE CHAMPLAIN



MONTPELIER



BOSTON

A POWERFUL HYDRO PARTNERSHIP FOR MASSACHUSETTS



IMPRESSIVE BENEFITS FOR MASSACHUSETTS

The NECPL will deliver
\$20 billion
to the Commonwealth
over 20 years.

Developed by
financially **STRONG**,
EXPERIENCED
PARTNERS

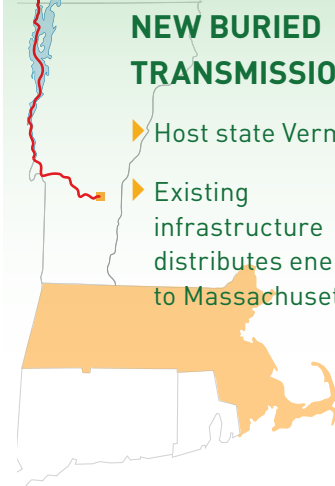


A fixed-price
bid that **PROTECTS**
Massachusetts
RATEPAYERS



The most
VIABLE AND ONLY
NEW BURIED
TRANSMISSION

- ▶ Host state Vermont
- ▶ Existing infrastructure distributes energy to Massachusetts



Strong support from host state Vermont

Project will be buried in Lake Champlain and along existing rights of way, greatly reducing community and environmental impact



Guy Charlton
Chairman of
Board of Selectmen,
Town of Benson



Frank Heald
Municipal Manager,
Town of Ludlow



Watch the New England Clean
Power Link Project Video



Sharon Combes
Combes Family Inn,
Ludlow



Chris Sabick
Archaeological Director,
Lake Champlain
Maritime Museum

**HELPS MEET
MASSACHUSETTS'
GLOBAL WARMING
SOLUTIONS ACT
mandate**

Achieves 24% of
Massachusetts' 2020
target for CO₂ reductions

**Dramatically
REDUCES
GREENHOUSE
EMISSIONS**

Millions of tons of CO₂
emissions reduction annually

**ONLY FULLY
PERMITTED PROJECT
IN NEW ENGLAND**
with complete site
control, buried along
existing rights-of-way





“As the host state for this project, Vermont is proud of the role it will play delivering new, clean energy to Massachusetts and other neighbors throughout New England.”

Governor Phil Scott, Vermont

Project overview

TDI-New England (TDI-NE) and Hydro-Québec (HQ) are pleased to provide this proposal, which offers firm deliveries of 1,000 MW of incremental hydroelectric generation imported from the Hydro-Québec system. We will accomplish this via the buried New England Clean Power Link (NECPL) at fixed prices through a 20-year Power Purchase Agreement (HQ PPA) and Transmission Service Agreement (TDI-NE TSA) with the Commonwealth’s Distribution Companies.

This mature, viable project is well supported by Vermont and New England, and is poised to deliver reliable, base-load clean energy to the Commonwealth. The NECPL will provide significant economic and environmental benefits to Massachusetts’ ratepayers for decades.

Hydro-Québec operates a generating fleet with over 36,000 MW of installed hydro capacity. In order to import hydropower from Hydro-Québec’s system, a new 194-mile HVDC line interconnection between Québec and ISO New England (ISO-NE) is required. Importantly, the NECPL is the only fully permitted project in New England that can cost effectively achieve the Commonwealth’s climate change goals.

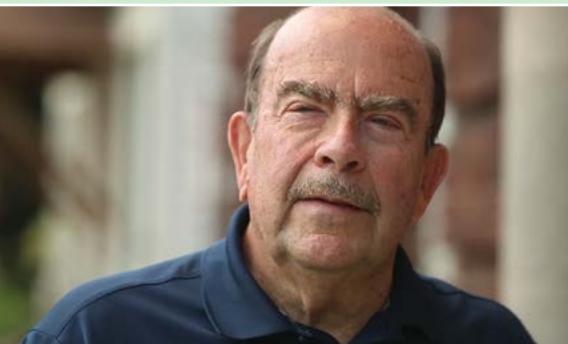
The energy for this project will tie into and be transported to the border via Québec’s robust transmission system. The Québec portion of this line will be constructed and operated by Hydro-Québec TransÉnergie (HQT) in Québec.

The NECPL will connect with the HQT system at the U.S.-Canada border in Alburgh, Vermont, and then travel along the bottom of Lake Champlain for approximately 97 miles. An additional 57 miles of the line will be buried beneath existing public road rights-of-way and will connect to TDI-NE’s proposed converter station in Ludlow, Vermont. At this new station, the electrical power will be converted from direct current (DC) to alternating current (AC), and then flow to the unconstrained Coolidge Substation in Ludlow, Vermont. The Coolidge Substation is owned by the Vermont Electric Power Company (VELCO).

The permitted 154-mile NECPL HVDC buried transmission line will be constructed and operated by TDI-NE in Vermont under the proposed terms of the TDI-NE TSA.

Once constructed, the NECPL transmission line will be capable of transmitting 1,000 megawatts (MW) of clean electricity around the clock.





“Everything TDI-NE has done in terms of getting the project prepared for construction has been absolutely by the book. Everything has been done, in my mind, as well as you could possibly do it.”

Frank Heald
Town of Ludlow, VT

A partnership to power the future of Massachusetts

The NECPL and Hydro-Québec are the ideal partners for ensuring that Massachusetts can achieve its energy diversity goals by providing a source of clean, reliable, firm, base-load power for the next 20 years. The benefits of this partnership include:

- ▶ Hydro-Québec’s ability to generate reliable, base-load, large-scale hydropower and the immediate availability of this energy without building new generation facilities
- ▶ The only fully permitted project in New England, the NECPL is a cost-effective HVDC line ready for construction
- ▶ Solid financial backing from both TDI-NE and Hydro-Québec

Minimum risk, maximum reward for Massachusetts

This proposal offers a viable, low-cost clean energy generation delivery project with limited risk for the following reasons:

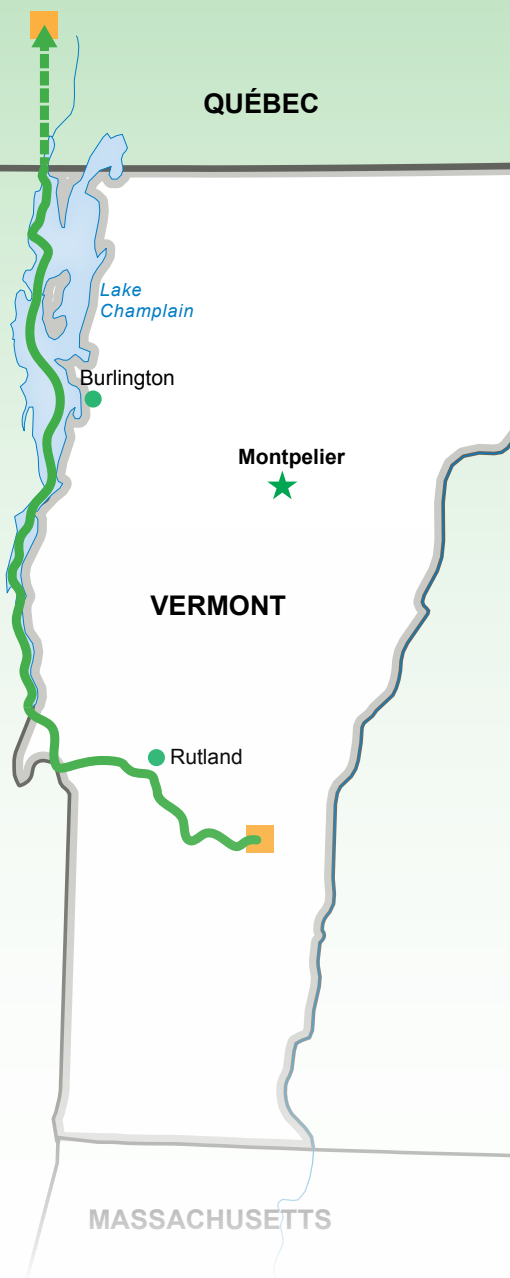
- 1.** The partners are offering a stable and predictable fixed-price bid to protect Massachusetts ratepayers.
- 2.** There is no construction risk related to the generation resources, as they are already in service. In addition, TDI-NE is taking on all of the construction risk in building the NECPL.
- 3.** The Commonwealth’s citizens will receive impressive energy, environmental and economic benefits. This includes \$20 million in funding to assist an estimated 2,500 low-income households.
- 4.** The NECPL is fully permitted, has full site control and is well supported.

A viable transmission line

The NECPL is viable and construction-ready, having obtained all necessary permits including a Presidential Permit from the U.S. Department of Energy (December 2016), a Certificate of Public Good from the Vermont Public Service Board (January 2016), and a wetlands permit from the Army Corps of Engineers (January 2016). The project also enjoys very broad support across Vermont state and local government, as well as from businesses and homeowners.



US Army Corps of Engineers®



Firm energy from proven partners

Hydro-Québec has been a market participant in the New England Power Pool (NEPOOL) and the ISO-NE markets for decades, and has provided New England with a significant source of clean energy on a non-firm basis. This proposal represents an opportunity for Massachusetts to take the next step forward in securing additional large-scale, clean energy generation from Hydro-Québec on a firm basis imported over a new interconnection. NECPL is owned by Blackstone, an alternative asset management leader with over \$368 billion currently under management. Blackstone is the preeminent global leader in the development and construction of energy infrastructure, having invested over \$30 billion in energy infrastructure assets globally. Blackstone will provide all the equity required for financing and Societe Generale will secure the debt financing, in their role as Financial Advisor to the project. Multiple large banks have confirmed their strong interest in providing debt for the project.

The NECPL HVDC system will be manufactured and constructed by a consortium comprised of ABB and NKT, as well as Quanta Services, for a fixed price. TDI-NE has obtained ISO-NE approval and completed the I.39 process. ISO-NE has identified certain upgrades required on the New England transmission system as a result of the project. These upgrade costs are well understood by TDI-NE and are incorporated into the fixed-price bid. The NECPL will be operated by ISO-NE and TDI-NE, and maintenance services will be completed by ABB and VELCO under long-term agreements.


This proposal is fully responsive to the RFP and provides the following benefits:

Significant Benefits to Massachusetts over 20 Years.

THE ESTIMATED TOTAL BENEFIT FROM THE NECPL IS **\$20 BILLION**

- ▶ Energy, Capacity and Gas Savings: \$16 billion
- ▶ Economic and Environmental Benefits: \$4 billion





2008 MASSACHUSETTS GLOBAL WARMING SOLUTIONS ACT

CLEAN ENERGY THAT CAN HELP MASSACHUSETTS MEET ITS GWSA MANDATE

- ▶ Contributes 24% to achieving Massachusetts' economy-wide 2020 GWSA mandate.
- ▶ On a life-cycle basis, HQ's energy has the same GHG emission profile as wind energy.

RELIABLE, FLEXIBLE AND CONTROLLABLE SYSTEM POWER

- ▶ Hydro-Québec operates 61 hydroelectric generating stations that are fully interconnected through the company's high-voltage transmission system.
- ▶ This system power will be delivered over the NECPL, a dedicated high-voltage direct-current line. This supply will be fully dispatchable by ISO-NE, as if it were reliable base-load generation located within New England.

BASE-LOAD ENERGY THAT CAN FIRM UP AND UNLOCK INTERMITTENT ENERGY SOURCES, AND PROVIDE A HEDGE TO NATURAL GAS GENERATION

- ▶ This proposal will decrease the Massachusetts power sector's natural gas usage by 11%, which will reduce natural gas costs to the Commonwealth's ratepayers by \$900 million and provide additional electricity cost savings over the term of the contracts.
- ▶ HQ's significant storage capacity can respond instantly to changes in demand, including during peak periods.
- ▶ Dispatchable, continuous, and predictable, hydropower is the best renewable generation resource that can support the ongoing development of intermittent resources such as solar and wind power.

PROVEN ABILITY TO DELIVER EVEN DURING QUÉBEC'S WINTER PEAK PERIODS

- ▶ Hydro-Québec is fully capable of delivering a firm 1,000 MW every hour of the year, including during Québec's peak period in winter, over the life of the project for the full 20 years of the PPA. Even during the winter peak periods in Québec, Hydro-Québec has consistently maintained non-firm delivery volumes into New England that are well above its contractual obligations. During its winter peak in 2014–2015 and 2015–2016, Hydro-Québec delivered, on average, over 1,600 MW/hour during peak hours into New England. As for the 2016–2017 winter peak, average deliveries into New England were even higher: on average over 1,900 MW/hour. For all years in question, volumes were well above supply obligations.
- ▶ If the NECPL had been operating during the polar vortex of January 2014, it would have saved Massachusetts ratepayers an estimated \$200 million.





“They really asked us to think about what would be beneficial to people who are struggling to pay their utility bills.”

*Clare Higgins,
Community Action of the
Franklin, Hampshire, and
North Quabbin Regions*



ECONOMIC BENEFITS TO THE COMMONWEALTH

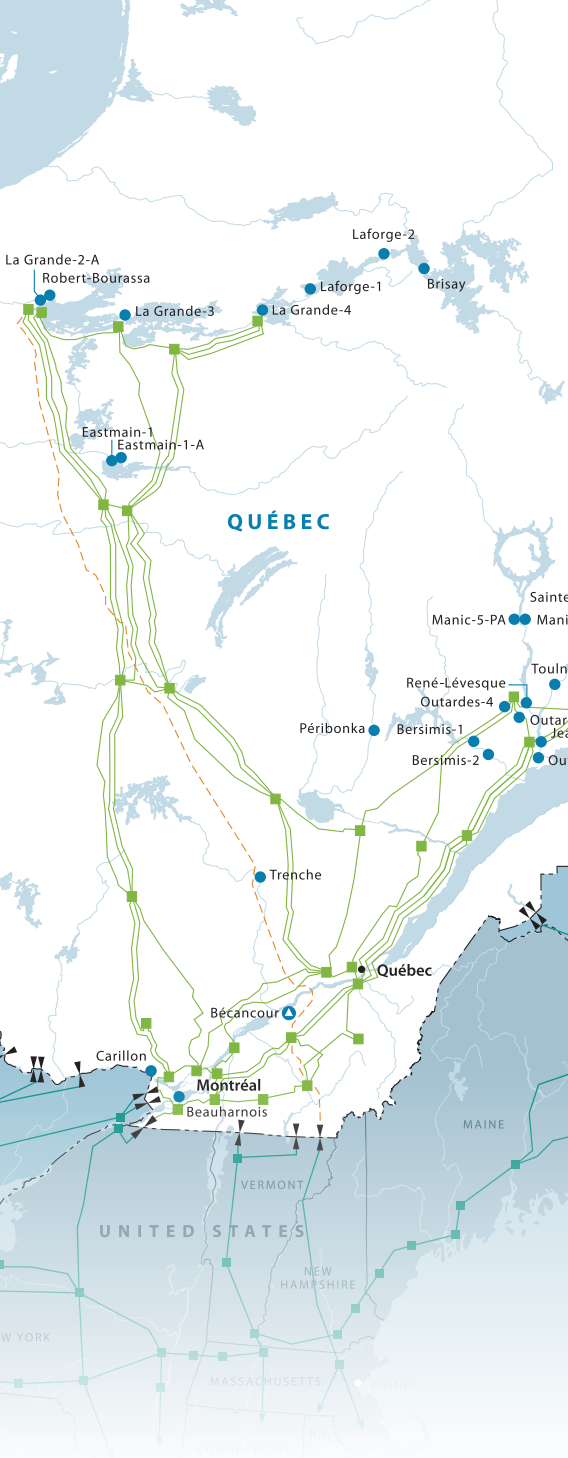
- ▶ NECPL will support the creation of more than 1,100 long-term jobs and create an estimated \$7 billion in economic output in Massachusetts.
- ▶ In partnership with Community Action, a nonprofit located in Western Massachusetts, the NECPL will provide \$20 million in funding that will assist an estimated 2,500 low-income households with energy retrofits.

ENERGY SECURITY AND A ROBUST TRANSMISSION SYSTEM

- ▶ Hydro-Québec’s 27 large reservoirs are managed on a multiannual basis with sufficient energy reserves to offset water inflow fluctuations.
- ▶ Hydro-Québec operates its system to the most stringent reliability standards, in accordance with the criteria of the NERC and the Northeast Power Coordinating Council (NPCC).
- ▶ The HVDC line in Vermont will be buried, providing protection from natural disasters.

SOLID FINANCIAL BACKING AND EXPERIENCE

- ▶ As a state-owned corporation, Hydro-Québec has the ability to finance the construction of the Québec portion of the new interconnection through the strength of its balance sheet and the issuance of debentures and notes guaranteed by the Québec government. This financial strength assures Hydro-Québec’s ability to maintain its facilities throughout the entire term of the HQ PPA.
- ▶ The engineering and construction quality of Hydro-Québec’s generating fleet has been a model for the industry for 50 years. Hydro-Québec makes substantial investments to maintain and upgrade its facilities. In 2016, C\$344 million was invested in the retrofitting and refurbishment of generating stations and associated structures. In 2016, Hydro-Québec TransÉnergie invested C\$1.8 billion in its transmission facilities. The HQ hydropower resources are secure and reliable because of the flexibility and quality of Hydro-Québec’s generation, transmission, and distribution facilities.
- ▶ The NECPL is owned and backed by Blackstone, one of the largest asset managers in the world. Blackstone has provided all development funding to date and is prepared to provide 100% of the required equity. Blackstone is a world-class energy infrastructure developer. Over the past decade, the organization has financed and developed over \$30 billion of energy infrastructure assets. This includes close to 6,000 MW of power generation assets. Debt funding will be arranged by Societe Generale and sourced from multiple large banks that have demonstrated a strong interest. Blackstone’s track record of securing financing is well recognized by the investment community.
- ▶ The NECPL equipment will be manufactured and constructed by two of the leading HVDC companies in the world, ABB/NKT and Quanta. VELCO and ABB will provide long-term maintenance services.



Proposal highlights

The partnership between TDI-New England and Hydro-Québec makes this proposal extremely favorable compared to other clean-energy resources for the following reasons:

- ▶ **SECTION 3: ENHANCED RELIABILITY WITH MINIMAL OUTAGES.** Hydro-Québec has structured the HQ PPA supporting this proposal in a manner that leverages the strengths of its existing hydroelectric generation fleet as a system. Thus, the HQ hydropower resources effectively have no operating constraints. Similarly, the project’s transmission facilities in both Vermont and Québec will be constructed according to industry standards and will be maintained in compliance with NERC, NPCC, and ISO-NE system protocols to maximize the project’s ability to deliver clean energy at the full 1,000 MW transfer capability every hour on a firm basis. The NECPL will be a buried HVDC system that provides extraordinary operational flexibility for ISO-NE.
- ▶ **SECTION 4: A SECURE ENERGY RESOURCE AND DELIVERY PLAN.** Hydro-Québec’s system is a diverse portfolio of run-of-river and reservoir generation units located in geographically diverse areas. Hydro-Québec’s reservoir system can withstand several years of dry conditions.
- ▶ **SECTION 5: STRONG FINANCIAL ABILITY.** Hydro-Québec can generate financing through the strength of its balance sheets and issuance of debt, and Hydro-Québec’s debt is guaranteed by the government of Québec. Hydro-Québec’s credit ratings are among the highest for regulated public utilities, and it has a track record of completing hundreds of large capital projects over the past decade. TDI-NE is owned by Blackstone, which has \$368 billion in assets under management. Blackstone has committed to providing all the required equity for NECPL’s financing. Societe Generale, one of the leading financing banks for transmission lines, is the project’s financial advisor and will arrange for the debt portion of the financing. Blackstone’s track record of securing financing is well recognized by the investment community.
- ▶ **SECTION 6: FULL SITE CONTROL AND INTERCONNECTION STUDIES COMPLETED.** The NECPL has 100% site control from the U.S./Canada border to the interconnection point in Ludlow, Vermont. There are no disputes over this site control, and TDI-NE enjoys strong partnerships with the towns and State of Vermont, which welcome the project. The NECPL has received its I.39 authorization, which confirms the project can reliably interconnect into the ISO-NE system. Importantly, the NECPL is the only fully permitted project in New England that can cost effectively achieve the Commonwealth’s climate change goals.

- ▶ **SECTIONS 7: LOW ENVIRONMENTAL IMPACTS AND TREMENDOUS SUPPORT.** The project is fully compliant with Massachusetts’ desire to site transmission in a low-impact manner along existing infrastructure. NECPL is fully permitted and has minimal appeal risk that could delay COD, since it was developed in a manner that respects the local communities and environment. Vermonters across the state publicly endorse the project and fully support Massachusetts’ effort to procure clean energy through the NECPL.





1,100 JOBS

Once operational, the NECPL will create more than 1,100 long-term jobs in the Commonwealth of Massachusetts.



► **SECTION 8: ADVANCED ENGINEERING AND PROCUREMENT.** The HQ hydropower resources are already in service and require no further procurement. The HVDC converter terminal and DC cable technologies proposed to be used in the transmission projects are widely used in the industry and have a strong track record of exceptional reliability. ABB and NKT have provided a fixed-price bid to manufacture and warranty the HVDC system and will install the 97-mile lake portion of the project. Quanta Services has also provided a fixed-price bid to install the overland portion.

► **SECTION 9: EXTENSIVE OPERATIONS AND MAINTENANCE EXPERIENCE.** Hydro-Québec has a strong record of operating and maintaining generation and transmission systems with billions of dollars in capital assets. The company is committed to maintaining the generation and transmission assets that are necessary to this proposal in accordance with the highest industry standards. TDI-NE will partner with VELCO and ABB to conduct maintenance activities; ISO-NE will assume operational control of the project. TDI-NE and Blackstone will draw on their internal team's formidable experience operating large energy projects to ensure the project meets its reliability guarantees.

► **SECTION 10: CRITICAL PATH SCHEDULE.** The project's critical path schedule is achievable and on track to commence construction shortly after approval of the proposed HQ PPA and TDI-NE TSA.

► **SECTION 11: ORGANIZATIONAL EXPERIENCE IN LARGE-SCALE ENERGY DEVELOPMENT.** Hydro-Québec's development team has built more than 4,500 MW of new installed capacity since 2003. TDI-NE's development team, Blackstone and partners ABB/NKT and Quanta have built thousands of megawatts of operating energy projects in the past decade. Blackstone has invested over \$30 billion in global energy infrastructure assets and is recognized as world-class energy infrastructure developer.

► **SECTION 12: A GIANT LEAP FORWARD IN GREENHOUSE GAS EMISSION REDUCTIONS.** The HQ hydropower resources will deliver a minimum of 8.3 TWh of clean energy generation and reduce millions of tons of CO₂ emissions annually. This resource is the best and most cost-effective solution at the large scale necessary to help Massachusetts achieve the greatest progress in hitting the Global Warming Solutions Act's emissions reduction targets along with enhanced system reliability and firm deliveries to mitigate price volatility to customers.

► **SECTION 13: SIGNIFICANT BENEFITS TO THE COMMONWEALTH.** The NECPL will provide significant benefits to the Commonwealth of Massachusetts, including lower energy costs for commercial and residential ratepayers, cleaner air, a significant number of new jobs, and a new source of funding for low-income ratepayers.

► **SECTION 14: FIXED-PRICE BID.** TDI-NE is pleased to submit a fixed-priced bid for the NECPL that will insulate the Commonwealth's ratepayers from potential cost overruns.

► **SECTION 15: COMPLIANT TRANSMISSION SERVICES AGREEMENT.** TDI-NE has provided a draft TSA that is fully compliant with the RFP directives.



“They’re showing how big energy infrastructure can be done the right way.”

*Ian Bowles,
Massachusetts Secretary
of Energy and Environmental
Affairs, 2007–2011*

Bid structure



- ▶ 1,000 MW transmission line
- ▶ 96.5% minimum availability
- ▶ FERC regulated

TRANSMISSION SERVICES AGREEMENT

TSA with MA Utilities

- ▶ 20-year contract
- ▶ Firm transmission rights
- ▶ Approved by FERC



- ▶ Québec 1,000 MW interconnection
- ▶ Commitment to guaranteed deliveries, including peak periods
- ▶ Existing hydro resources

POWER PURCHASE AGREEMENT (8.3 TWh)

PPA with MA Utilities

- ▶ 20-year contract
- ▶ Firm delivery of a minimum of 8.3 TWh hydropower annually
- ▶ Approved by MA DPU
- ▶ Environmental attributes

