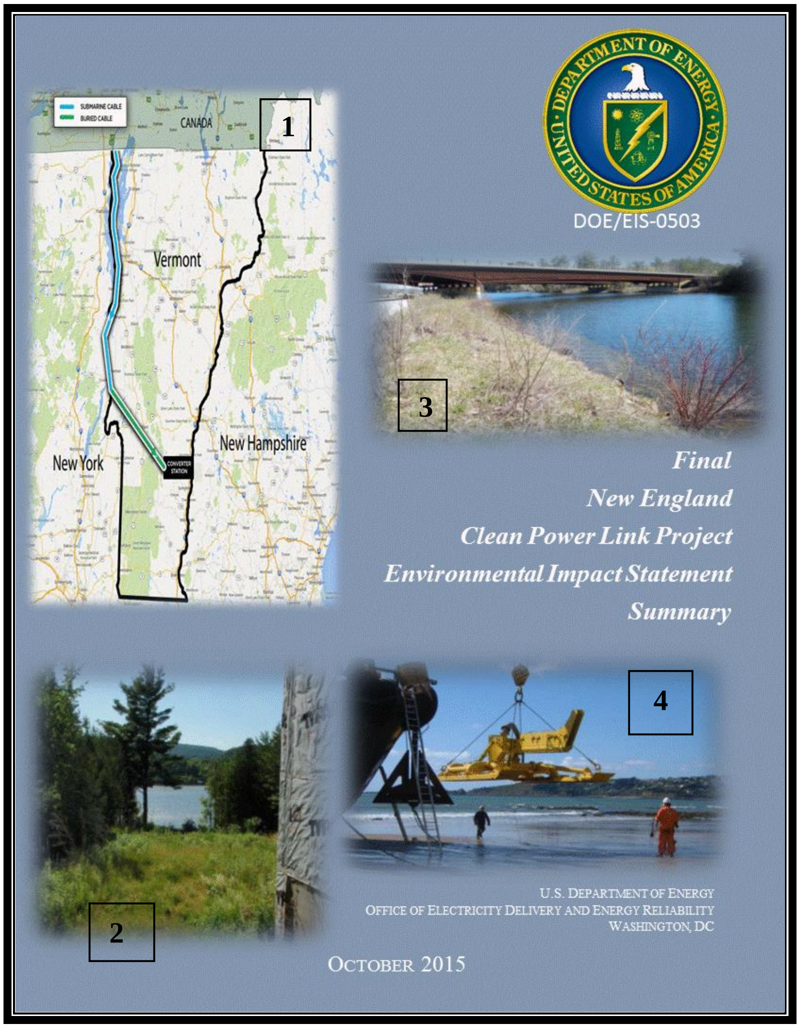
DOE/EIS-0503

Final New England Clean Power Link Project Environmental Impact Statement Summary

U.S. DEPARTMENT OF ENERGY
OFFICE OF ELECTRICITY DELIVERY AND ENERGY RELIABILITY
WASHINGTON, DC

OCTOBER 2015



Cover Photo Credits

1. TDI-NE (*http://wamc/files/styles/default/public/201410/new-england-clean-power-link-map-ctsy-tdi-new-england.jpg" alt="">)*
2. NECPL exit from Lake Champlain (Benson, Vermont) courtesy of TDI-NE
3. Lake Bomoseen, Fair Haven, Vermont courtesy of TDI-NE
4. TDI-NE 2014a

FINAL

NEW ENGLAND CLEAN POWER LINK PROJECT ENVIRONMENTAL IMPACT STATEMENT

DOE/EIS-0503

SUMMARY

U.S. DEPARTMENT OF ENERGY
OFFICE OF ELECTRICITY DELIVERY
AND ENERGY RELIABILITY

COOPERATING AGENCIES

U.S. ENVIRONMENTAL PROTECTION AGENCY
U.S. ARMY CORPS OF ENGINEERS
U.S. COAST GUARD

OCTOBER 2015

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COVER SHEET

RESPONSIBLE FEDERAL AGENCY

U.S. Department of Energy (DOE),
Office of Electricity Delivery and Energy Reliability

COOPERATING AGENCIES

U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), U.S. Coast Guard (USCG)

TITLE

New England Clean Power Link Transmission Line Project Final Environmental Impact Statement (EIS) (DOE/EIS-0503)

LOCATION

Grand Isle, Chittenden, Addison, Rutland, and Windsor counties in Vermont

CONTACTS

For additional information on this Final EIS contact:
Mr. Brian Mills, National Environmental Policy Act (NEPA) Document Manager
Office of Electricity Delivery and Energy Reliability, OE-20
U.S. Department of Energy
Washington, DC 20585
Telephone: (202) 586-8267
Brian.Mills@hq.doe.gov

ABSTRACT: Champlain VT, LLC, d/b/a Transmission Developers Inc. - New England (TDI-NE) applied to the U.S. Department of Energy (DOE) to construct, operate and maintain a 154-mile long electric transmission line in the United States from the border with Canada, near the town of Alburgh, Vermont. The New England Clean Power Link (NECPL) Project would consist of one 1,000-megawatt, high voltage direct current (HVDC) transmission line and a new converter station in Ludlow, Vermont. This Environmental Impact Statement (EIS) addresses the potential environmental impacts of the proposed transmission line (Preferred Alternative) and the No Action Alternative. The proposed transmission cable would include both aquatic (underwater) and terrestrial (primarily underground) segments in Vermont. The underwater portions of the transmission cable would be buried in the beds of Lake Champlain, and the terrestrial portions would be buried, principally in roadway rights-of-way and railway beds. The transmission cable would consist of two transmission cables. A new converter station in Ludlow, Vermont, would convert the electrical power from DC to alternating current (AC) and interconnect to Vermont Electric Power Company's existing substation in Cavendish, Vermont.

PUBLIC COMMENTS: Comments on the Draft EIS were accepted for a 60-day period following publication of EPA's Notice of Availability (NOA) in the *Federal Register* on June 12, 2015. The DOE held two public meetings on the Draft EIS (July 15, 2015 in South Burlington, Vermont and July 16, 2015 in Rutland, Vermont). All comments were considered during preparation of the Final EIS. ***Appendix M–Comment Response Document*** of this Final EIS contains revisions and new information based in part on comments received on the Draft EIS. Vertical bars in the margins marking changed text indicate the locations of these revisions and new information. Deletions are not indicated.

The Final EIS analyzes the potential environmental impacts of the DOE issuing a Presidential permit for the proposed NECPL Project, which is DOE's proposed Federal action (Preferred Alternative). If the DOE determines that granting a Presidential permit is in the public interest, the information contained in this Final EIS will also help to inform the DOE's decision regarding potential mitigation measures and other conditions of the permit. Copies of the Final EIS are available for public review at 11 local libraries as noted in ***Appendix B–EIS Distribution List*** of the Final EIS or a copy may be requested from Mr. Brian Mills. The Final EIS also is available on the NECPL Project EIS Web site (http://necplinkeis.com/). The DOE will announce its decision on the Proposed Action in a Record of Decision (ROD) in the *Federal Register* no sooner than 30 days after EPA publishes the NOA of the Final EIS.

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SUMMARY

S.1 BACKGROUND

The proposed New England Clean Power Link (NECPL) Transmission Line Project (Project) consists of an approximately 154-mile long, 1,000-megawatt (MW), high-voltage direct current (HVDC) electric power transmission system that will have both aquatic (underwater) (≈ 98 miles) and terrestrial (underground) (56 miles) segments in the state of Vermont. The Project includes a transmission cable that would run from the United States and Canada border to Ludlow, Vermont, and associated equipment. The Project would terminate at the existing Vermont Electric Power Company (VELCO) substation in Cavendish, Vermont, and interconnect with the transmission system operated by Independent System Operator New England (ISO-New England). In addition to the transmission line itself, the system would include a new direct current (DC)-to-alternating current (AC) HVDC converter station in the town of Ludlow, Vermont.

On May 20, 2014, Champlain VT, LLC, d/b/a Transmission Developers, Inc.-New England (TDI-NE) applied to the U.S. Department of Energy (DOE) for a Presidential permit in accordance with Executive Order (EO) 10485, as amended by EO 12038, and the regulations at *10 Code of Federal Regulations* (CFR) 205.320 et seq. (2000), “Application for Presidential Permit Authorizing the Construction, Connection, Operation, and Maintenance of Facilities for Transmission of Electric Energy at International Boundaries.” TDI-NE submitted a minor route revision on October 9, 2014.

As required by 10 CFR 205.320(a), any entity “who operates an electric power transmission or distribution facility crossing the border of the United States, for the transmission of electric energy between the United States and a foreign country, shall have a Presidential Permit, in compliance with EO 10485, as amended by EO 12038.” EO 10485, as amended by EO 12038, authorizes the Secretary of Energy “[u]pon finding the issuance of the permit to be consistent with the public interest, and, after obtaining the favorable recommendations of the Secretary of State and the Secretary of Defense thereon, to issue to the applicant, as appropriate, a permit for [the] construction, operation, maintenance, or connection” of “facilities for the transmission of electric energy between the United States and a foreign country.” The DOE determines whether issuing a Presidential permit would be consistent with the public interest and assesses the environmental effects of the proposed project, the effect of the proposed project on electric reliability, and other factors that the DOE considers relevant to the public interest.

The DOE Office of Electricity Delivery and Energy Reliability is responsible for reviewing Presidential permit applications and determining whether to grant a permit for electrical transmission facilities that cross the United States' international border. If the DOE issues the Presidential permit to TDI-NE (OE Docket Number PP-400), it would authorize TDI-NE to construct, operate, maintain, and connect the United States’ portion of the Project at the international border near the village of Alburgh, Vermont.

The DOE determined that issuance of a Presidential permit would constitute a major federal action and that an Environmental Impact Statement (EIS) is the appropriate level of environmental review under the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [U.S.C.] 4321 et seq.). The DOE prepared this EIS in compliance with NEPA requirements, the Council on Environmental Quality's (CEQ) regulations for implementing NEPA (40 CFR Parts 1500-1508), the DOE's implementing procedures for NEPA (10 CFR Part 1021), and other applicable regulations, including Compliance with Floodplain and Wetland Environmental Review Requirements (10 CFR Part 1022). This Final EIS contains revisions and new information based in part on comments received on the Draft EIS. Vertical bars in the margins marking changed text indicate the locations of these revisions and new information. Deletions are not indicated.

Other environmental review requirements are being implemented in coordination with or integrated with the NEPA process to the extent possible, namely, floodplains and wetlands assessments in accordance with EO 11988 and EO 11990, respectively and 10 CFR Part 1022, DOE floodplain and wetland environmental review requirements; Clean Air Act Conformity requirements; threatened and endangered species consultation required under the Endangered Species Act (ESA); and consultation under the National Historic Preservation Act (NHPA).

S.2 DOE'S PURPOSE OF AND NEED FOR AGENCY ACTION

The purpose of and need for the DOE's action is to decide whether to issue a Presidential permit for the Project. Although the DOE does not have siting or project alignment authority, projects proposed in applications for Presidential permits are evaluated as "connected actions" to the proposed Presidential permit that would authorize the border crossing.

The DOE will consider the effects analysis presented in this EIS in deciding whether to issue the permit to TDI-NE.

S.3 APPLICANT'S OBJECTIVES

In the Presidential permit application, TDI-NE noted that the proposed NECPL Project would be a merchant transmission facility that would deliver clean, renewable hydroelectric power from the Canadian province of Quebec into Vermont and ISO-New England through the 1,000-MW transmission line (TDI-NE 2014a). Specifically, TDI-NE stated that the NECPL Project would:

- further New England states' energy and environmental policy goals;
- diversify fuel supply in New England;
- reduce carbon emissions in New England;
- improve the economic competitiveness of the New England states; and
- provide economic benefits to Vermont and other New England states.[1]

S.4 PUBLIC PARTICIPATION AND INTERAGENCY COORDINATION

The public participation and interagency coordination elements of the NEPA process promote open communication between the lead federal agency and other regulatory agencies, Native American tribes, stakeholder organizations, and the public. On August 26, 2014, the DOE issued a Notice of Intent (NOI) to prepare an EIS for the Proposed Action and conduct public scoping (79 *Federal Register* 50901). The NOI explained that the DOE would prepare an EIS to assess the potential environmental effects of its Proposed Action to grant a Presidential permit to TDI-NE to construct, operate, maintain, and connect a new electric transmission line across the United States-Canada border in northern Vermont. The NOI also announced the DOE's public scoping process and invited the public to participate. The DOE's NOI was placed on the Project Web site[2] and on TDI-NE's Web site[3]. The DOE invited several federal and state agencies to participate as cooperating agencies in preparing this EIS because of their special expertise or jurisdiction by law (40 CFR 1501.6). The cooperating agencies for the Project are the U.S. Environmental Protection Agency (EPA) Region 1, the U.S. Coast Guard (USCG), and the U.S. Army Corps of Engineers (USACE), New England District. Each agency has a defined role relative to this EIS.

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[1] See www.necplinkeis.com for additional information regarding TDI-NE's project objectives.
[2] http://www.necplinkeis.com
[3] http://necplink.com

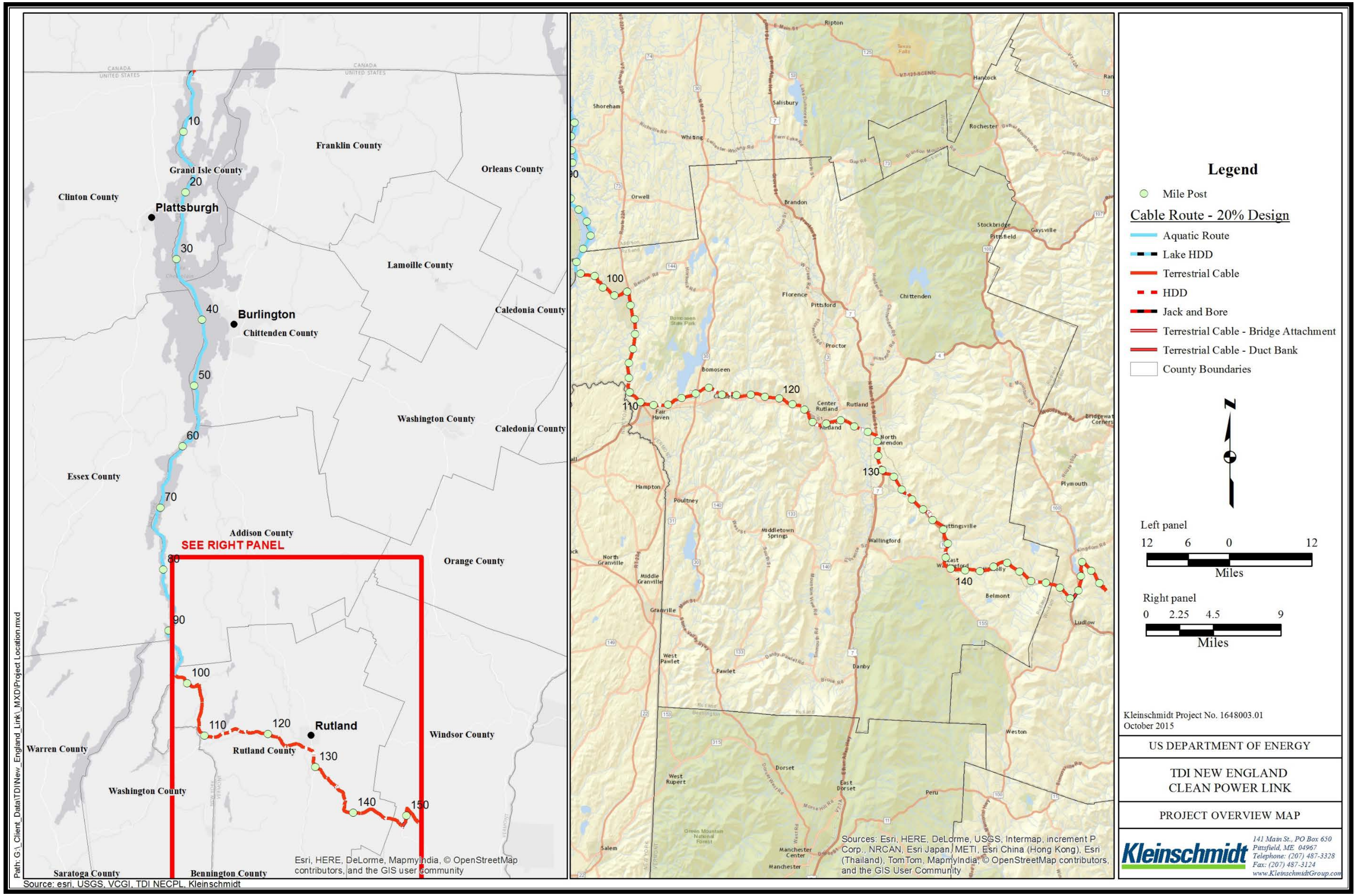

FIGURE S-1. NECPL PROJECT OVERVIEW

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Public Scoping

The purpose of scoping is to provide interested agencies, stakeholder organizations, Native American tribes, and the public an opportunity to provide comments regarding potentially significant environmental issues and the scope of the EIS. The DOE provided a 45-day public scoping period starting August 26, 2014, and ending on October 10, 2014, to receive comments regarding the scope of the EIS. During the scoping period, the DOE held two public scoping meetings; one in Burlington, Vermont, and one in Rutland, Vermont. The DOE selected these locations because of their proximity to the proposed Lake Champlain Segment of the Project (Burlington) and to the Overland Segment (Rutland). TDI-NE held an open house beginning at 5 PM at each scoping meeting to provide Project information to interested parties. TDI-NE presented information about the proposed Project route; the technology to be used in constructing, operating and maintaining the HVDC transmission cable; and potential environmental issues.

All comments received during the scoping process were summarized in a Scoping Report issued on November 19, 2014, and made available on line at the Project Web site[4].

One individual gave verbal comments, which were transcribed by a court reporter. ***Appendix A, Scoping Summary Report,*** contains transcripts of the scoping meetings. The DOE received 12 written letters and emails from private citizens, government agencies, and non-governmental organizations providing comments on scoping. ***Appendix A*** and the Project Web site[5] contain the comments received during the scoping period, along with materials that were submitted for the record.

The following general issues and concerns were raised during the scoping period for the NECPL Project:

- potential for collocating the cables in the proposed location for the Champlain Hudson Power Express (CHPE) Project;
- potential effects of burying the transmission line in Lake Champlain, particularly resuspension of sediments and resultant effects, especially from phosphorus and mercury, on water quality, drinking water, and recreation (fishing, boating and swimming);
- potential for trenching techniques that would stir up solid sediments containing phosphorus, mercury, and other contaminants and cause them to dissolve and become active pollutants in Lake Champlain;
- potential effects of electric and magnetic fields (EMFs) on magnetic compass deviation;
- potential effects of heat produced by the cable on aquatic and geologic/soil resources;
- potential effects on navigation related to identifying and verifying sufficient burial depth and protection to prevent anchor fouling and damage of the transmission line; and
- potential spread of invasive species during construction and use of construction vessels.

The DOE considered the scoping comments in preparing this EIS.

Draft EIS Public Review Period

The DOE provided a 60-day review and comment period beginning June 12, 2015 with publication by the EPA of the Notice of Availability (NOA) of the Draft EIS in the *Federal Register*. ***Appendix B*** contains the EIS mailing list. The DOE also provided copies of the Draft EIS to federal, state, and local agencies with jurisdiction by law and to any stakeholder or member of the public that requested a copy. Comments on the Draft EIS were solicited via the Project Web site at necplinkeis.com or sent directly to the DOE.

[4] http://www.necplinkeis.com
[5] http://www.necplinkeis.com

During the review and comment period for the Draft EIS, the DOE held public hearings in Rutland and Burlington Vermont. The public hearings were recorded by a court reporter; however, since no one submitted any written or oral comments at the two public meetings, the transcripts are not appended to this Final EIS. Each of the three cooperating agencies provided comments on the Draft EIS. Other commenters included an individual, Department of the Interior, Vermont State Historic Preservation Officer (VTSHPO), and a tribe. The DOE considered all comments received during the Draft EIS comment period in preparing the Final EIS.

Appendix M to the Final EIS includes a summary of the comments received on the Draft EIS and responses to those comments. The comments generally fall into the following categories.

- Edits to reflect updated technical information: TDI-NE provided edits to the Draft EIS that updated the Project-specific technical details that mirror technical information provided by TDI-NE in other federal and state applications since publication of the Draft EIS. Edits were made to promote consistency between the EIS and other state and federal permits. Similar edits were requested by the USCG and USACE.
- Alternatives – The USACE requested that the DOE consider the alternatives described in the USACE 404 permit. The DOE provided in ***Appendix E*** a link to the most recently filed 404 permit application.
- Aquatic Resources – EPA recommended various additions to the water resource analyses; USCG recommended that the DOE include the Navigation Risk Assessment; USACE recommended addressing effects on invasive species during and after construction.
- Terrestrial Resources – Commenters requested details on the Project construction period; the effects on long-eared bat; permanent direct impacts to wetlands and temporary impacts. The DOE addressed these comments in Sections 5.1.6, 5.1.7, 5.2.6, and 5.2.7.
- Cultural Resources – The Vermont State Historic Preservation Office commented on the Region of Influence (ROI) for cultural resources in the Overland Segment, the blasting plan, and direct adverse effects of potential *National Register* eligible sites. The DOE addressed these comments in Sections 5.1.10 and 5.2.10.
- Public Comments – Only one public comment was received. This commenter objects to the Project on behalf of the stolen and destroyed terrain by dams, impoundments and corporations to sell power to the New England grid.

A NOA for the Final EIS will be published in the *Federal Register*. The Final EIS will be distributed to all individuals and parties that submitted substantive comments on the Draft EIS and to other interested parties who request a copy of the Final EIS. A Record of Decision (ROD) will be issued no sooner than 30 days following publication of the NOA for the Final EIS.

S.5 ALTERNATIVES ANALYZED

This Final EIS addresses the No Action Alternative and the DOE's Proposed Action. The Applicant, referred in this document as TDI-NE's, proposed NECPL Project is described in ***Section S.6***.

S.5.1. No Action Alternative

According to CEQ and the DOE regulations, an EIS must consider the No Action Alternative. The No Action Alternative establishes the baseline against which the potential environmental effects of a proposed action can be evaluated. Under the No Action Alternative, the DOE would not issue a Presidential permit to TDI-NE for the Project; the transmission system would not be constructed, and potential effects from the Project would not occur.

S.5.2. DOE's Proposed Action

The DOE's Proposed Action (Preferred Alternative) is the issuance of a Presidential permit that would authorize the construction, operation, and maintenance of the Project, which would cross the United States-Canada border. This EIS has been prepared to comply with NEPA and to support the DOE's decision regarding issuing the Presidential permit for the proposed Project.

S.6 PROPOSED NECPL PROJECT OVERVIEW

TDI-NE proposes to develop the NECPL Project as a merchant transmission facility to connect renewable power from Canada to Northeast power markets. TDI-NE estimates that the total capital cost for the Project would be $1.2 billion and that it would be in-service by 2019 (TDI-NE 2014a, 2014b).

The Project includes construction, operation, and maintenance of an approximately 154-mile long, 1,000-MW, high-voltage electric power transmission system originating in the Canadian Province of Quebec and terminating at a proposed new HVDC converter station in Ludlow, Vermont. The NECPL transmission system includes aquatic (underwater) and terrestrial (underground) segments in the state of Vermont. The underwater portions of the transmission cable would be buried in Lake Champlain, except at depths greater than 150 feet, where the cables would be placed on the lakebed and self-burial is expected to occur unless cable crosses an existing utility or another cable. The terrestrial portions of the transmission cable would be buried underground within existing roadway right-of ways (ROWs) and, to a small extent, railroad ROWs and property controlled by TDI-NE. At two specific stream/river crossings in Ludlow, TDI-NE proposes to place the cables in conduits and attach the conduits to a bridge or culvert headwall. The HVDC transmission line consists of two cables, one positively charged and the other negatively charged. Two solid, dielectric (no fluids), cross-linked polyethylene (XLPE) cables, each approximately 154-miles long, would have a nominal operating voltage of approximately +/- 300 to 320 kilovolts (kV). The proposed new HVDC converter station in Ludlow, Vermont, would convert the electrical power from DC to AC and then connect to the existing 345-kV Coolidge Substation in Cavendish, Vermont, which is owned by the Vermont Electric Power Company (VELCO) (TDI-NE 2014a).

The transmission cable route is divided into two segments: Lake Champlain (underwater) and Overland (terrestrial). ***Table S-1*** summarizes the Project route, including the corridor type and approximate length for each section. ***Appendix C*** provides the transmission system route maps.

TABLE S-1. SUMMARY OF PROJECT ROUTE

Cable Section	Segment	Corridor Type	Approximate Length (miles)
United States/Canada Border to Alburgh, Vermont	Lake Champlain	Terrestrial	0.5
Lake Champlain at Alburgh, Vermont to Benson, Vermont	Lake Champlain	Aquatic	97.6
Benson east (along local roads) to Vermont Route 22A	Overland	Terrestrial	4.3
Vermont Route 22A south to U.S. Route 4 in Fair Haven	Overland	Terrestrial	8.2
U.S. Route 4 east to U.S. Route 7 in Rutland	Overland	Terrestrial	17.4
Route 7 south to Route 103, North Clarendon	Overland	Terrestrial	2.7
Vermont Route 103 south/southeast to Railroad ROW in Shrewsbury	Overland	Terrestrial	3.8
Green Mountain Railroad Corporation Railroad ROW south to Route 103 in Wallingford	Overland	Terrestrial	3.5
Route 103 ROW south/southeast to Route 100 in Ludlow	Overland	Terrestrial	10.6
Route 100 ROW north to Town Roads in Ludlow	Overland	Terrestrial	0.8
Ludlow town roads to proposed new HVDC Converter Station	Overland	Terrestrial	4.5
Proposed AC cable alignment from the new Converter Station in Ludlow to the existing VELCO Coolidge substation in Cavendish, Vermont along town roads	Overland	Terrestrial	0.6

Source: TDI-NE 2014b; updated in TRC 2015

The Vermont Public Service Board (VTPSB) must approve the siting of Vermont electric transmission facilities before site preparation or construction may begin. TDI-NE has completed all phases of the VTPSB approval process, including an evidentiary hearing on October 20, 2015, except for the filing of a post-hearing brief. The post-hearing brief must be filed by November 10, 2015. VTPSB will issue its decision after reviewing the brief. More information is available via www.necplink.com.

Aquatic Direct Current Transmission Cable

TDI-NE proposes to install transmission XLPE HVDC cables rated at +/- 300 to 320kV (depending upon the manufacturer) in the Lake Champlain Segment. The polyethylene insulation in the XLPE cable eliminates the need for fluid insulation, enables the cable to operate at higher temperatures with lower dielectric losses, improves transmission reliability, and reduces risk of network failure (TDI-NE 2014a). Underwater cable installation activities would be limited to certain times of the year to avoid life-cycle effects on aquatic species in the Project area. The majority of the transmission cables would be buried beneath the bed of Lake Champlain at depths of 3 to 5 feet to prevent unrelated aquatic operations in the waterways from disturbing the cables. In depths greater than 150 feet the cables are proposed to be laid on the bottom of the lake and self-burial is expected to occur unless cable crosses an existing utility or another cable. The actual burial depth would depend on factors such as the presence of existing infrastructure, the potential for anchor damage, the identification of archaeological or historic resources, local geological or topographical obstacles, or other environmental concerns. Burial depths would depend on available aquatic construction equipment, soil types and depth to bedrock, existing utilities, and the types of lake activities that occur in an area and their potential threat to cable integrity. Where the transmission cables cross an existing utility such as a pipeline or another cable, they would be laid over the existing utility, and articulated concrete mats would be installed over the cable crossing. Articulated concrete mats are typically small, pre-formed, concrete blocks that are

9 to 12 inches thick and are interconnected by cables or synthetic ropes in a two-dimensional grid ranging in size from 6 feet by 6 feet to 8 feet by 25 feet.

Horizontal Directional Drilling

TDI-NE would use horizontal directional drilling (HDD) to install the transmission cables in transition areas between aquatic and terrestrial portions of the Project route and to install cables under certain roadway or railway crossings in situations where trenching is not possible, or under environmentally sensitive areas such as lakes, rivers, wetlands, or archaeology sites. TDI-NE anticipates that the largest, most complex, HDD operation would occur at the two land-to-water transitions in Alburgh and Benson, Vermont.

At each proposed HDD location, two separate drill holes would be required, one for each of the cables. Each cable would be installed within a 10-inch-diameter, or larger, high-density polyethylene (HDPE), tube-shaped duct, or conduit. A minimum of 6 feet is required between each drill path to maintain appropriate separation between the cables. After the HDPE conduits are in place, the transmission cables are pulled through these pipes, which remain in place to protect the transmission cable.

For drilling operations extending from land into water, the directional drill would exit the ground in water at a depth sufficient to avoid affecting the littoral zone. To minimize turbidity in Lake Champlain associated with the HDD operation, TDI-NE may use a receiver casing. A large-diameter pipe segment would be pushed into the lake bottom at the planned HDD exit point. The slope of the exit shaft would be set at a grade suitable for the HDD exit slope. The HDD drill head would be steered into the bottom of the receiver casings and would continue up the shaft to the cable-laying barge. The shaft would be left in-place until the borehole is ready to receive the bore casing or cable. At that time, sediment and turbid water would be pumped out of the shaft into holding tanks on the barge, and the shaft would be removed and treated water released back into the lake.

As a potential alternative to receiver casings at the exit point of land-to-water HDD operations, a temporary rectangular cofferdam would be constructed at the offshore exit-hole location to reduce turbidity associated with the dredging and HDD operations and to help maintain the exit pit. The cofferdam would be approximately 16 feet by 30 feet with a dredged entry/exit pit typically 6 to 8 feet deep and would be constructed using steel sheet piles driven by a barge-mounted crane. The area inside the cofferdam would be excavated to create an exit pit at the water ward end of the borehole.

TDI-NE expects to employ at least three different sized HDD rigs on the Project, requiring staging areas of varying sizes depending on the length of the drill at the particular location, proximity to sensitive areas such as wetlands, access limits, and other constraints.

Terrestrial Direct Current Transmission Cable

The buried transmission line would begin at the United States and Canada border, continue into Alburgh (0.5 miles) and then approximately 56 miles from Benson to the proposed new HVDC converter station in the town of Ludlow, Vermont. The outer sheathing insulation of the underground transmission cables would be composed of an ultraviolet-stabilized, extruded polyethylene layer. The underground transmission cables would have an outside diameter of 4.5 inches, and each 1-foot length of cable would weigh approximately 30 pounds.

The two cables within the system typically would be laid side by side approximately 12 to 18 inches apart in a trench approximately 4 to 5 feet deep to provide for at least 3 feet of cover over the cables. After the cables are laid in the open trench, the trenches would be backfilled with low-thermal-resistivity material, such as well-graded sand to fine gravel, stone dust, or crushed stone. A protective cover of HDPE, concrete, or polymer blocks would be placed directly above the backfill material. A marker tape would then be placed 2 to 3 feet above the cables.

Installing underground transmission cables along existing ROWs (road and railroad) would be completed via trenching techniques along this portion of the route, and HDD installation would be used in certain areas. A typical staging area for construction equipment in a roadway ROW would be approximately 20 to 50 feet wide along one side of the roadway.

Trenchless technologies, such as HDD, horizontal boring, or pipe jacking, may be used where the transmission line would cross roadways, railroads, or significant environmental resources. Horizontal boring is similar to HDD but uses an auger-type drill head (i.e., a rotating screwshaped blade) to remove soil from the borehole. Pipe jacking involves pushing a casing pipe into the soil along the desired alignment and removing the soil from within the casing pipe (TDI-NE 2014a).

Ludlow HVDC Converter Station

The HVDC transmission cables would terminate at the proposed HVDC converter station in Ludlow, Vermont. The new Ludlow HVDC Converter Station would convert the electrical power from DC to AC. An underground HVAC line would run approximately 0.6 miles to connect to the nearby existing Coolidge Substation located in Ludlow and Cavendish, Vermont. The "compact type" new HVDC converter station would have a total site footprint (i.e., building and associated areas and equipment) of approximately 4.5 acres, although the cleared area could be approximately 10 acres due to required grading, laydown areas, construction trailers, and setbacks. The main building would be approximately 165 feet by 325 feet with a height of approximately 52 feet. The new HVDC converter station would be powered by electricity taken directly from the proposed NECPL Project. The facility would not require onsite personnel during normal operations.

TDI-NE controls the property for the proposed new HVDC converter station which is adjacent to previously disturbed farmland and an overhead transmission line corridor.

Coolidge Substation Interconnection

The new Ludlow HVDC Converter Station would deliver its energy by underground cable to the existing Coolidge 345-kV substation, which is located on an approximately 6-acre parcel owned by VELCO. The Coolidge Substation is the Project's point of interconnection with the ISO-New England transmission system.

Additional Engineering Details – Heat

The operation of the transmission cables would result in the generation of heat, which reduces the electrical conductivity of the cables; therefore, before laying the cables, the trenches would be backfilled with low-thermal-resistivity material, such as sand, to prevent heat from one cable from affecting a nearby cable. Should circumstances dictate that debris be removed from the lake and disposed of on land, disposal would be arranged in accordance with applicable federal, state and local codes, regulations and guidelines. A protective layer of weak concrete or a similar protective material would be installed directly above the backfill material. A marker tape would be placed 2 to 3 feet above the cables. The top of the soil covering the trench might be slightly crowned to compensate for settling.

Additional Engineering Details – Electric and Magnetic Fields

For electrical transmission lines, EMF levels decrease with increasing distance from the line. The EMF strength is inversely proportional to the square of the distance from the transmission line; however, when HVDC cables are close to each other, the opposing magnetic fields substantially cancel each other. Over time, magnetic fields produced by DC sources are constant, but those produced by AC sources vary in both magnitude and polarity. Since DC magnetic fields are static, they do not induce currents in surrounding stationary objects or humans (NIEHS 2002; Vitatech 2012). The proposed NECPL cable would carry DC. Electrical fields are measured in units of kilovolts per meter (kV/m), and magnetic fields are measured in unit of gauss (G). This EIS discusses magnetic field strength in units of milligauss (mG), or one thousandth of a G. Common household devices produce EMFs when they are connected to a source of electricity. Modern lifestyles rely upon a suite of electronic devices contributing to the baseline or natural background exposure to EMFs.

Results of a numerical study that calculated the expected magnetic field within the Lake Champlain Segment suggest that the fields would diminish quickly with distance from the transmission cable (Exponent 2014a). At 10 feet from the cables, the expected magnetic field deviation would be only 10 percent of the ambient background geomagnetic level, and at 25 feet the deviation would be only 1 percent of the ambient level (Exponent 2014). The strongest magnetic field expected anywhere along the submarine portion of the route is predicted to occur 1 foot above the lakebed (Exponent 2014). The level produced would be approximately 0.1 percent of the general public exposure limit of 4,000,000 mG recommended by the International Commission for Non-Ionizing Radiation Protection (ICNRP). The risk to public health and safety from EMFs during the operation and maintenance of the proposed transmission cable is so small that it is practically zero.

S.6.1. Construction and Schedule

TDI-NE anticipates that the permitting phase of the proposed NECPL Project could continue through mid-2016, with major construction commencing in 2018. Installation of the cables is proposed to be completed between 2016 and 2018.

S.6.1.1. Aquatic Transmission Cable Installation

The general sequence for installing the aquatic DC transmission cables would be as follows:

- pre-installation clearing
- cable installation
- post-installation survey

To the extent practical, the aquatic transmission cables would be buried in Lake Champlain to a target depth of between 3 and 5 feet, or the maximum reasonably attainable depth. Factors that may influence attainable depth include the lakebed bedrock and substrate. The first step in the installation of the aquatic transmission cables would involve clearing the proposed route of debris (e.g., logs, out-of-service cables) by dragging various types of grapnels (i.e., a long sliding prong, a series of giffords[6], and a series of rennies[7]) along the route. The specific type of grapnels to be utilized would be determined prior to construction in consultation with the contractor (TRC 2015). The next step would be installing the transmission cables using either a jet plow or a shear plow. The two HVDC underwater cables associated with the Project would be bundled and laid together within the same trench. The cables would be initially placed in a vertical position (one on top of the other) in the trench, although sediment conditions could allow for slumping into a horizontal position (side-by-side) relative to each other (TRC 2015). Cable burial would generally be performed at the same time the cable is laid or at

[6] A gifford grapnel is composed of units of four hooks at right angles to each other. The hooks resemble a crane hook with a broad hookseat to form a cup to hold the hooked cable. It can be used on any type of bottom but was originally designed for rocky or coral environments. Often used in tandem with a rennie grapnel.

[7] The rennie chain Grapnel is built of flat links, each having a double fluke bolted to it; links are shackled together in sets of four in the form of a chain, successive links and flukes being at right angles to each other. The Rennie chain grapnel can be used on any type of seabed but was originally designed for rocky environments. It is normally used with a set of Gifford grapnels to provide weight and back-up for varying seabed conditions.

a later date, as deemed appropriate or necessary due to subsurface conditions. The cables would be laid by a specially outfitted lay-barge.

The plowing process would be conducted using either a dynamically positioned cable ship or a positioned cable barge towing a plow device that simultaneously lays and embeds the aquatic transmission cables in a trench. If a barge is used, it would propel itself along the route with its forward winches; other moorings would hold the alignment during the installation. A four-point mooring system would allow a support tug to move the anchors while the installation and burial proceeds. A dynamically positioned cable ship would use thrusters and a propulsion system to tow the plow without the use of anchors.

The skid-mounted plow would be towed by the barge or cable ship because it has no propulsion system. The transmission cables would be deployed from the vessel to a funnel device on the plow. The plow would be lowered to the lakebed, and the plow blade would cut into the lakebed while it is towed along the pre-cleared route for a simultaneous lay-and-bury operation. The plow would then bury both cables in the same trench.

The buried aquatic cable in the northern part of Lake Champlain would be installed using water-jetting techniques. The water-jetting process uses jets of pressurized water to fluidize the sediments. The jet plow is fitted with hydraulic pressure nozzles that create a downward and backward flow within the trench, allowing the transmission cable to settle into the trench under its own weight before the sediment settles back into the trench.

A shear plow would be used to install portions of the transmission line route where the sediment stiffness is low and the waterway is narrow, which is expected to be in the southern portion of Lake Champlain. For the shear plowing technique, the plow is tethered to a surface support vessel that tows the plow along the lakebed. The plow creates a trench approximately 2 feet wide and 3 to 5 feet deep where the cables will settle. In limited areas along the aquatic route, the necessary burial depths for the protection of the transmission cables might not be achievable due to geology (e.g., areas of bedrock) or existing submerged infrastructure (e.g., other electric cables, natural gas pipelines). In these instances, the transmission cables would be buried as deep as possible or simply laid on the lake bottom and covered with articulated concrete mats for protection.

Both water jetting and mechanical plowing (i.e., jet plow and shear plow) would displace lakebed sediment within a narrow trench, which would permit the transmission cables to sink under their own weight. The displaced sediment would settle, and the trench would refill naturally following the installation of the transmission cables. The bottom area directly disturbed by water jetting or mechanical plowing varies depending upon sediments and depth of installation but would encompass a range from 12 to 16 feet in width depending on the width of the installation device (TDI-NE 2014a).

Given the limitations on barge size and the amount of transmission cable that could be carried on board, TDI-NE estimates that the cable-laying vessel would be able to carry approximately 15 miles of cable. This would result in approximately 8 segments that would require 16 splices for the 2 HVDC cables for the approximately 98-mile-long aquatic portion of the Lake Champlain Segment.

S.6.1.2. TERRESTRIAL DIRECT CURRENT TRANSMISSION CABLE INSTALLATION

The general sequence for installing the underground terrestrial DC transmission cables along road ROWs would be as follows:

- survey work, initial clearing operations (where necessary), and stormwater and erosion control installation;
- trench excavation;
- cable installation and splicing;
- backfilling; and
- restoration and revegetation.

Most of the supplies and equipment required for installing terrestrial transmission cable within the typical trench would be up to 4 feet wide at the top and approximately 4 to 6 feet deep to allow for proper depth and the 1-foot separation required between the two transmission cables to allow for heat dissipation (TDI-NE 2014a).

The underground transmission cables would require several joints; a flat pad would be installed under each joint for splicing activities. The number of joints would be determined either by the maximum length of cable that could be transported or by the maximum length of cable that could be pulled. The jointing would be performed in a jointing pit; typical segment lengths would range from 0.1 to 0.5 miles. The Overland Segment of the transmission line within the road ROWs could require more than 200 splices as part of the installation process. Along the road ROWs in normal terrain, where soil conditions range from organic, loam, sand, gravel, or other unconsolidated material, the trench would be excavated using wheeled or tracked construction vehicles where possible.

Along road ROWs, the transmission cables would be installed in the cleared area; where that is not possible due to constraints the cables would be installed under the road. If forested areas exist within the ROW, minor clearing would occur. If shallow bedrock is encountered, the rock would be removed by the most suitable technique given the relative hardness, fracture susceptibility, and expected volume of material. TDI-NE's preferred approach is mechanical removal. If that is not possible, then TDI-NE would evaluate alternatives, including a more shallow cable installation with enhanced concrete or steel cover protection, an increase in the amount of cover (if the changed topography is not problematic), or blasting to achieve the standard depth. Blasting, if needed, would be conducted only to the extent necessary to remove rock to allow the cables to be buried.

Six construction methods are proposed for installing the transmission line across waterbodies and small streams, although TDI-NE will consider others (VHB 2015[8]):

- **Aerial Crossing**. At aerial crossings, the transmission cable would be suspended above the stream being crossed in two locations where the fascia of an existing bridge or the headwall of an existing culvert provides a suitable face for attachment and the structure owner allows this configuration.
- **At Culvert Crossing**. Where feasible, the Project proposes to complete “At Culvert” crossings by excavating a trench within the roadway or within the embankment adjacent to the roadway and installing the transmission cable a minimum of five feet beneath the existing culvert.
- **Over Culvert Crossing**. At over culvert crossings, the proposed cable would be installed in the roadway embankment above an existing culvert.
- **Duct Bank Crossing.** At one location, a duct bank is proposed to be installed beneath the road surface in conjunction with a Vermont Agency of Transportation (VTrans) roadway improvement project.

[8] http://www.necplink.com/regulatory-documents.php

- **HDD.** Using this method, cable conduits would be installed under the streambed, avoiding any disturbance of the streambed, and the cables would then be pulled through the conduits.
- **Open Trench Excavation.** The open cut method of construction involves deploying temporary in-stream flow diversion structures, digging an open trench excavation (OTE) across the stream channel, installing the transmission cable, backfilling with suitable materials, and restoring the stream bank and channel bottom. This category includes dam and pump crossing and open cut.

The specific stream crossing method would be selected with prior approval from state and federal agencies as required by permit conditions

Ephemeral and intermittent streams that are dry at the time of crossing would be crossed only by the open-cut method with prior approval from state and federal agencies as required by permit conditions.

In wetland areas, the transmission cables would be installed by trenching. The typical sequence of activities would include clearing vegetation, installing erosion controls, trenching, installing cable, backfilling, and restoring the ground surface. TDI-NE notes that they cannot commit at this time to having the trench plugs remain in place until they receive guidance from state agencies as to what materials they might require be used. The trench plugs cannot be left in place if they could present a heat dissipation issue during operations. Equipment mats or low-ground-pressure, tracked vehicles would be used to minimize compaction and rutting. To expedite revegetation of wetlands, the top 1 foot of wetland soil would be stripped from over the trench, retained, and subsequently spread back over and across the backfilled trench area to facilitate wetland regrowth by maintaining physical and chemical characteristics of the surface soil and preserving the native seed bank. Trench plugs or other methods would be used to prevent draining of wetlands or surface waters into the trench.

The permanent ROW required for maintenance and operation of the transmission line along the terrestrial portions of the Project route would be approximately 12 feet wide along roadway ROWs. The permanent ROW would provide protection of the transmission cables against third-party damage and facilitate any required maintenance or repair. The transmission cables within the trench generally would be separated by a distance of approximately 1 foot.

Measures to Minimize Environmental Impacts

TDI-NE developed industry-accepted Best Management Practices (BMPs) and other environmental mitigation measures that it would implement before and after construction and during construction to minimize environmental impacts. Those plans and BMPs are discussed in ***Section 5*** of the EIS.

Operations and Maintenance

The proposed NECPL Project has an expected life span of 40 years or more. The HVDC and short sections of HVAC transmission cables are designed to be relatively maintenance-free and operate within the specified working conditions. Selected portions or aspects of the transmission system would be inspected to ensure equipment integrity is maintained (TRC 2015).

ROW Maintenance

During Project operation, TDI-NE proposes to clear vegetation on an as-needed basis within the 12-foot wide Project corridor, over the transmission cables. Vegetation management would include mowing, selective cutting to prevent the establishment of large trees (i.e., greater than 20 feet tall) directly over the trenched transmission line, and vegetation clearing on an as-needed basis to conduct repairs.

Decommissioning

Decommissioning of the Project transmission system would consist of de-energizing and abandoning the transmission cables in place. If decommissioning plans change, applicable regulations at the time of decommissioning would be met (DOE 2014).

S.7 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER DETAILED ANALYSIS

S.7.1. Collocating the Cables

Some stakeholders requested that TDI-NE consider collocating the CHPE and NECPL cables in a single trench. Collocating the cables would significantly increase the probability of a single, common mode failure[9] that could cause the outage of both cables. The loss of the two cables would result in the deficit of 2,000-MW of energy resources to eastern New York and New England. The reliability consequence of such a contingency was first studied with the proposal to construct a 2,000-MW HVDC from Raddison, Quebec, to Sandy Pond, New Hampshire, commonly called the New England Phase II HVDC transmission line. The Mid-Atlantic Area Council, East Central Area Reliability, and Northeast Power Coordinating Council (MEN) studied the issue extensively because the potential loss of 2,000-MW in eastern New York and New England would cause a major blackout in the three reliability regions. The results of the studies led to an inter-Area (PJM[10], NY, NE) operating procedure that limits the transfer on the Phase II HVDC line (ISO-New England). Thus, the two projects' cables are being proposed to be constructed in separate trenches with sufficient separation to preclude the single, common-mode outage of both sets of cables (TDI-NE 2014a).

S.7.2. Other Alternatives

TDI-NE evaluated several alternatives relative to the Project's purpose, need, and geographic requirements, as well as the practicability and environmental consequences of each alternative. A summary of the practical alternatives to the Project and a discussion of the potential environmental impacts of each alternative (TDI-NE 2014a) is presented in ***Appendix D***.

S.7.3. Conservation and Demand Reduction Measures

The energy demand forecasts for ISO-New England anticipate a 10-year growth rate of 1.3 percent a year for the summer peak demand, 0.6 percent a year for the winter peak demand, and 1.0 percent a year for the annual use of electric energy. Although demand is anticipated to grow relatively slowly, the *Regional System Plan* identifies the need for additional reliable capacity and fuel certainty. New England has become an "energy constrained system" due in part to heavy dependence on natural-gas-fired generation and the planned retirement of more than 4,000-MW of resources between June 2014 and June 2017 (ISO-NE 2014). The proposed NECPL Project would help address the needs and future goals identified in the *Regional System Plan.*

S.7.4. Transmission Technologies

Transmission technologies for HVDC can transport electricity from Canada to the New England area. The transmission technology that is selected greatly influences the system design, construction, and the resulting potential environmental effects (DOE 2014). The DOE analyzed the two types of transmission technologies in the CHPE FEIS (Chapter 2, Section 2.5.4, pp2-48 to 2-50); therefore,

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[9] Common mode failure is when one event causes multiple systems to fail.

[10] PJM refers to Pennsylvania, New Jersey and Maryland

because the technology proposed for the Project is identical to that previously analyzed, the description of the technologies and advantages of each are incorporated herein by reference.

S.8 SUMMARY OF POTENTIAL EFFECTS ASSOCIATED WITH THE PROPOSED NECPL PROJECT

A summary of potential effects from the construction, operation, maintenance, and emergency repairs associated with the Proposed NECPL Project and the No Action Alternative are presented in ***Table S-2.*** The full impact analysis is presented in ***Section 5*** (Environmental Consequences) and ***Section 6*** (Cumulative Impacts) of the EIS.

While no specific alternative power generation sources have been identified under the No Action Alternative, it is assumed that future demand growth for electric power would be met by a mix of other power generation sources. The No Action Alternative is presented in ***Section 4*** of the EIS.

TABLE S-2. SUMMARY OF POTENTIAL EFFECTS OF THE PROPOSED NECPL PROJECT

	Proposed NECPL Project		
	Lake Champlain Segment	**Overland Segment**	**No Action Alternative**
State	Vermont	Vermont	Vermont
Counties	Grand Isle, Chittenden, Addison, Rutland	Rutland, Windsor	N/A
Milepost Range	0.0 to 97 (Canada to Alburgh to Lake Champlain to Benson)	98 to 154 (Benson Overland to Ludlow)	N/A
Corridor Type	Aquatic; limited terrestrial	Terrestrial	N/A
Construction Method	Trenching; HDD for Alburgh to Lake Champlain; diver lay, jet plow; shear plow; bottom lay HDD from Lake Champlain to Benson.	Trenching; HDD; blasting; jack and bore.	N/A
Construction Period	Cable installation: 7 months.	Cable installation: 18 months to 2 years.	N/A
Effects on Resource Areas from Project Construction, Operation and Maintenance (O&M), and Repairs			
Land Use	**Construction**: Minor, temporary displacement of vessel traffic. **O&M/Repairs**: Minimal effects on navigation and no effect to anchorage areas, which would be avoided; potential for minimal disruption of commercial and recreational use of lake.	**Construction**: Temporary disturbance of surrounding land uses along road ROWs; traffic patterns may be temporarily changed (e.g., detours, closures); temporary staging areas would be limited to ROWs to the extent possible and additional work space sited outside of ROW would have a temporary conversion from current use to construction use; all areas would be regraded and revegetated. **O&M/Repairs**: No effect on land uses.	No new land use effects would occur.

	Proposed NECPL Project		
	Lake Champlain Segment	**Overland Segment**	**No Action Alternative**
Transportation and Traffic	**Construction**: Potential short-term effect on ferry operations and commercial and recreational use of lake when ferry guidance cables are removed; timing with ferry cable maintenance outages would reduce any adverse impacts; no effect on any federal navigation channels or anchorage areas. **O&M/Repairs**: Potential for anchor snags is likely to be insignificant and location of transmission cable would be placed on navigation chart; barges may affect commercial and recreational use temporarily.	**Construction**: Local, temporary disturbances within the ROW; temporary increase in truck traffic along Project route roads especially during construction of the new Ludlow Converter Station (average 50 trucks per day). **O&M/Repairs**: No adverse effects anticipated because cable would be underground and within existing road and railroad ROWs; emergency repairs would be similar to construction but on a much smaller scale and duration.	No new effects on transportation and traffic would occur.
Water Quality	**Construction**: Temporary, minor increase in turbidity and resuspension of sediments from trenching and lakebed disturbance; increased turbidity may reduce light levels and oxygen levels; phosphorus concentration levels would temporarily increase at cable installation points; effects on water quality would be within limits of Vermont standards; no effect on groundwater. **O&M/Repairs**: Minimal heat transfer effects-0.9 degrees F immediately above the cable; for bedrock and self-burial installation configuration, temporary increase in water temperature of 1 degree F but would be in the normal water temperature fluctuations in Lake Champlain.	**Construction**: Minor, temporary increases in erosion and run off into surface waters during construction; minor temporary increase in turbidity in groundwater quality due to blasting and could increase bedrock fracturing. **O&M/Repairs**: No adverse effects.	No new effects on water quality would occur.

	Proposed NECPL Project		
	Lake Champlain Segment	**Overland Segment**	**No Action Alternative**
Aquatic Habitats and Species	**Construction**: Temporary minor increases in turbidity and sedimentation from dragging grapnel and jet and shear plowing; minor, temporary effects on submerged aquatic vegetation (SAV) in southern portion of the cable route; temporary increases in total suspended solids (TSS), reduction in prey, and releases of hydrocarbons may cause minor effects on fish, especially in shallower zones. Approximately 2.5 acres would be covered in concrete mats. **O&M/Repairs**: Insignificant effect of EMFs and increased temperature from cable.	**Construction**: Minimal effects due to resuspension of sediments and increased turbidity; the proposed Project would cross 11 named streams and 39 unnamed tributaries (perennial streams) and Lake Bomoseen. **O&M/Repairs**: Negligible effect of EMFs and increased temperature from cable.	No new effects on aquatic habitats and species would occur.
Aquatic Protected and Sensitive Species	**Construction**: No aquatic federal threatened and endangered species are present; local, temporary, minor effects on state-listed species from noise and increased sedimentation; sediment quality would be within Vermont standards; use of concrete mats represent approximately 4 percent of total cable coverage (2.5 acres) and would not affect habitat for state listed Lake sturgeon and overall construction would not create a barrier to Lake sturgeon migration into rivers for spawning. No anticipated effect from EMFs since only 4 percent of underwater cable would be atop the lakebed. **O&M/Repairs**: No aquatic federal threatened and endangered species are present; emergency	**Construction**: No aquatic federal threatened and endangered species are present in the Overland Segment; state listed Lake sturgeon in streams along the Overland Route could be temporarily affected through sediment disturbance and increased turbidity. No effect from EMFs. **O&M/Repairs**: Effects on state-listed species similar to those described for non-protected aquatic habitats and species.	No new effects on aquatic protected and sensitive species would occur.

	Proposed NECPL Project		
	Lake Champlain Segment	**Overland Segment**	**No Action Alternative**
	repairs would have effects similar to those of construction but would involve a smaller area over a shorter period.		
Terrestrial Habitats and Species	**Construction**: Minor temporary effect on vegetation in the Alburgh section of the cable route-removal of vegetation and trampling caused by construction equipment; no existing forest would be temporarily disturbed or permanently converted; noise associated with construction may cause temporary avoidance of forage, roosting, and nest areas near construction corridor, no EMF effects are anticipated. **O&M/Repairs**: No effects from operations anticipated because the cables would be buried. Temporary, minor effects associated with noises generated by maintenance activities (i.e., mowing in the ROW and human activity).	**Construction**: Temporary and permanent removal of some vegetation, including trampling during construction (e.g., soil excavation, soil compaction); some minor, temporary disturbance of forested areas, particularly in the fringe habitat near ROWs; conversion of 5.51 acres of forested habitat to herbaceous communities (0.74 acres permanently converted); blasting may result in temporary adverse effects on birds and wildlife that would avoid the foraging areas; one area of deer wintering area habitat (0.32 acres) would be affected. **O&M/Repairs**: Increases in soil temperature may cause minor alterations of terrestrial vegetation; mowing and maintenance may temporarily displace wildlife; occasional clearing of trees along the permanent project corridor would occur.	No new effects on terrestrial habitats and species would occur.
Terrestrial Protected and Sensitive Species	**Construction**: Noise from construction may have a temporary adverse effect on bald eagles and bats that may temporarily avoid foraging	**Construction**: No adverse effect on bald eagles, the Indiana bat, or northern long-eared bat; no adverse	No new effects on terrestrial protected and

	Proposed NECPL Project		
	Lake Champlain Segment	**Overland Segment**	**No Action Alternative**
	areas near construction; migratory waterfowl could be temporarily affected by construction noise-anticipated to occur for short duration at any one location. **O&M/Repairs**: Effects would be minimal and temporary as a result of watercraft performing the maintenance or emergency services which may displace birds, bats and waterfowl.	effect on state-listed rattlesnakes or eastern rat snake due to protective measures; no adverse effect on sandpipers; limited loss of woodlands and migratory bird habitat; no EMF effects on terrestrial species are anticipated. **O&M/Repairs**: No anticipated effects.	sensitive species would occur.
Wetlands	**Construction**: Two wetlands are associated with Alburgh portion of the route but both would be avoided so there would be no effect on terrestrial wetlands. **O&M/Repairs**: No effect.	**Construction**: No direct permanent impacts (i.e., permanent wetland fills) are proposed; temporary direct effects on 4.5 acres; 0.74 acres of permanent effects within the proposed Project corridor potentially resulting in habitat disturbance and alteration of local wetland hydrology and reduction of wetland function; there would be some limited clearing of palustrine forested (PFO) wetlands that overlap the Permanent Project Corridor. Clearing in PFO wetlands would result in conversion of these wetlands to palustrine emergent (PEM) or palustrine scrub-shrub (PSS) wetlands. **O&M/Repairs**: No significant effects on wetland species and function. No	No new effects on wetlands would occur.

	Proposed NECPL Project		
	Lake Champlain Segment	**Overland Segment**	**No Action Alternative**
		anticipated effects from increased temperatures.	
Geology and Soil	**Construction**: Temporary disturbance of 119 to 179 cubic yards of sediment in the cofferdam area if used; temporary, minor sediment disturbance if receiver casings is used; grapnel clearing may result in temporary disturbance to sediments; proposed Project would not affect bedrock layer as it would not be permeated to install the cable. **O&M/Repairs**: No maintenance is expected; effects of repairs would be similar to those of construction, except in a much smaller area.	**Construction**: Temporary, local effects on soil including erosion, sedimentation, and potential compaction and increased runoff; 4-5 acres (10 total acres due to grading) would be permanently cleared for the new Ludlow Converter Station; potential local effects on bedrock due to blasting, if needed. **O&M/Repairs**: May be a slight elevation in soil temperature immediately surrounding the cable but no adverse effects are anticipated.	No new effects on geology and soils would occur.
Cultural Resources	**Construction**: May adversely affect 3 known underwater archaeological sites, 2 of which are eligible for National Register of Historic Places (NRHP); the DOE is working with the VTSHPO to avoid, minimize, or mitigate any potential adverse effects. **O&M/Repairs**: No adverse effects anticipated.	**Construction**: May adversely affect 23 properties that are listed in the state register or NRHP; 4 known terrestrial sites; revised Overland Segment route specifically avoids historic village; potential to adversely affect properties not previously identified or listed. The DOE is working with VTSHPO to avoid, minimize, or mitigate any potential any effects. **O&M/Repairs**: No adverse effects.	No new effects on cultural resources would occur.
Infrastructure	**Construction**: No effect on local infrastructure anticipated; some excess soils would be disposed of at local solid waste management facility.	**Construction**: No anticipated effects on infrastructure.	No new effects on infrastructure would occur.

	Proposed NECPL Project		
	Lake Champlain Segment	**Overland Segment**	**No Action Alternative**
	O&M/Repairs: No effect on local infrastructure anticipated, including EMF effects on communications infrastructure.	**O&M/Repairs**: No anticipated effects on infrastructure, including EMF effects on communications infrastructure.	
Recreation	**Construction**: Short-term displacement of recreational users during construction; temporary closure of fishing platform in Alburgh; temporary delay or interruption of ferry operations; no adverse effects from EMFs; however, boaters may see a small deviation if using a compass; global positioning system (GPS) would not be affected. **O&M/Repairs**: Minimal effects if repairs are needed; repairs probably would be restricted to a small geographic area; no permanent aboveground facilities would be constructed; no adverse effects on recreationists or recreational activities are anticipated from EMFs.	**Construction**: Short-term, temporary disturbances of recreational facilities and access near the Project route, especially cyclists using the roads along the construction route. **O&M/Repairs**: No adverse effects anticipated from EMFs.	No new effects on recreation use and access would occur.
Public Health and Safety	**Construction**: Minor effects on contractors' health and safety; no effects on general public health and safety; no adverse effects from EMFs. **O&M/Repairs**: Potential health and safety risks to contractors during operations; emergencies, if any, would be brief (i.e., less than 30 days) and local.	**Construction**: Minor effects on contractors' health and safety; no effects on general public health and safety; no adverse effects from EMFs. **O&M/Repairs**: Potential health and safety risks to contractors during operations; emergencies, if any, would be brief (i.e., less than 30 days) and local.	No new effects on public health and safety would occur.
Noise	**Construction**: Local temporary increases in noise (i.e., 1 hour peak of up to 80 dBA at 35	**Construction**: Local temporary increases in noise during cable	No new effects on noise from construction,

	Proposed NECPL Project		
	Lake Champlain Segment	**Overland Segment**	**No Action Alternative**
	feet) during cable installation but is limited to those areas where the cable enters and exits Lake Champlain; boaters may notice the increase in noise across the water; waterfowl and other birds would likely relocate temporarily away from construction noise. **O&M/Repairs**: No adverse effects of operation; temporary noise increases during maintenance, localized to specific geographic area.	installation; noise increases in the ROW probably would not be noticeable due to existing traffic and activity; temporary adverse effect of blasting on local area which would be temporary and expected to be a rare occurrence. **O&M/Repairs**: No adverse effects of operation; temporary noise increases during maintenance, localized to specific geographic area.	operation and maintenance would occur.
Hazardous Materials	**Construction**: Hazardous materials used in construction equipment present the potential for spill contamination of water or land in staging areas and could have a temporary adverse impact on water quality and sediments. **O&M/Repairs**: Minimal amount of oils, solvents, and other hazardous materials from operations and potential emergency repairs.	**Construction**: Cables do not contain hazardous fluids - no effect on soils; storage and use of hazardous materials during construction presents the potential for spill contamination in staging areas and in the ROW. **O&M/Repairs**: Minimal amount of oils, solvents, and other hazardous materials from operations and potential emergency repairs.	No new effects from hazardous materials and wastes would.
Air Quality	**Construction**: Minor, local, temporary effects of use of diesel-powered engines, heavy equipment, barges, boats and generators; associated emissions of greenhouse gases (GHG) (9.9 tons per year).	**Construction**: Local, temporary effects of use of diesel powered engines, heavy equipment, and generators; associated emissions of GHG (4.5 tons per year) and fugitive dust. This represents a decrease over existing conditions.	No new effects from air quality would occur. GHG emissions would continue to occur at the present rate.

	Proposed NECPL Project		
	Lake Champlain Segment	**Overland Segment**	**No Action Alternative**
	O&M/Repairs: Effects of repairs would be less than those of construction; no violation of air quality standards.	**O&M/Repairs**: Effects of repairs would be less than those of construction; no violation of air quality standards. Operation of the Project is expected to decrease New England power plant emissions of carbon dioxide (“CO_2”), the primary constituent of GHGs by 32.9 million tons, equivalent to an 8.6% reduction, over a ten year study period; however, very little of that reduction would occur in Vermont, reflecting the limited in-state fossil-fueled generation.	
Socioeconomics	**Construction**: Minor, temporary increase in jobs in Vermont; no effect on population; no effects on children. **O&M/Repairs**: Employment in operation phase would be lower than in construction phase; tax payments to local towns and lease payments would provide funding to local economy; overall reduction in wholesale electric energy market prices.	**Construction**: Minor, temporary increase in jobs in Vermont; no effect on population or permanent housing or children. **O&M/Repairs**: Employment in operation phase would be lower than in construction phase; tax payments to local towns and lease payments would provide funding to local economy; overall reduction in wholesale electric energy market prices.	No new effects on socioeconomic resources would occur.

	Proposed NECPL Project		
	Lake Champlain Segment	**Overland Segment**	**No Action Alternative**
Environmental Justice	**Construction**: No disproportionate effect on minority or low-income populations. **O&M/Repairs**: No effect on minority or low-income populations.	**Construction**: No disproportionate effect on minority or low-income populations. **O&M/Repairs**: No effect on minority or low-income populations.	No new effects on environmental justice would occur.