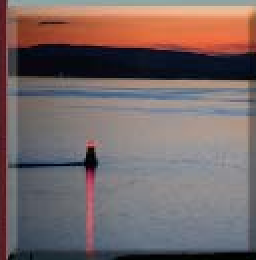


DOE/EIS-0447

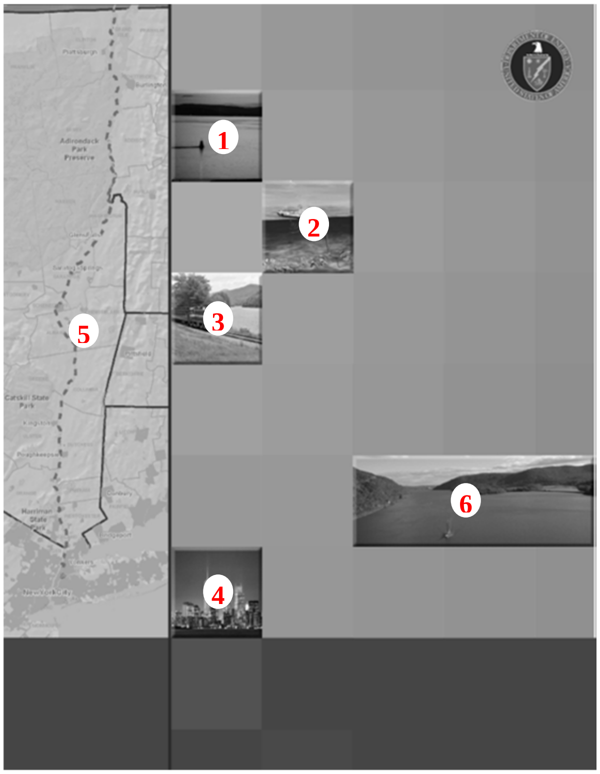
Final

Champlain Hudson Power Express Transmission Line Project Environmental Impact Statement

Volume I: Impact Analyses

U.S. Department of Energy
Office of Electricity Delivery and Energy Reliability
Washington, DC

August 2014



COVER PHOTO CREDITS:

1. Lake Champlain at sunset obtained from Wikipedia.com
2. Cable-laying vessel courtesy of CHPEI
3. Upper Hudson River Railroad obtained from sncrr.com
4. New York City skyline and new World Trade Center obtained from wtc.com
5. Project route courtesy of CHPEI
6. Hudson River courtesy of CHPEI

FINAL

CHAMPLAIN HUDSON POWER EXPRESS TRANSMISSION LINE PROJECT ENVIRONMENTAL IMPACT STATEMENT

Volume I: Impact Analyses

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. FISH AND WILDLIFE SERVICE
U.S. COAST GUARD
NEW YORK STATE DEPARTMENT OF PUBLIC SERVICE
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AUGUST 2014

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 (USEPA), U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Fish and Wildlife Service, New York State Department of Public Service, New York State Department of Environmental Conservation

TITLE: Champlain Hudson Power Express Transmission Line Project Environmental Impact Statement (EIS)

LOCATION: Clinton, Essex, Washington, Saratoga, Schenectady, Albany, Greene, Ulster, Dutchess, Orange, Putnam, Rockland, Westchester, Bronx, New York, and Queens counties in New York State

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ABSTRACT: Champlain Hudson Power Express, Inc. (CHPEI) has applied to the DOE for a Presidential permit to construct, operate, maintain, and connect a 336-mile (541-kilometer) electric transmission line across the international border between the United States and Canada, near the town of Champlain, New York. This EIS addresses the potential environmental impacts of the proposed transmission line (Preferred Alternative) and the No Action Alternative. The proposed transmission line would include both aquatic (underwater) and terrestrial (primarily underground) segments. The underwater portions of the transmission line would be buried in the beds of Lake Champlain and the Hudson, Harlem, and East rivers, and the terrestrial portions would be buried, principally in railroad and roadway rights-of-way. The transmission system would consist of one 1,000-MW, high-voltage direct current transmission line and ancillary aboveground facilities (e.g., cooling stations). The transmission line would be a bipole consisting of two transmission cables. A new converter station in Queens, New York, would convert the electrical power from direct current to alternating current and then interconnect with the New York City electrical grid at two points.

PUBLIC COMMENTS: In preparing this Final EIS, DOE considered comments received during the scoping periods (June 18, 2010, through August 2, 2010, and April 30, 2012 through June 14, 2012) and public comment period on the Draft EIS (November 1, 2013, through January 15, 2014). Comments on the Draft EIS were accepted during the 45-day period following publication of USEPA's Notice of

Availability (NOA) in the *Federal Register* on November 1, 2013; the public comment period was extended for an additional 30 days until January 15, 2014. DOE held four public hearings on the Draft EIS in Queens and Stony Point, New York, on November 18, 2013; Albany, New York, on November 19, 2013; and Plattsburgh, New York, on November 20, 2013. All comments were considered during preparation of this Final EIS. Appendix P in Volume III of this EIS contains the comments received on the Draft EIS and DOE's responses to these comments. 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. Volumes III and IV are entirely new parts of this EIS; therefore, they do not contain bars indicating changes from the Draft EIS.

The EIS analyzes the potential environmental impacts of DOE issuing a Presidential permit for the proposed CHPE Project, which is DOE's proposed Federal action (Preferred Alternative). DOE will use the EIS to ensure that it has the information it needs for informed decisionmaking. Copies of the Final EIS are available for public review at seven local libraries as noted in **Appendix E** of the Final EIS or a copy can be requested from Mr. Brian Mills. The EIS also is available on the proposed CHPE Project EIS Web site (http://www.chpexpresseis.org). 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 the USEPA publishes the NOA of the Final EIS.

FINAL
CHAMPLAIN HUDSON POWER EXPRESS TRANSMISSION LINE PROJECT
ENVIRONMENTAL IMPACT STATEMENT

VOLUME I: IMPACT ANALYSES

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Summary

S.1 Background

On January 25, 2010, Champlain Hudson Power Express Incorporated (CHPEI) applied to the U.S. Department of Energy (DOE) for a Presidential permit in accordance with Executive Orders (EOs) 10485 and 12038, and 10 Code of Federal Regulations (CFR) 205.320 *et seq*. The Presidential permit, if issued, would authorize CHPEI to construct, operate, maintain, and connect the U.S. portion of an electric transmission line that would cross the international border between the United States and Canada near the town of Champlain, New York.

The proposed Champlain Hudson Power Express (CHPE) Transmission Line Project (proposed CHPE Project) would be an approximately 336-mile (541-kilometer [km])-long, 1,000-megawatt (MW), high-voltage merchant electric power transmission system that includes a transmission line that would extend to Astoria, Queens, New York (see **Figure S-1**). The system would include the transmission line, transmission line cooling stations at certain locations along the route, a direct current (DC) to alternating current (AC) converter station, and high-voltage alternating current (HVAC) interconnections from this converter station to the New York Power Authority (NYPA) Astoria Annex and the Consolidated Edison Company of New York, Inc. (ConEd) Rainey substations in Queens.

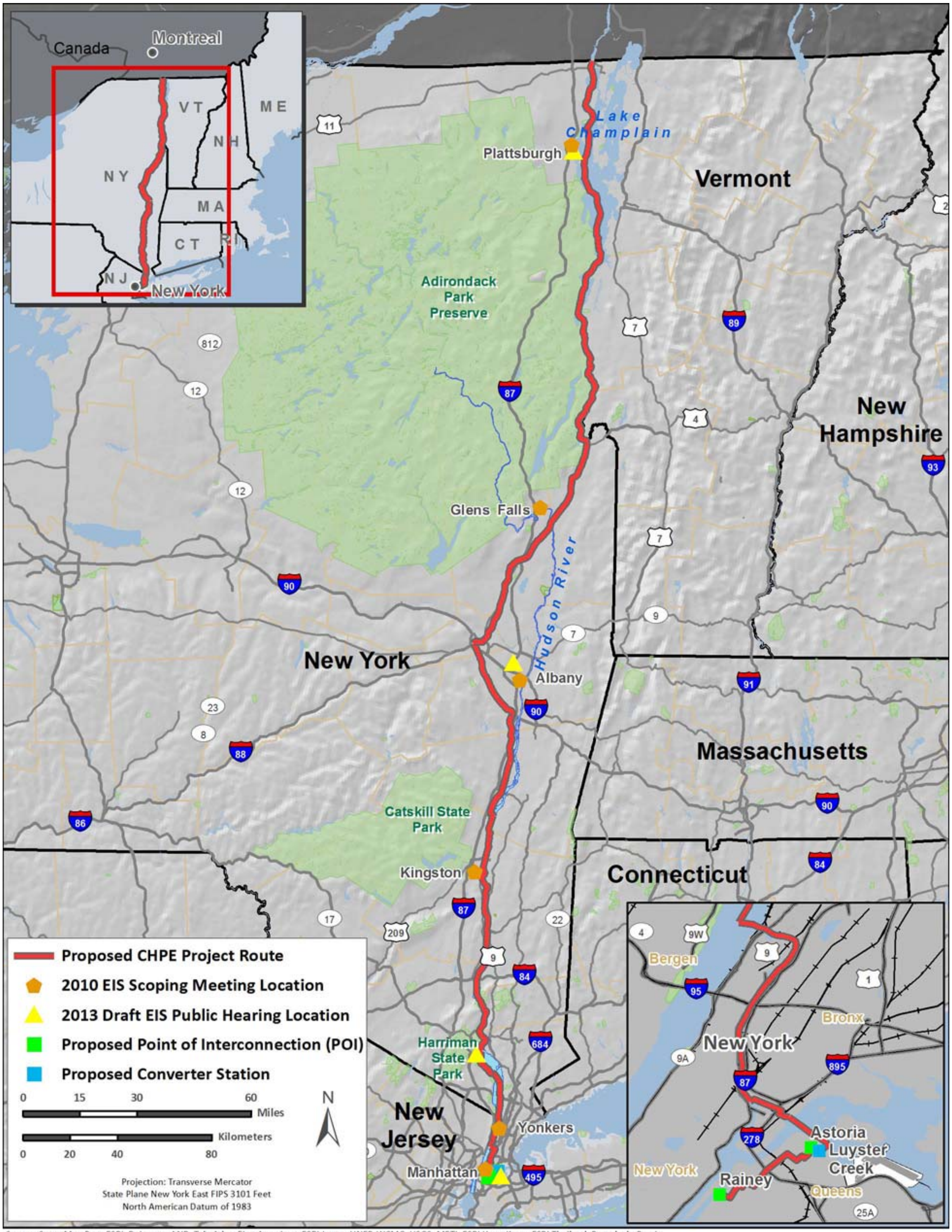
The DOE Office of Electricity Delivery and Energy Reliability is responsible for reviewing Presidential permit applications and determining whether to grant a permit for electrical transmission facilities that cross the U.S. international border. The Presidential permit for the Applicant (OE Docket Number PP-362), if issued, would authorize the Applicant to construct, operate, maintain, and connect the U.S. portion of the project at the international border.

DOE has determined that the 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 of 1969 (NEPA) (42 United States Code [U.S.C.] 4321 *et seq.*). In 2010, DOE issued in the *Federal Register* a Notice of Intent (NOI) to prepare an EIS for the Proposed Action and conducted public scoping (75 *Federal Register* 34720). In 2012, DOE issued an amended NOI to modify the scope of the EIS to reflect Applicant-proposed revisions to the project and conducted additional public scoping (77 *Federal Register* 25472).[1] These revisions included moving the transmission line out of the narrows of lower Lake Champlain, the middle Hudson River, and Haverstraw Bay into nearby road and railroad rights-of-way (ROWs) on land.

DOE prepared this Final EIS in compliance with the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR Parts 1500–1508) and DOE's NEPA regulations (10 CFR Part 1021), and other applicable regulations. The preparation of an EIS includes two formal opportunities for public input: (1) the public scoping period, and (2) the Draft EIS public comment period, both of which are described further in the Public Participation section of this summary.

Other environmental review requirements are being implemented in coordination with or integrated with the NEPA process to the fullest extent possible, namely, floodplains and wetlands assessments, in accordance with EOs 11988 and 11990, respectively (both signed on May 24, 1977) and 10 CFR Part

[1] Vertical bars in the margins of the Final EIS mark changed text, including revisions and new information based in part on comments received on the Draft EIS. Deletions are not indicated.



Source: StreetMap Pro; ESRI, DeLorme, AND, Tele Atlas, First American, ESRI Japan, UNEP-WCMC, USGS, METI, ESRI Hong Kong, ESRI Thailand, Procalculo Prosis

Figure S-1. Proposed CHPE Project Location Overview Map

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

CHPEI has applied to DOE for a Presidential permit that would allow the company to construct, operate, maintain, and connect the approximately 336-mile (541-km), 1,000-MW, high-voltage electric power transmission system in the United States that would cross the U.S./Canada border. If granted, the Presidential permit would authorize the international border crossing.

The purpose of and need for DOE's action is to decide whether or not to grant a Presidential permit for the proposed CHPE Project. Applications for Presidential permits are evaluated based on the potential impacts that a proposed project could have on the environment, the operating reliability of the U.S. electric power supply, and any other factors relevant to the public interest. If DOE determines that granting a Presidential permit is in the public interest, the information contained in this EIS will also help to inform DOE's decision regarding potential mitigation measures and other conditions of the permit.

S.3 Applicant's Objectives

According to the Presidential permit application, the proposed CHPE Project would be a merchant transmission facility that would provide needed electrical energy, primarily hydroelectric and wind energy generated in Canada, to the New York City metropolitan area, which the Applicant states would result in lower wholesale electric power prices, reductions in emissions, greater fuel diversity, and increased energy supply capability and system reliability.

CHPEI has estimated that importing 1,000 MW of lower-cost Canadian energy into the power markets in New York City would be expected to save consumers in the New York Control Area between $554 million to $654 million per year (LEI 2011). Independent modeling conducted by the New York State Department of Public Service (NYSDPS) projected that ratepayer benefits in the New York Control Area would total approximately $405 million to $720 million per year (CHPEI 2012e). Therefore, the Applicant has stated that the proposed CHPE Project power would be purchased first and displace natural gas and oil-fueled sources of electrical generation supplying the region. This would result in the potential to reduce regional greenhouse gas (GHG) emissions. Using the initial year of operation of 2018 as an illustration, NYSDPS predicted that the proposed CHPE Project would reduce annual emissions of carbon dioxide (CO_2) by approximately 1.5 million tons, sulfur dioxide (SO_2) by 751 tons, and nitrogen oxides (NO_x) by 641 tons (NYSDPS 2012a).

DOE has designated southeastern New York State as a Critical Congestion Area, defined as "Areas where it is critically important to remedy existing or growing congestion problems because the current and/or projected effects of the congestion are severe" (DOE 2009a). The *U.S. Department of Energy's National Electric Transmission Congestion Study* (DOE 2006) determined that consumers in the Mid-Atlantic area of the United States, including southeastern New York State, are adversely affected by transmission congestion. These adverse effects on consumers result in consistently higher energy prices and reduced reliability of electricity.

CHPEI's application predicts that the proposed CHPE Project would result in an improvement to the overall reliability of the New York Independent System Operator's (NYISO) electricity system, because the CHPE Project would provide supplemental power capacity from Quebec, thereby improving resource adequacy and reducing loss of load expectations. The high-voltage direct current (HVDC) technology proposed for use in the proposed CHPE Project would possess four-quadrant control technology, allowing the transmission supplier to control voltage and power separately, thereby providing reactive power (i.e., used to control voltage on the transmission system to improve system efficiency) for real-time voltage control.

According to the Applicant, the voltage source converter technology that would be used in the CHPE Project would increase the efficiency of the transmission and distribution system, incorporate greater levels of renewable energy, improve power quality and stability to support new digital demands, and increase operational flexibility and greatly reduce the risk of failure that might affect the entire grid.

The Applicant notes that the proposed CHPE Project intends to accomplish the following:

- Provide 1,000 MW (7,640 gigawatt hours [GWh] per year) of electricity to New York City without contributing to additional transmission congestion on the existing electricity transmission infrastructure in the United States
- Provide additional new transmission infrastructure capacity into New York City using HVDC and HVAC cables that would be buried to avoid potential visual impacts from traditional overhead transmission lines
- Apply downward pressure on the price of electricity in the Location Marginal Price (LMP) spot markets operated by Independent System Operators (ISOs) in the New York City market
- Reduce air pollution and GHG emissions within the New York City area by alleviating the need to operate one or more existing fossil-fueled power plants within the region during periods of transmission congestion
- Improve stability of the electric grid serving the New York City metropolitan area due to the highly reliable and controllable nature of HVDC technology and its compatibility with Smart Grid initiatives
- Reduce the dependency of the New York City region on fossil fuels, such as coal, oil, and natural gas.

S.4 Public Participation and Interagency Coordination

Public participation and interagency coordination are integral elements of the NEPA process and are intended to promote open communication between DOE and regulatory agencies, Native American tribes, potential stakeholder organizations, and the public.

S.4.1 Cooperating Agencies

DOE invited several Federal and state agencies to participate in the preparation of the EIS as cooperating agencies because of their special expertise or jurisdiction by law (40 CFR 1501.6). The cooperating agencies are U.S. Environmental Protection Agency (USEPA) Region 2, the New York District of the U.S. Army Corps of Engineers (USACE), the New York Field Office (Region 5) of the U.S. Fish and Wildlife Service (USFWS), the U.S. Coast Guard (USCG), the NYSDPS, and the New York State Department of Environmental Conservation (NYSDEC).

S.4.2 Public Involvement

Initial Public Scoping. On June 18, 2010, DOE published in the *Federal Register* its *Notice of Intent to Prepare an Environmental Impact Statement and to Conduct Public Scoping Meetings; Notice of Floodplains and Wetlands Involvement; Champlain Hudson Power Express, Inc.*

(75 *Federal Register* 34720). This and other relevant documents are available on the EIS Web site: http://www.chpexpresseis.org. During the initial public scoping period, DOE conducted seven scoping meetings: one in Connecticut and six within the Lake Champlain and Hudson River Valley corridors of New York State.

Additional Public Scoping. In response to the Applicant's submission of an amended Presidential permit application, DOE published on April 30, 2012, an *Amended Notice of Intent to Modify the Scope of the Environmental Impact Statement for the Champlain Hudson Power Express Transmission Line Project in New York State* (77 *Federal Register* 25472). DOE announced that it would revise the scope of the EIS to address the proposed changes and that it was accepting public comment on the revised scope until June 14, 2012.

DOE received scoping comments and prepared scoping reports for both scoping periods, which are available as **Appendix D** of this EIS and available for review on the EIS Web site.

The major issues identified during public scoping include impacts on protected and sensitive flora or fauna species, water quality for Lake Champlain and the Hudson River, cultural or historic resources, human health and safety, air quality, visual resources, navigation, and road traffic; impacts from the development of additional electric generation facilities in Canada; and justification of the need for additional electrical energy.

Draft EIS Public Review Period. DOE provided a 45-day public review period starting November 1, 2013, which was extended for an additional 30 days and ended on January 15, 2014, and held 4 public hearings for the Draft EIS. The public review period was initiated through publication of a Notice of Availability (NOA) in the *Federal Register* by the USEPA. Methods similar to those used during the scoping period were used to notify the public and applicable Federal and state agencies of the public review period for the Draft EIS, including distributing the document to individuals or parties who submitted scoping comments, and to other interested parties that requested a copy of the EIS.

DOE made the Draft EIS available online at the CHPE EIS Web site (http://www.chpexpresseis.org) and on the DOE NEPA Web site (http://energy.gov/nepa). The Draft EIS was also circulated to Federal, state, and local agencies with jurisdiction by law or special subject matter expertise and to any person, stakeholder organization, or agency that requested a copy (40 CFR 1502.19).

DOE received 107 comment documents on the Draft EIS, which have been categorized into eight series based on the type of commenter as follows:

- 100 series – Public Hearing Transcripts: 45 comment documents
- 200 series – Federal Agencies: 5 comment documents
- 300 series – Federal and State Elected Officials: 6 comment documents
- 400 series – State Agencies: 3 comment documents
- 500 series – Local Elected Officials: 4 comment documents
- 600 series – Local Agencies: 2 comment documents
- 700 series – Stakeholder Groups: 22 comment documents
- 800 series – Other Groups and Members of the Public: 20 comment documents.

The Final EIS includes, in **Appendix P**, a summary of the Draft EIS public review period, all comments on the Draft EIS, and responses to the comments. All comments submitted on the Draft EIS were considered in preparing the Final EIS. **Appendix P** also contains, in Table P-4, a summary of representative comments provided during the Draft EIS comment period, and changes made to the Draft EIS in response to comments or new information received in Table P-5. Following are DOE responses to major issues raised by agencies and the public during the Draft EIS public comment period and major conclusions made by DOE regarding the Proposed Action, in accordance with CEQ NEPA regulations (40 CFR 1502.12).

Issues Raised During Draft EIS Public Review Period

NEPA Process. Several comments requested an extension of the public comment period on the Draft EIS due to the length of the EIS and potentially complicated issues addressed in the document. *DOE response:* DOE extended the 45-day comment period by 30 days to provide additional time for the public to review the Draft EIS and submit comments (see **Section 1.7.3** of the Final EIS).

Land Use. Comments expressed concern that portions of the proposed CHPE Project route would be outside of the existing road and railroad ROWs in deviation areas, which would require the taking of private property, including residential and commercial properties, through eminent domain. Some comments also expressed concern that the presence of the transmission line could limit the use of some private property. *DOE response:* Analyses of the potential impacts on use of land outside the existing road and railroad ROW are included in the “Land Use” section for each terrestrial route segment of the proposed CHPE Project addressed in the EIS (see **Sections 5.2.1**, **5.3.1**, and **5.4.1** of the Final EIS). Where acquisition of land outside existing ROWs would be required, the process established under the New York State Public Service Law would be followed.

Transportation and Traffic. Several comments expressed concern that the proposed transmission line would be installed within the Federal navigation channel in various locations, which could prevent some vessels from deploying anchors due to risk of anchor damage, or could result in anchor snags on the transmission cables or concrete mats. Other comments expressed concern that the presence of the transmission line would prevent dredging of the Federal navigation channel or other locations along the Hudson River. *DOE response:* Through ongoing discussions among the USACE, USCG, maritime stakeholders, and the Applicant, the Applicant has revised its proposed cable burial depths which are reflected in the “Transportation and Traffic” section for each route segment in the Final EIS, and has agreed to relocate the transmission line to areas outside of proposed and known anchorage areas in the Hudson and Harlem rivers to reduce potential impacts on navigation and anchor snags.

Aquatic and Terrestrial Protected and Sensitive Species. One comment stated that it would be beneficial to also discuss species proposed for listing under the Endangered Species Act (e.g., northern long-eared bat) in the EIS. Other comments requested additional analysis of the potential impacts of magnetic and induced electrical fields and the use of concrete mats on sturgeon. *DOE response:* The Applicant, in consultation with the relevant resource agencies including USFWS and the National Marine Fisheries Service (NMFS), made revisions to the proposed CHPE Project and developed revised best management practices (BMPs) to avoid or minimize potential impacts on protected or sensitive species. In particular, the Applicant has agreed to conduct tree clearing activities in the winter months to avoid impacts on Indiana bats and to avoid any construction or maintenance activities that would adversely affect Karner blue butterfly habitat. DOE has prepared a Biological Assessment (BA) that concludes that the proposed CPHE Project construction, operation, and maintenance activities may affect, but are not likely to adversely affect, shortnose and Atlantic Sturgeon, Indiana and Northern long-eared bats, and the Karner blue butterfly (see **Appendix Q** of the Final EIS). The proposed CHPE Project would have no effect on other species listed under the ESA.

Cultural Resources. Several comments were concerned that the proposed CHPE Project route would cross and disrupt the Waldron Cemetery and Stony Point Battlefield Historic Park. *DOE response:* DOE has developed a Programmatic Agreement (PA) (see **Appendix T** of the Final EIS) with the New York State Historic Preservation Office (SHPO) to ensure that cultural resources are identified, avoided, or mitigated through continued consultation during project development. The Applicant intends to avoid these impacts at these locations through the use of avoidance measures such as horizontal directional drilling (HDD) where possible (see **Section 5.3.10** of the EIS).

Socioeconomics. Some comments stated that the proposed CHPE Project would result in additional local employment and other economic benefits in New York State, while other commenters expressed concerns that the CHPE Project would outsource jobs from New York State to a foreign county, lead to the reduction of in-state employment (including some due to closing of existing power plants), and increase the U.S. dependence on foreign energy. Other comments expressed concern that the proposed CHPE Project would decrease property values, including residential and commercial properties, and reduce revenue from taxes to local jurisdictions. *DOE response:* Project employment and potential impacts on tax revenues and property values are addressed in the "Socioeconomics" section for each route segment in the EIS (see **Sections 5.1.18**, **5.2.18**, **5.3.18**, and **5.4.18** of the EIS).

Transmission System Reliability. Comments stated that the proposed CHPE Project would not be in the National Interest and would be detrimental to the existing energy grid in New York State because existing power plants and renewable energy projects would not be able to connect to the transmission line, and it would not strengthen the New York State transmission system. Other comments expressed concern that the proposed CHPE Project would prevent other renewable and non-renewable proposed energy projects in New York State from being developed. *DOE response:* DOE is reviewing system interconnection and reliability studies to determine whether the proposed CHPE Project would have an adverse effect on electrical system reliability.

Impacts in Canada. Comments stated that impacts in Canada from the hydroelectric facilities that would be the source of the power should be addressed in the EIS, and without this analysis the EIS does not address potential impacts of the entire proposed CHPE Project. *DOE response:* DOE does not agree that such an analysis is appropriate or required.

NEPA does not require an analysis of potential environmental impacts that occur solely within another sovereign nation with its own environmental statutes and regulations that result from actions approved by that sovereign nation. The Quebec Provincial Government is conducting an environmental review for impacts in Canada, as applicable, as part of its authorization process associated with the construction of facilities (i.e., a new transmission line from a proposed new HVDC converter station at Hertel, in La Prairie, Quebec, to the U.S./Canada border) in the province. The Canadian Government, through the National Energy Board, would also have the authority to authorize the project and consider potential environmental impacts in its analysis (see **Section 1.7.4** of the EIS).

Other Alternatives. Several comments stated that instead of the proposed CHPE Project, energy conservation and efficiency measures should be implemented and the power should be produced locally in New York State through renewable energy projects, distributed generation, existing power plants in upstate New York or in the Hudson Valley Region, or by constructing new power plants in New York State. *DOE response:* Energy efficiency and conservation measures were considered in the Draft EIS but eliminated from further detailed analysis because DOE determined that these measures alone were not a reasonable alternative to the proposed CHPE Project (see **Section 2.5.3** of the EIS). As presented in Section 1.2 of the Draft EIS, the purpose of and need for DOE's Proposed Action is whether to issue a Presidential permit for the proposed transmission line crossing of the U.S. international border (i.e., proposed CHPE Project). Continued operation or development of other new in-state power sources or transmission lines is not the subject of the application for a Presidential permit and, therefore, is outside the scope of this EIS.

S.5 Alternatives Analyzed

This EIS addresses the No Action Alternative and DOE's Proposed Action (Preferred Alternative). The Applicant's proposed CHPE Project is described in **Section S.6**.

S.5.1 No Action Alternative

CEQ and DOE regulations require consideration of the No Action Alternative. The No Action Alternative serves as a baseline against which the potential environmental impacts of a proposed action can be evaluated. Under the No Action Alternative, DOE would not issue a Presidential permit for the proposed CHPE Project, the transmission system would not be constructed, and the potential impacts from the project would not occur.

S.5.2 DOE's Proposed Action (Preferred Alternative)

DOE's Proposed Action (Preferred Alternative) is the issuance of a Presidential permit that would authorize the construction, operation, and maintenance of the proposed CHPE Project that would cross the U.S./Canada border. This EIS has been prepared to comply with NEPA and support DOE's decisionmaking associated with the issuance of the Presidential permit for the proposed CHPE Project.

S.6 Proposed CHPE Project Overview

S.6.1 Proposed CHPE Project Route Segments

The proposed CHPE Project would include construction, operation, and maintenance of an approximately 336-mile (541-km)-long, 1,000-MW, high-voltage electric power transmission system that would have both aquatic (underwater) and terrestrial (and primarily underground) segments. The underwater portions of the transmission line would be buried in the beds of Lake Champlain and the Hudson, Harlem, and East rivers, and the terrestrial portions of the transmission line would be buried underground, principally in road and railroad ROWs.

The transmission system would consist of one 1,000-MW, HVDC transmission line, communications cable, and ancillary aboveground facilities, including a DC-to-AC converter station and cooling stations at selected locations where required. The transmission line would be a bipole consisting of two transmission cables, one positively charged and the other negatively charged. A new HVDC converter station would be constructed in Queens, New York, to convert the electrical power from DC to AC and then connect to two points of interconnection (POIs) within the New York City electrical grid. Cooling stations would be installed along the terrestrial portions of the transmission line route in certain locations to disperse accumulated heat in long cable segments installed by HDD.

The entire length of the transmission system would be buried, with the majority of the route beneath Lake Champlain and the Hudson River, and the exceptions would be ancillary above-ground facilities, such as at the converter station and cooling stations. For the purposes of understanding, the various environmental settings associated with the proposed CHPE Project, and to facilitate the analysis in the EIS, the transmission line route was divided into four geographically logical segments as follows:

- Lake Champlain Segment
- Overland Segment
- Hudson River Segment
- New York City Metropolitan Area Segment.

The four segments are shown on **Figures S-2** through **S-5**, respectively. From the U.S./Canada border, the HVDC transmission line would be located in the bed of Lake Champlain for approximately 101 miles (163 km), from near Champlain, New York, to Dresden, New York. This portion of the route composes the ***Lake Champlain Segment*** (see **Figure S-2**).

The ***Overland Segment*** begins at the southern end of Lake Champlain in the Town of Dresden, where the HVDC transmission line would exit the water at milepost (MP) 101 and be installed underground in the New York State Department of Transportation (NYSDOT) ROW, the Canadian Pacific (CP) railroad ROW, and the CSX Transportation (CSX) railroad ROW for 127 miles (204 km) until the transmission line would enter the Hudson River at the Town of Catskill, New York (see **Figure S-3**).

The ***Hudson River Segment*** begins at MP 228 where the HVDC transmission line would be buried in the bottom of the Hudson River for approximately 67 miles (108 km) to Stony Point, New York, where the transmission line would be routed upland primarily along the CSX railroad ROW and the U.S. Route 9W roadway ROW between MPs 295 and 303 (see **Figure S-4**). The transmission line would be buried underground through this entire stretch before reentering the Hudson River. The transmission line would reenter the Hudson River at MP 303 for approximately 21 miles (34 km) until it reaches the end of the Hudson River Segment at Spuyten Duyvil Creek and the Harlem River in New York City at MP 324.

The ***New York City Metropolitan Area Segment*** begins at Spuyten Duyvil at MP 324, where the HVDC transmission line would enter the Harlem River and continue south in the river for a distance of approximately 6 miles (10 km) to a point north of the Willis Avenue Bridge in the borough of the Bronx at MP 330 (see **Figure S-5**). The transmission line would exit the river and proceed east through the NYSDOT railroad corridor and rail yards along the northern side of the Bronx Kill to the East River at MP 331 and proceed to the southeast to land at the site of the ConEd Charles Poletti Power Plant complex in Astoria, Queens, New York, at MP 332.

Onshore, the HVDC transmission cables would wrap around the eastern portion of the power plant complex for approximately 1 mile (1.6 km) and would terminate in a proposed HVDC converter station occupying an approximately 4.5-acre (1.8-hectare) site along Luyster Creek. The Luyster Creek HVDC Converter Station would convert the DC electrical power to AC, and underground double-circuit 345-kilovolt (kV) AC cables would connect the converter station with the adjacent NYPA Astoria Annex 345-kV substation. An approximately 3-mile (5-km) buried 345-kV HVAC cable circuit would be constructed by CHPEI from the Astoria Annex Substation to ConEd's 345-kV Rainey Substation.

S.6.2 Proposed CHPE Project Details

The following subsections describe the specific engineering details of the transmission system: the aquatic DC transmission cables; HDD methods; terrestrial DC transmission cables; cooling stations to be used in certain locations along the transmission line; the proposed HVDC converter station and substation interconnection in Astoria, New York; and the proposed Astoria Annex to Rainey substation HVAC interconnection. The amended Presidential permit application submitted to DOE on February 28, 2012, reflected route and project changes that resulted from negotiations, including more than 50 settlement conferences held between November 2010 and February 2012, with state agencies and stakeholder organizations pursuant to the New York State Public Service Commission's (NYSPSC) Article VII Certificate of Environmental Compatibility and Public Need process review of the project (Joint Proposal). The Applicant and 13 signatory parties submitted the Joint Proposal to the NYSPSC on February 24, 2012. The NYSPSC issued an Order granting a Certificate of Environmental Compatibility and Public Need (Certificate) for the proposed CHPE Project on April 18, 2013 (NYSPSC 2013). DOE is reviewing, and this EIS analyzes, the proposed CHPE Project as amended by the Joint Proposal and the Certificate. The Certificate is available on the CHPE EIS Web site (http://www.chpexpresseis.org).

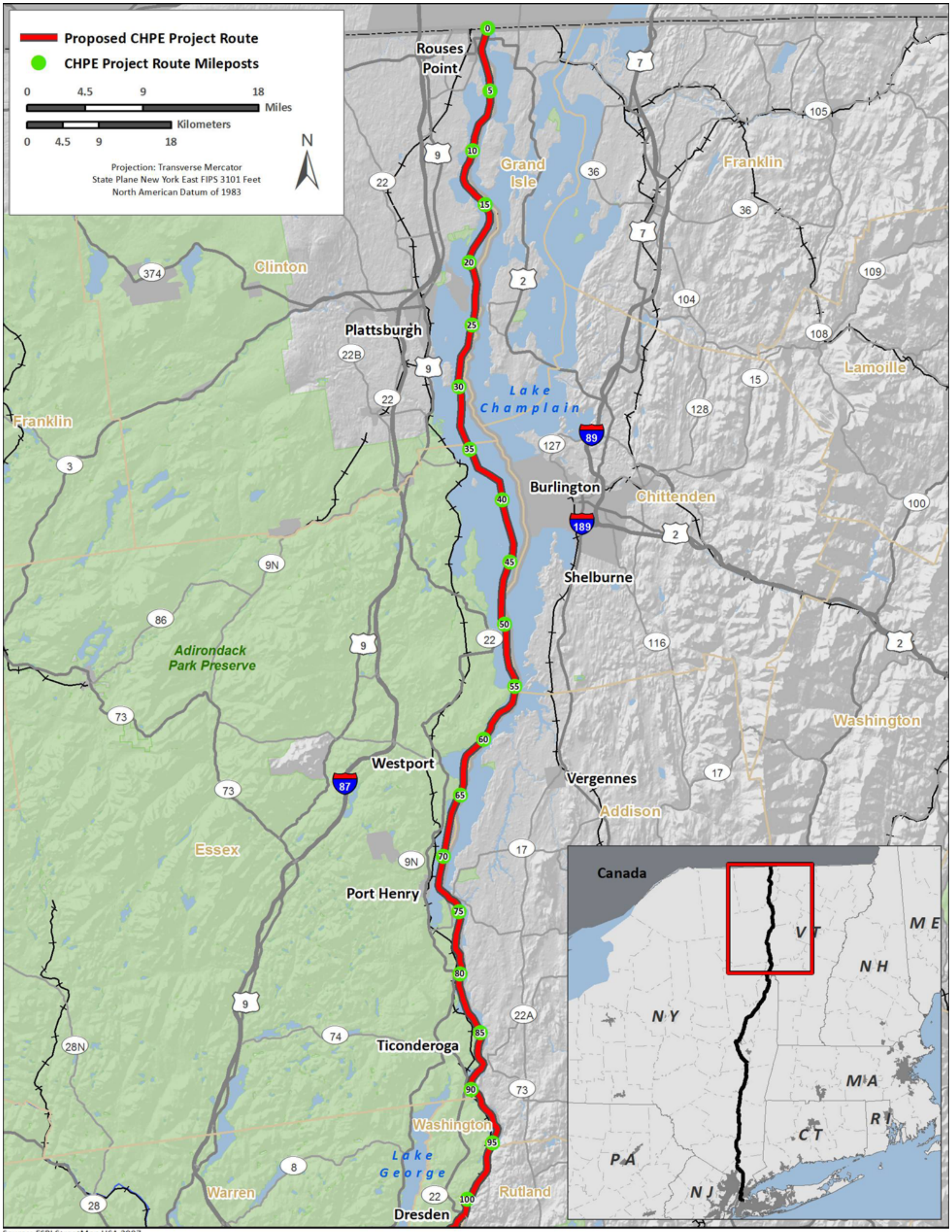
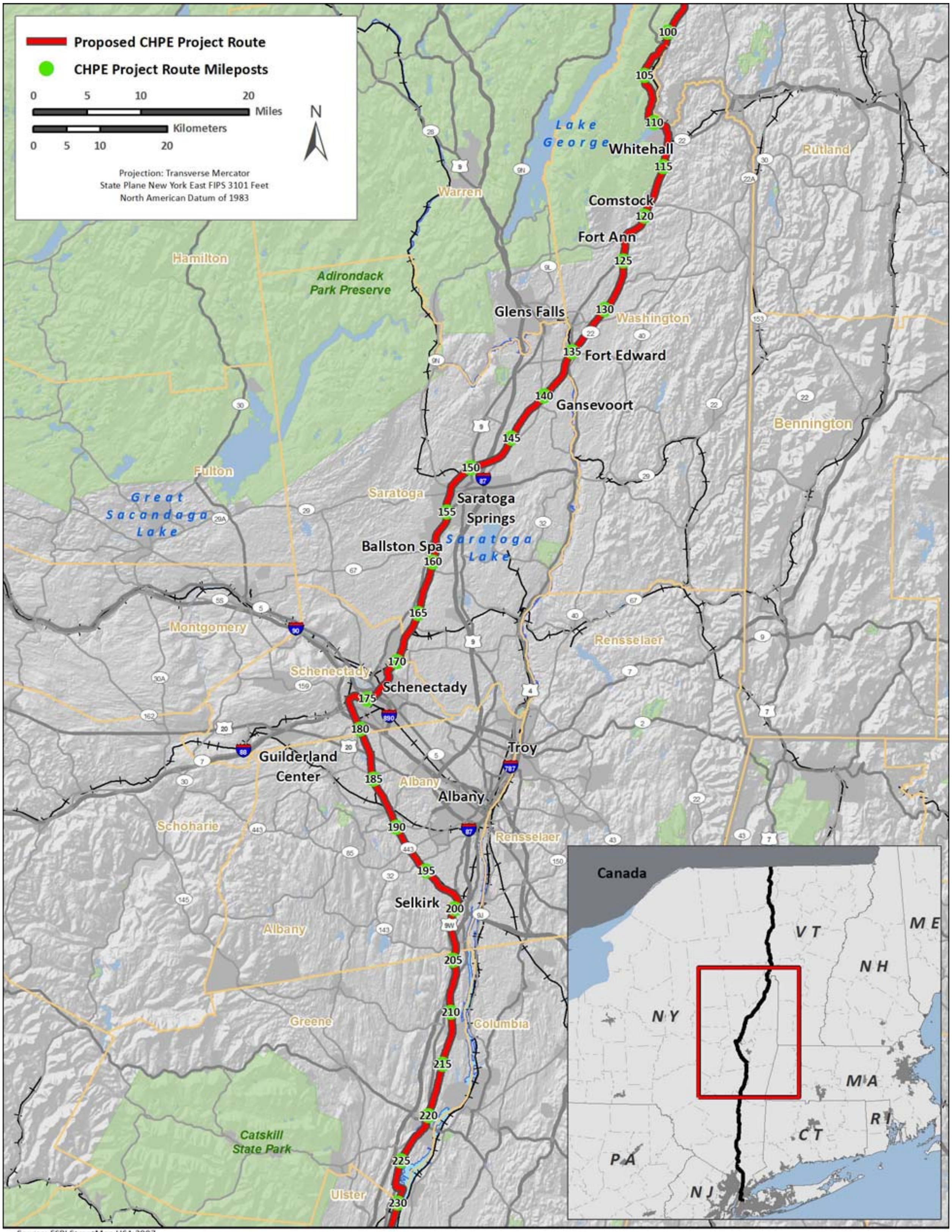


Figure S-2. Lake Champlain Segment



Source: ESRI StreetMap USA 2007

Figure S-3. Overland Segment

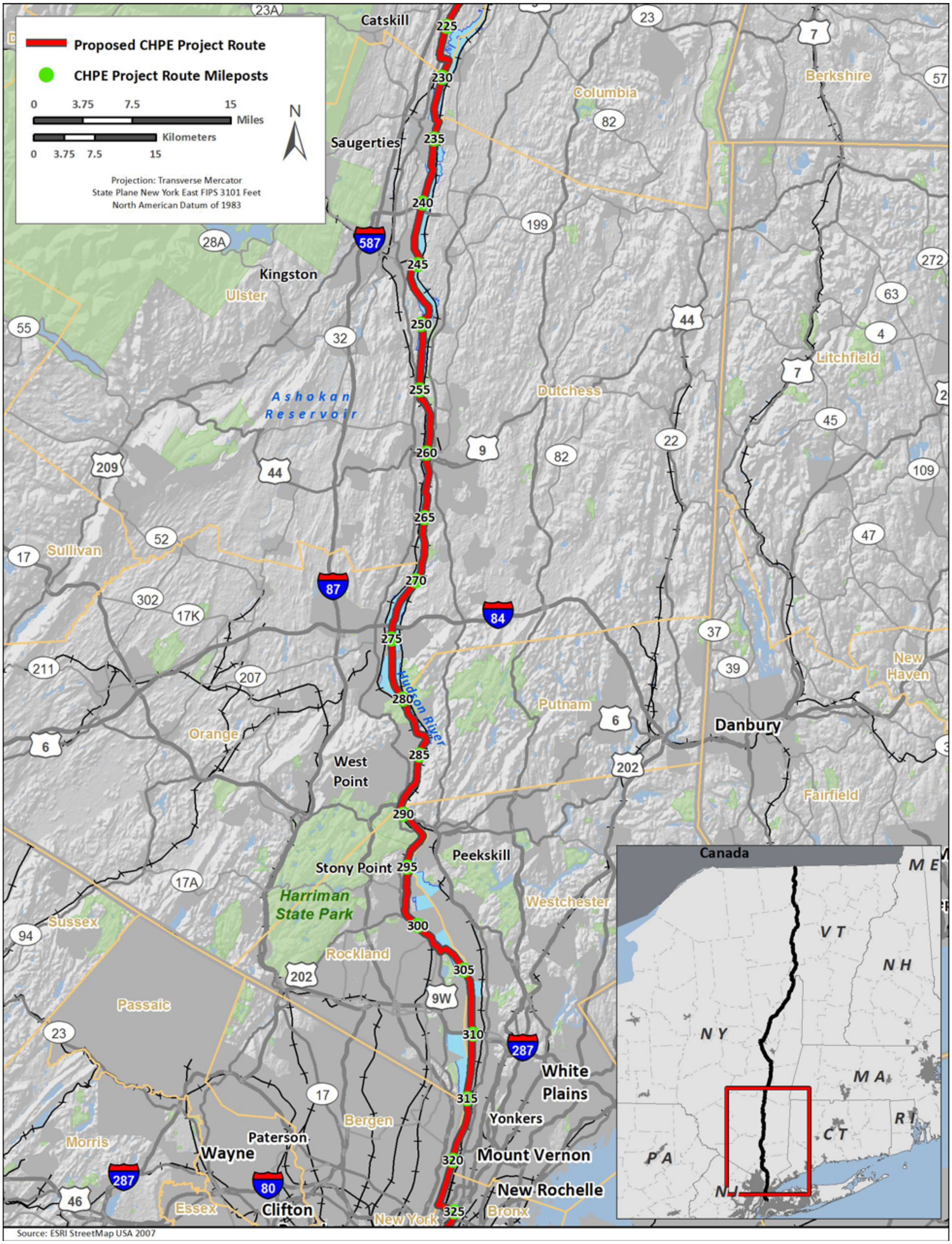


Figure S-4. Hudson River Segment

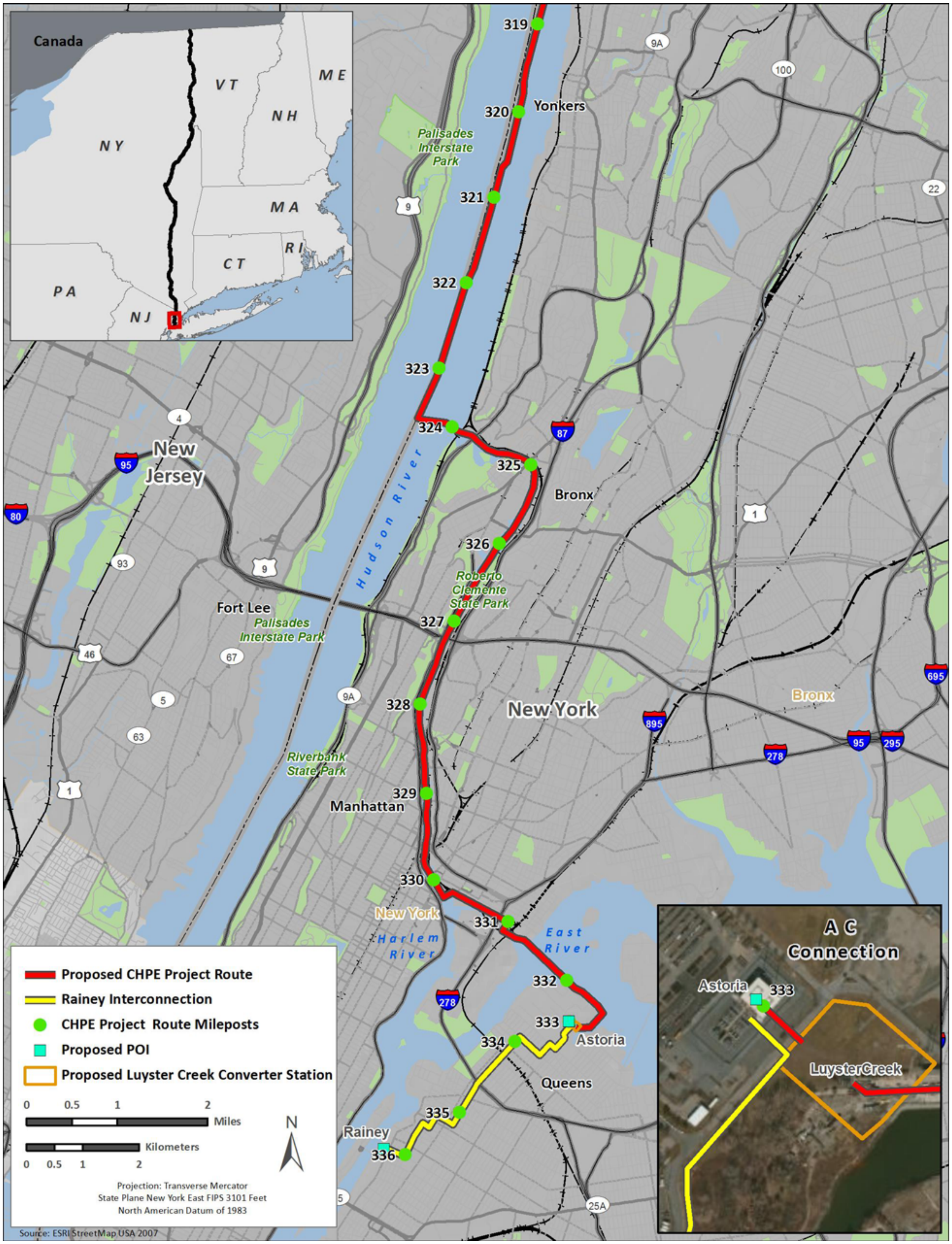


Figure S-5. New York City Metropolitan Area Segment

Appendix C of the EIS contains references to the Certificate, the Joint Proposal, and other relevant documents. The following subsections also discuss how the Applicant proposes to install and operate the transmission line and aboveground facilities of the proposed CHPE Project.

Aquatic Direct Current Transmission Cable. The transmission cables proposed for installation in the Lake Champlain, Hudson River, and New York City Metropolitan Area segments would be cross-linked polyethylene (XLPE) HVDC cables rated at 300 to 320 kV. An armored layer of galvanized steel wires embedded in bitumen would provide additional protection for the aquatic transmission cables. To prevent disturbance to the cables from unrelated marine operations in the waterways, the transmission cables would be buried beneath the bed of Lake Champlain at a depth of at least 8 feet (2.4 meters) in the sediment and at least 4 feet (1.2 meters) in rock within the federally maintained (i.e., dredged) navigation channel, and at least 4 feet (1.2 meters) in the lakebed outside of the federally maintained navigation channel. Cables installed in the Hudson River sediment bed would be buried to a minimum depth of 7 feet (2.1 meters). Cable installation in the Harlem River would be entirely within the federally maintained navigation channel at minimum depths of 8 feet (2.4 meters) in the sediment and 6 feet (1.8 meters) in rock. Cables would be installed along the entire East River route using HDD; therefore, trench burial depths would not apply (USACE 2013). The depth of burial that can be achieved would depend on available marine construction equipment, soil types and depth to bedrock, existing utilities, and the types of marine activities occurring and their potential threat to cable integrity.

Where the transmission cables cross bedrock or an existing utility such as a pipeline or another cable, they would be laid over the rock or existing utility and protective coverings, such as articulated concrete mats, would be installed over the cable crossing. An approximated total of 3.0 miles (4.8 km) of concrete mats, representing 1.5 percent of the length of the aquatic portion of the entire transmission line route, would be installed over the portions of the transmission line that cannot be buried. Specifically, concrete mats would be installed as protective covering over the transmission cables for 0.6 miles (1.0 km) in the Lake Champlain Segment, 1.8 miles (2.9 km) in the Hudson River Segment, and 0.6 miles (1.0 km) in the New York City Metropolitan Area Segment. Underwater cable installation activities would be limited to certain times of the year to avoid life-cycle or migratory impacts on aquatic species in the project area.

Horizontal Directional Drilling. HDD would be used to install the transmission cables in transition areas between aquatic and terrestrial portions of the proposed CHPE Project route under the East River; and in sensitive areas such as wetlands and streams where deemed necessary, wild blue lupine (*Lupinus perrenis*) habitat, and existing infrastructure along the terrestrial portions of the proposed CHPE Project route, and in special circumstances to avoid obstacles along the route, such as road or railroad crossings where open trenching is not possible.

The HDD operation at a water-to-land transition would include an HDD drilling rig system, a drilling fluid collection and recirculation system, temporary cofferdam installed at the water exit to maintain exit pit stability following dredging of the pit, and associated support equipment. For each proposed HDD location, two separate drill holes would be required, one for each cable. During installation, a drill rig would be placed on shore behind a temporary fluid return pit and a 40-foot (12-meter) drill pipe with a cutting head would be set in place to begin the drilling process. As the initial pilot borehole is drilled, a slurry composed of water and bentonite (i.e., a shrink-swell clay) would then be pumped into the hole to transport the drill cuttings to the surface, to aid in keeping the borehole stable, and to lubricate the drill. After the final drill length has been achieved, high-density polyethylene (HDPE) conduits would be pulled into the drilled hole from the exit point in the waterbody. Once the HDPE conduits are in place, the transmission cables would be pulled through these pipes and into a transition splice vault, which would remain in place to protect the transmission cable.

A visual and operational monitoring program would be developed and conducted during HDD operations to detect any losses of drilling fluid. Visual observations of drilling fluid in the water, or excessive loss of volume or pressure in the borehole would trigger response actions by the HDD operator, including halting drilling activities and initiating cleanup of released bentonite. A sheet pile cofferdam would be constructed around the exit pit in the waterbody to contain drilling fluids from the HDD operation. A spud barge (barge with self-leveling anchor legs that are supported by the riverbed) with a pumping system would be positioned at the cofferdam to collect any drilling fluids released into the cofferdam enclosure.

It is expected that at least three different sized HDD rigs would be employed on the proposed CHPE Project, requiring varying staging area sizes depending on the length of the drill at the particular location, proximity to sensitive areas such as wetlands where deemed necessary, access limits, and other constraints.

Terrestrial Direct Current Transmission Cable. Approximately 42 percent of the proposed CHPE Project route would be composed of underground (terrestrial) portions. For the underground portions of the transmission line route, the two cables within the bipole system would typically be laid side-by-side in a trench. After the cables are laid in the trench, the trenches would be backfilled with low thermal resistivity material, such as well-graded sand to fine gravel, stone dust, or crushed stone. For the underground transmission cables, the outer sheathing insulation would be composed of an ultraviolet-stabilized, extruded polyethylene layer. The underground transmission cables would have an outside diameter of 4.5 inches (11 centimeters [cm]), and each cable would weigh approximately 20 pounds per foot (30 kilograms per meter). A protective cover of HDPE, concrete, or polymer blocks would be placed directly above the low thermal resistive backfill material before the trench would be backfilled.

A combination of HDD and trenching techniques would be used to install the transmission line underground along upland portions of the route. Trenchless technologies would be used where roadways and railroad beds would be crossed by the transmission line. Trenchless technologies could include HDD, horizontal boring, or pipe jacking (driving a casing underground using pneumatic blows). Following completion of the transmission cable installation, the excavated area would be backfilled and regraded, and the disturbed area would be returned to its previous condition as much as possible.

The proposed CHPE Project would be in the existing ROWs of both the CP and CSX railroads between MPs 112 and 228 and MPs 295 and 301. The Applicant has stated that drafts of Occupancy Agreements for easements along the railroad corridor have been exchanged with both CP and CSX and are currently under negotiation. The final agreements would establish the terms of occupancy of the ROWs and refine required offsets of the transmission cables from the track centerline. The proposed CHPE Project would be in the Harlem River Rail Yard from MPs 330 to 331.

Cooling Stations. In certain situations where there is a long segment of cable installed by HDD, heat can accumulate in the HDPE conduit and reduce the performance of the transmission system. The Applicant has identified 16 sections of underground cabling where the potential for heat accumulation could require that a cooling equipment station be installed at each section. Each of the 16 cooling stations would consist of a chiller unit and pumping system within a building and this equipment would circulate chilled water through tubing in a closed-loop system alongside the HVDC cable to cool the cables. The building footprint would occupy 128 square feet (12 square meters) of land area and the power to the cooling station would be provided by a local electrical utility. The heat emitted from the cables within the buried conduit would then be transferred by the coolant back to the cooling station and then to the outside atmosphere above ground. It is anticipated that the cooling systems would be operated primarily during peak electric load conditions.

Luyster Creek HVDC Converter Station. An HVDC converter station would be constructed near Luyster Creek in Astoria, New York, to convert the electrical power from DC to AC (see **Figure S-5**). The converter station site would be approximately 4.5 acres (1.8 hectares) in size. The HVDC converter station building would be approximately 165 feet by 325 feet (50 meters by 99 meters) with a building footprint of 1.2 acres (0.5 hectares) and a height of approximately 70 feet (21 meters), with transformers, cooling equipment, and power line carrier filters being installed outside of the building. The converter station would be powered by electricity taken directly from the proposed CHPE Project transmission line and would not require onsite personnel during normal operations.

Astoria Annex Substation Interconnection. The Luyster Creek Converter Station would deliver its energy by underground cable to the Astoria 345-kV, sulfur hexafluoride (SF6) gas-insulated substation that serves as the primary point of system interconnection to the grid. The Applicant has proposed to modify the electrical configuration of the Astoria Annex Substation by adding a four-breaker gas-insulated switch ring bus to connect both the cable from the Luyster Creek Converter Station and the Astoria-Rainey Cable to the one remaining empty bus at the Astoria Annex Substation. This new ring bus could be constructed in a new building approximately 72 feet (22 meters) long, 58 feet (18 meters) wide, and 40 feet (12 meters) high. The new ring bus building would be 4,176 square feet (388 square meters) in size and would be located on the same parcel of land as the Luyster Creek Converter Station. The new ring bus would be connected to both the converter station and the Astoria Annex Substation by gas-insulated switch cables in underground pipes. However, no obstacles have been identified that would prevent the expansion of the existing Astoria Ring Bus to eight breaker positions. Therefore, it is unlikely that it would be necessary to build a new building to house the ring bus.

Astoria to Rainey Interconnection. CHPEI would also construct a 345-kV HVAC cable circuit from the ring bus to ConEd's Rainey Substation in Queens to deliver power reliably into ConEd's 345-kV system. This interconnection would consist of HVAC cables buried beneath city streets for approximately 3 miles (5 km) (see **Figure S-5**). The XLPE HVAC cables would be buried in a trench to a depth of more than 4 feet (1.2 meters) with a separation distance of 9 inches (23 cm) between the cables in the trench.

Additional Engineering Details – Heat. XLPE transmission cables typically operate at about 176 to 194 degrees Fahrenheit (°F) (80 to 90 degrees Celsius [°C]) with an emergency operating temperature of about 266 °F (130 °C). The proposed CHPE Project's HVDC cables would be designed to operate at normal temperature of only 158 °F (70 °C). Under limited durations (i.e., maximum of 2 hours) of emergency overload conditions, the resulting increased temperature would not exceed 176 °F (80 °C). At this increased temperature, heat must be carried away from the conductors for them to operate efficiently. Soils in and around a trench perform this heat transfer for underground cables. Where required, a low thermal resistive backfill material would be used instead of native soil in the trench around the cables to ensure sufficient standard heat transfer to the surrounding soils and groundwater.

Additional Engineering Details – Electric and Magnetic Fields. Operation of the proposed CHPE Project transmission line would produce electric and magnetic fields. Transmission lines, like all electric devices, produce electric and magnetic fields, more commonly referred to as electromagnetic fields (EMFs). Voltage, the force that drives the current, is the source of the electric field. Current, the flow of electric charge in a wire, produces the magnetic field. The strength of the EMF depends on the design of the electrical line and the distance from it. EMF is found around any electrical wiring, including household wiring, electrical appliances, and equipment.

Electric fields are measured in volts per meter (V/m) or kilovolts per meter (kV/m). Electric field strength is reduced by shielding or by intervening objects such as structures and vegetation. The proposed CHPE Project transmission cables would be shielded within a lead-alloy sheath and buried, which would effectively eliminate any exposure to the electric field above ground. In areas where the cables cannot be buried (e.g., when installed over existing utility lines or bedrock), protective covering, such as concrete mats, would be installed over them.

Magnetic fields are measured in units of gauss (G) or milligauss (mG). The average magnetic field strength in most homes (away from electrical appliances and wiring) is typically less than 2 mG. Outdoor magnetic fields in publicly accessible places can range from less than a few mG to 300 mG or more, depending on proximity to power lines and the voltage of the power line. The magnetic field produced by the proposed CHPE Project transmission line would be less than 162 mG at the land surface directly over the buried transmission line.

Like electric fields, magnetic fields fall off with distance from the source. Unlike electric fields, however, intervening objects, such as structures, or being buried, do not reduce magnetic field strength. Consequently, while electrical appliances can produce the highest localized magnetic fields, power lines serving neighborhoods and distribution lines and transformers serving individual homes or businesses are a common source of longer-term magnetic field exposure.

S.6.3 Construction and Schedule

The Applicant anticipates that the initial permitting phase of the proposed CHPE Project would continue through mid 2014, with major construction commencing later in 2014. Installation of the transmission cables is proposed to be completed between 2014 and 2017. The Applicant anticipates that the commercial operation date for the proposed CHPE Project would be 2017.

The NYSPSC Certificate issued for the proposed CHPE Project established construction work schedule windows identifying times of the year when work associated with the underwater portion of the transmission line could take place (NYSPSC 2013). These work windows were subsequently supplemented through consultation with NMFS.

Aquatic Construction Sequence. Installation of the aquatic portion of the transmission line would occur via jet plow in all locations except where installed by shear plow in southern Lake Champlain (south of MP 74), installed by HDD at water-to-land transitions and under the East River, laid on the surface over bedrock or utility line crossings and covered with concrete mats (total 3.0 miles [4.8 km] for entire aquatic portion of the proposed CHPE Project route), and blasted for 460 feet (140 meters) of trench at MP 324.5 in the Harlem River. The plowing process would be conducted using a dynamically positioned cable barge and towed plow device that simultaneously lays and embeds the aquatic transmission cables in a trench. The transmission cables composing the bipole would be deployed from the vessel to a funnel device on the plow. The plow is lowered to the lake or river floor, and the plow blade cuts into the lake or riverbed while it is towed along the pre-cleared route to carry out a simultaneous lay-and-burial operation. The plow would bury both cables of the bipole in the same trench at the same time. Anchorage of vessels during installation of the aquatic transmission line would be necessary in the event that bottom conditions are encountered that either stop forward progress at reasonable tow tension or result in excessive rolling or pitching of the jet plow. Anchorage would be anticipated in specific areas such as where locations of construction and removal of temporary cofferdams and cable landings at water-to-land transitions, marine splicing locations (although this could also be accomplished using dynamic positioning), and possibly along the 460-foot (140-meter) length of bedrock trenching in the Harlem River (at MP 324.5).

It is anticipated that the majority of the aquatic cable route would be installed and buried using water-jetting techniques, such as the jet plow and shear plow. The jet plow is fitted with hydraulic pressure nozzles that create a downward and backward flow to fluidize the sediment within a 2-foot (0.6-meter)-wide by 4- to 8-foot (1.2- to 2.4-meter)-deep trench, allowing the transmission cables to settle to the bottom of the trench under their own weight before the sediments settle back into the trench. The trench dimensions of the shear plow would be 0.8 feet (0.2 meters) wide and 4 to 8 feet (1.2 to 2.4 meters) deep.

Installation of the transmission line in the Harlem River would require blasting to excavate approximately 460 feet (140 meters) of bedrock from a former rock peninsula at MP 324.5. The minimum burial depth for the transmission line in areas of rock in the Harlem River, which is a federally maintained (i.e., dredged) navigation channel, is 6 feet below the rock surface. Geologic maps indicate this rock is Fordham gneiss with unconfined compressive strength that is too hard to remove by cutterhead, ripping, hoe-ramming, or non-explosive methods. The Applicant would conduct blasting trials using a pre-packaged chemical demolition agent loaded into boreholes drilled into the rock that, when ignited, would generate an expansive force to fracture the rock. The rock fragments would then be removed by long-reach hydraulic excavating buckets and deposited in a barge. If the trials were successful, a vertical pattern of holes would be drilled into the rock to form a trench. The broken rock would be dredged sequentially from each end of the trench progressing towards the middle with the rock fragments placed into a barge. If the trials were unsuccessful, it would be necessary to use water gel dynamites to fracture the rock, which would produce a shock wave upon detonation. The blasting program in the Harlem River would be estimated to take up to 10 weeks, requiring approximately 300 drill holes of 1.5-inch (3.8-cm) diameters with each drill taking 30 to 60 minutes to complete. The exact production schedules would be developed by the construction contractor; however, preliminary construction sequencing studies indicate 15 to 20 separate blasts could be required.

Terrestrial Cable Installation. The general sequence for installing the terrestrial DC transmission cables along the road and railroad ROWs would be conducted in steps as follows:

- Initial clearing operations (where necessary) and storm water- and erosion-control installation
- Trench excavation
- Cable installation
- Backfilling
- Restoration and revegetation.

The typical trench would be up to 9 feet (2.7 meters) wide at the top and approximately 3 feet (0.9 meters) deep to allow for proper depth and a 1-foot (0.3-meter) separation required between the two transmission cables to allow for heat dissipation. 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. The operation of the transmission cables would result in the generation of heat, which would reduce the electrical conductivity of the cables; therefore, prior to laying the cables, the trenches would be backfilled with low thermal resistivity material such as sand to prevent heat from one cable affecting a nearby cable. There would be a protective concrete cover such as a layer of weak concrete directly above the low thermal resistive backfill material. The whole assembly would have a marker tape placed 1 to 2 feet (0.3 to 0.6 meters) above the cables.

For crossings of waterbodies such as Catskill Creek and numerous small streams, five dry-ditch crossing methods would be used for installation of the transmission line. These methods are as follows:

- *Attachment to a Bridge.* Where available and feasible, the transmission line would be affixed directly to an existing railroad bridge as it spans the waterbody.
- *Flume Crossing Method.* This method involves installing a flume pipe to carry the stream around the work area in an enclosed pipe, allowing the trenching to be done in a dry condition, limiting the amount of sediment that can enter the waterbody.

- *Dam and Pump Crossing Method.* For this method, the stream is dammed upstream of the work area and a pump and hose are used to transport the stream flow to bypass the trenching area to a point downstream where it would be discharged back to the streambed.
- *HDD.* Under this method, cable conduits would be installed under the streambed using HDD and avoiding any disturbance to the streambed, and the cables would then be pulled through the conduits.
- *Open Cut.* The open cut method of construction involves digging an open trench across the streambed, laying the cable, and backfilling the trenched area without diverting the stream around the work area.

The waterbody crossing methods would be determined based on the NYSDPS stream width classification, NYSDEC stream type classification, and conditions present during the time of construction and would be in accordance with NYSDPS's *Environmental Management and Construction Standards and Practices for Underground Transmission and Distribution Facilities in New York State* (NYSDPS 2003).

In wetland areas, the cables would generally be installed by trenching. The typical sequence of activities would include vegetation clearing, installation of erosion controls, trenching, cable installation, backfilling, and ground surface restoration. Equipment mats or low-ground-pressure tracked vehicles would be used to minimize compaction and rutting impacts on wetland soils. To expedite revegetation of wetlands, the top 1 foot (0.3 meters) 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 down into the trench.

The permanent ROW required for maintenance and operation of the transmission line along the terrestrial portions of the proposed CHPE Project route would be up to 20 feet (6 meters) wide for both railroad and roadway ROWs. The permanent ROW would provide protection of the transmission cables against third-party damage and would facilitate any required maintenance or repairs.

Measures to Minimize Environmental Impacts. As part of its application development process, the Applicant detailed a number of industry-accepted BMPs that it would undertake to avoid or reduce environmental impacts during construction and operation of the proposed CHPE Project. The Applicant would develop a final Environmental Management and Construction Plan (EM&CP), which documents environmental and construction management procedures and plans to be implemented during the proposed CHPE Project construction activities and during facility operation. These impact reduction measures, collectively referred to as BMPs, have been proposed by the Applicant for use during construction and operation to protect environmental, agricultural, cultural, and other potentially sensitive resources along the proposed CHPE Project route. These BMPs have been incorporated into the NYSPSC Certificate to the Applicant and will be incorporated into the final EM&CP (NYSPSC 2013). The Applicant-proposed measures have been taken into account in the environmental analyses conducted for the EIS. These measures include development of a Spill Prevention, Control, and Countermeasures (SPCC) Plan, time-of-year work restrictions, water quality monitoring, biological studies, work site restoration, and inspection and reporting.

S.6.4 Staging Areas

Aquatic Transmission Cable Support Facilities. For the portions of the proposed CHPE Project route where aquatic transmission cables would be installed, it is anticipated that minimal land-based support would be required. Transport of the aquatic transmission cables would occur via the cable-laying vessel, supported by resupply barges operated from a temporary storage area on land. This land-based support facility is expected to be no greater than 200 by 300 feet (61 by 91 meters), and would be at an existing port with heavy lift facilities, likely the Port of Albany or the Port of New York and New Jersey.

Terrestrial Transmission Cable Support Facilities. For the terrestrial portions of the proposed CHPE Project route where underground transmission cables would be installed, additional nearby temporary aboveground support facilities would be established. Support facilities could include contractor yards, storage areas, access roads, and additional workspace. Additional workspace might be required at HDD locations, cable-jointing locations, and areas with steep slopes. The support facilities would be sited within the existing road and railroad ROWs.

S.6.5 Operations and Maintenance

The proposed CHPE Project has an expected life span of 40 years or more. During this period, it is expected that the transmission system would maintain an energy availability factor of 95 percent, meaning that the transmission system would be delivering electricity 95 percent of the time, with the remaining 5 percent allocated for scheduled and unscheduled maintenance.

The HVDC and HVAC transmission cables would be designed to be relatively maintenance-free and operate within the specified working conditions. However, selected portions or aspects of the transmission system would be inspected to ensure equipment integrity is maintained.

ROW Maintenance. During operation of the proposed CHPE Project, vegetation clearing in the transmission line ROW would be performed on an as-needed basis. Vegetation management would include mowing, selective cutting to prevent the establishment of large trees (i.e., greater than 20 feet [6 meters] tall) directly over the transmission line, and vegetation clearing on an as-needed basis to conduct repairs.

Transmission Cable Repairs. While not anticipated, it is possible that over the lifespan of the proposed CHPE Project, the transmission cables could be damaged, either by human activity or natural processes. Before operation of the proposed CHPE Project begins, an Emergency Repair and Response Plan (ERRP) would be prepared to identify procedures and contractors necessary to perform maintenance and emergency repairs. The typical procedure for repair of a failure within the aquatic and terrestrial portions of the proposed CHPE Project route is described as follows:

- *Aquatic Transmission Cable Repair*. In the event of aquatic cable repair, the location of the problem would be identified and crews of qualified repair personnel would be dispatched to the work location. A portion of the transmission cable would be raised to the surface, the damaged portion of the cable cut, and a new cable section would be spliced in place by specialized jointing personnel. Once repairs were completed, the transmission cable would be reburied using a remotely operated vehicle (ROV) jetting device.
- *Terrestrial Transmission Cable Repair*. In the event of terrestrial transmission cable repair, contractors would excavate around the location of the problem and along the transmission cable for the extent of cable to be repaired or replaced. Specialized jointing personnel would remove the damaged cable and install new cable. Once complete, the transmission cable trench would be backfilled and the work area restored using the same methods as described for the original installation.

Transmission Service. The maximum electrical power delivery capability for the proposed CHPE Project under normal conditions would be 1,000 MW. The ultimate maximum capacity would be determined during final design of the proposed CHPE Project. The estimated short-time (i.e., 2-hour) emergency overload capability would be approximately 1,150 MW for the transmission system.

The NYISO would be the controlling authority for the proposed CHPE Project and the operator of the system where the energy would originate, Hydro-Québec, would coordinate with the NYISO.

Decommissioning. The Applicant proposes to de-energize and abandon the proposed CHPE Project transmission line in place following expiration of its useful life. This proposed approach or any changes to the plan for decommissioning would be subject to applicable Federal and state regulations in place at that time.

S.7 Alternatives Considered but Eliminated from Further Detailed Analysis

Several technology, alignment, and construction alternatives were considered but eliminated from further detailed study for various reasons. Alternatives considered but dismissed are discussed in the following paragraphs, along with the reasons for dismissal.

S.7.1 Alternative Upland Transmission Line Routes

The Applicant considered a range of terrestrial routes for the transmission line. These alternatives included consideration of transmission line alternatives that would have been installed either on overhead structures or buried within a new or existing terrestrial ROW, rather than in Lake Champlain or the Hudson, Harlem, and East rivers. An alternatives analysis report documenting the evaluation of alternative routes was submitted by the Applicant to the USACE in July 2013 as part of the Applicant's Clean Water Act (CWA) Section 404 permit application. This report is included in the EIS as **Appendix B**. DOE determined that these alternative transmission routes were not reasonable due to engineering feasibility, cost, and logistical considerations (e.g., legal limitations), and, therefore, they have been eliminated from further consideration in the EIS.

Alternatives considered included the following:

- Constructing the transmission line in and along existing electrical transmission line ROWs from the U.S./Canada border to New York City
- Constructing the transmission line in and along existing highway and roadway ROWs
- Constructing the transmission line within existing railroad ROWs beyond those identified as part of the proposed CHPE Project
- Using combinations of railroad, electrical, and roadway ROWs
- Development of a new electrical transmission line ROW.

These alternatives were analyzed and eliminated from further consideration for the following reasons.

- Twelve alternative alignments were identified in the NYSPSC process and in **Appendix B** as part of the alternative Hudson River Western Rail Line Route. Ten of these segments were not considered reasonable due to engineering constraints, intrusions into sensitive environmental areas and municipal parkland, existing infrastructure and development, access restrictions, required use of long HDD segments, blasting with insufficient spacing, and increased cost and construction time. The two remaining alternative alignments considered as part of this route were considered environmentally preferable and reasonable (Coeymans to Catskill and Stony Point to Clarkstown) and were adopted as part of the proposed CHPE Project analyzed in the EIS.

- The Harlem River Rail Route alternative alignment was not considered reasonable due to engineering and geotechnical constraints, existing infrastructure and development including passenger and freight rail lines and stations, potential for cable damage and significant traffic disruption, and increased cost and construction time.
- The Hell Gate Bypass Route alternative alignment was considered reasonable, would avoid conflict with existing development and reduce in-river construction, and was adopted as part of the proposed CHPE Project analyzed in the EIS.
- Two overland alternative routes, one west of Adirondack Park and one east of the Hudson River, were not considered reasonable due to engineering constraints, existing infrastructure and development, required use of long HDD segments with insufficient space in some areas, and increased cost and construction time.
- Both the development of a new electrical transmission line ROW and use of existing electrical transmission ROWs were not considered reasonable alternatives because of land use issues (extensive requirements for owner agreements or eminent domain). In addition, both alternatives were not considered reasonable due to engineering constraints, potential long and difficult HDD installations, and substantially increased project costs and construction time.

S.7.2 Conservation and Demand Reduction Measures

NYISO has projected that New York State's annual energy demand, without efficiency measures, would increase by 14 percent from approximately 163,000 GWh in 2011 to approximately 186,000 GWh in 2022, an increase of 23,000 GWh. Including implementation of the energy-efficiency measures identified in the 2009 State Energy Plan, NYISO forecasts that energy demand would increase to approximately 173,500 GWh, an increase of 10,500 GWh (7 percent). For the New York City location zone, NYISO forecasts that energy demand will increase more rapidly than statewide, rising by 9 percent between 2011 and 2022 (NYISO 2012). Consequently, NYISO has demonstrated energy-efficiency and conservation measures alone would not address southeastern New York's increasing demand for electricity and that a mix of energy efficiency, demand reduction, and new generation would be required to meet future energy demand. Therefore, DOE determined that the conservation and demand-reduction measures alternative alone is not a reasonable alternative and is therefore not addressed further in the EIS.

S.7.3 Use of HVAC Versus HVDC Technology

Two types of transmission technologies could be used to transport electricity from Canada to the New York City metropolitan area, namely HVAC or HVDC technology. The transmission technology selection greatly influences the system design and construction and the resulting potential environmental impacts.

AC Transmission Technology. An overhead HVAC transmission system is the traditional method of expanding transmission capacity within and between utility service territories. HVAC transmission by overhead lines is efficient for distances up to 400 miles (644 km). Construction of new overhead HVAC transmission cables would also require a new or expanded ROW for utility corridors, and in metropolitan and suburban areas, land costs are high and public concern regarding aesthetics and potential environmental and health effects (e.g., EMF) from an overhead HVAC transmission line result in few such projects proceeding beyond the planning stage.

DC Transmission Technology. The primary advantage of long-distance HVDC transmission technology lies in its efficiency. Because there is no need to charge the capacitance (i.e., measure of energy potential) of a transmission cable as is required for an AC transmission line, transmission losses are significantly reduced. In addition, HVDC only requires two conductors instead of three and allows for reduced separation between conductors. As a result, the need for an expansive new ROW is reduced and construction costs are lowered.

The Applicant has proposed an HVDC transmission system for the following reasons:

- *Greater Flexibility.* Long-distance HVDC transmission lines can be buried underwater and underground, and installed overhead, thus providing more flexibility with ROW planning.
- *Reduced ROW Requirements.* The proposed HVDC technology would require less ROW than comparably sized overhead HVAC transmission lines. The transmission cables would be buried, and the total corridor requirements typically would be approximately 20 feet (6 meters) wide in terrestrial sections and 30 feet (9 meters) wide in aquatic sections. An overhead HVAC transmission line of similar capacity would require a terrestrial ROW of up to 150 feet (46 meters).
- *Minimized Exposure to Electric Fields When Buried.* Independent studies have shown that buried cables, such as those proposed for the CHPE Project, would have no electric fields at the ground surface (WHO 2012). The burial of the transmission line at the proposed depths reduces the electric field exposure compared to an overhead transmission system.
- *Greater Reliability.* Underwater and underground armored HVDC transmission cables have a higher reliability than overhead HVAC transmission cables, primarily because they are less likely to be subject to damage from weather, collision, or vandalism. They also operate within a constant temperature regime; therefore, they are not subject to thermal derating at high ambient temperatures.
- *Enhanced Security.* Since the terrorist attacks of September 11, 2001, energy infrastructure security has become a national priority. The physical separation of transmission infrastructure in multiple corridors is one means of enhancing security, as is the installation of such facilities underwater and underground.
- *Reactive Power Requirements.* HVAC transmission is limited by the amount of reactive power required to deliver active power through transmission lines, so that long-distance power transmission by HVAC lines is restricted due to limitations on how far reactive power will travel.
- *Greater Control to Improve System Stability.* HVDC interconnections to AC transmission systems have the advantage of being able to enhance the controllability and stability of the AC transmission system by allowing the operation to regulate active power flow in the receiving transmission line.

For these reasons, the Applicant determined that only HVDC transmission technology would meet the objectives of the proposed CHPE Project; therefore, the use of HVDC technology is a component of the Applicant's preferred project proposal evaluated in the EIS. In light of this, DOE determined that the alternative of using HVAC transmission lines to deliver power into the New York City metropolitan area was not reasonable as an alternative from the Applicant, and therefore was eliminated from further consideration in the EIS.

S.7.4 Interconnection Alternatives

As part of its initial system planning evaluations, the Applicant considered a number of different locations for interconnecting the proposed CHPE Project transmission system into the grid and for siting the DC to AC converter station that would be required for this interconnection.

The Applicant conducted an Interconnection Feasibility Study to evaluate potential alternative POIs relating to the reliability of the New York State transmission system (CHPEI 2010a). The feasibility study evaluated possible POIs for the HVAC transmission interconnection at four locations in the New York City metropolitan area. The feasibility study determined that the NYPA Astoria Annex substation was the preferred location for the interconnection. The feasibility study indicated that the following locations were not feasible because of the reasons stated:

- The West 49th Street 345-kV Substation was not a practical POI location due to insufficient space for the interconnection equipment and excessive costs that would have rendered the proposed CHPE Project economically infeasible.
- The Sherman Creek POI would have required construction of a new step-down transformer station at a location where space is limited, and because ConEd indicated its preference that the Sherman Creek substation not be used as the POI.
- Engineering and environmental constraints associated with installing the HVAC transmission cables at the Gowanus 345-kV Substation rendered the site as an unreasonable POI location for the proposed CHPE Project.

Due to the reasons identified in the foregoing paragraphs, DOE determined that the West 49th Street, Sherman Creek, and Gowanus POIs were not reasonable alternatives and, therefore, were eliminated from further consideration in the EIS.

S.7.5 Alternatives to the Luyster Creek Converter Station

In conjunction with the identification of feasible POIs in the New York City metropolitan area, the Applicant identified possible sites for construction of the converter station in proximity to the POIs. Sites that were identified and evaluated are discussed as follows.

Gowanus POI Converter Station Location Alternatives. The Applicant identified the following three potential converter station sites near the existing Gowanus 345-kV Substation for evaluation:

- 611 Smith Street in Brooklyn, New York
- 688 Court Street in Brooklyn, New York
- Property within the Sunset Industrial Park in Brooklyn, New York.

However, due to concerns over environmental contamination along potential transmission cable routes and at the converter station sites, the presence of existing infrastructure and heavy vessel traffic could prohibit or further complicate the installation of the HVDC transmission cables. Therefore, locating the converter station near the Gowanus Substation was deemed to be unreasonable, and eliminated from further consideration.

Yonkers HVDC Converter Station Alternative. The Applicant identified and evaluated two potential locations in Yonkers for the 1,000-MW converter station. The first property is on Wells Avenue in Yonkers, between Alexander Street and Woodworth Avenue. The Wells Avenue site in Yonkers was included as part of the August 2010 proposal for the CHPE Project because it met the minimum size requirements, allowed for an interconnection to a number of the potential POIs under consideration, and was available to the Applicant. This previously proposed converter station site was dismissed from further consideration during the NYSPSC review process and is not included in the NYSPSC Certificate issued to the Applicant; therefore, this site is not considered further by DOE in this EIS.

A second Yonkers converter station site considered by the Applicant was at the former Yonkers (otherwise known as Glenwood) Power Station on Ravine Avenue. However, the size of the parcel (2.0 acres [0.8 hectares]) does not meet the minimum requirements for the converter station, and, therefore, this site was not considered a reasonable alternative by DOE and was eliminated from further consideration in the EIS.

Harlem River Rail Yard. An alternative converter station site was identified at a site in the Bronx along the terrestrial transmission system route at approximate MP 330.8 at a site owned by NYSDOT. However, NYSDOT declined to make that site available to the Applicant as a converter station, and consequently the Harlem River Rail Yard site was not considered a reasonable alternative by DOE and was eliminated from further consideration in the EIS.

S.8 Summary of Potential Impacts Associated with the Proposed CHPE Project

A summary of potential impacts from the construction, operation, maintenance, and emergency repairs associated with the proposed CHPE Project and the No Action Alternative are presented in the following resource area discussions and summarized in **Table S-1**. The full impact analysis, along with Applicant-proposed measures and BMPs to avoid or minimize potential impacts, is presented in **Chapter 5** (Environmental Consequences) and **Chapter 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 some mix of other power generation sources. A full discussion of the No Action Alternative is provided in **Chapter 4** of the EIS.

S.8.1 Land Use

Construction and operation of the proposed CHPE Project would be consistent with relevant land uses plans and policies, including the New York State Coastal Management Program (CMP). The New York State Department of State (NYSDOS) conditionally concurred with the consistency certification of the proposed CHPE Project under the enforceable policies of the New York State CMP subject to the implementation of certain conditions. These conditions, along with other measures to minimize the potential environmental impacts, have been incorporated into the proposed CHPE Project design by the Applicant and reflected in the NYSPSC Certificate for the proposed CHPE Project (NYSPSC 2013).

Impacts from Construction

Construction activities associated with the installation of the aquatic portions of the proposed CHPE Project would result in additional vessel traffic and an area immediately surrounding the work site that would be off-limits to other vessels. However, aquatic installation activities would not prohibit any water-dependent commercial and recreational uses of adjacent areas during the few hours that construction vessels would be present or during the approximate 2-week period when HDD operations would be occurring. Because the aquatic transmission line would be installed along state-owned submerged lands in Lake Champlain and the Hudson, Harlem, and East rivers, the Applicant would be required to obtain an easement from the New York State Office of General Services and pay associated fees.

Construction activities associated with the installation of the terrestrial portion of the transmission line, which would be within roadway and railroad ROWs, would generally be compatible with existing road and railroad operations, but could result in temporary disturbances that disrupt these operations, such as roadway lane closures or reduced shoulders, and presence of heavy equipment and construction

Table S-1. Summary of Potential Impacts Associated with the Proposed CHPE Project

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	Overland Segment	Hudson River Segment	New York City Metropolitan Area Segment	
General Overview					
State	New York	New York	New York	New York	New York
Counties	Clinton Essex Washington	Albany Greene Saratoga Schenectady Washington	Dutchess Greene Orange Putnam Rockland Ulster Westchester	Bronx New York Queens	N/A
Milepost Range	0–101	101–228	228–324	324–336	N/A
Corridor Type	Aquatic	Terrestrial	Aquatic/Terrestrial	Aquatic/Terrestrial	N/A
Construction Method(s)	Jet Plow, Shear Plow	Trenching, HDD	Jet Plow, Trenching, HDD	Jet Plow, Trenching, HDD, Underwater Blasting	N/A
Construction Period(s)	Cable Installation: 7 months	Cable Installation: 3 years	Cable Installation: 5 months	Cable Installation: 7 months Converter Station: 1 year	N/A
Impacts on Resource Areas from Construction and Operations, Maintenance, and Emergency Repairs of the Proposed CHPE Project					
Land Use	**Construction:** Temporary, non-significant increase in limitations on water-based uses. **Operations:** *Potential for future limitations on water-based uses or access during inspection activities; use limitations from maintenance and emergency repairs would be shorter and more localized than for construction.	**Construction:** Temporary, non-significant disruption of normal routines due to access limitations from presence of construction activities. **Operations:** Potential for future land use restrictions for operations and maintenance. Emergency repair impacts similar to construction, but shorter and with more localized disturbance.	**Construction/Operations:** Same temporary use and access limitations or disruptions and potential future land use restrictions as Lake Champlain and Overland segments.	**Construction/Operations:** Same temporary use limitations or disruptions as Lake Champlain and Overland segments.	None expected. No new land use impacts would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	Overland Segment	Hudson River Segment	New York City Metropolitan Area Segment	
Transportation and Traffic	**Construction:** Non-significant, temporary, and localized use limitations or disruptions on navigation, ferries, and other commercial and recreational transportation uses in Lake Champlain and in the Champlain Canal. **Operations:** Potential for anchor snags.	**Construction:** Non-significant disruptions on railroad operations, traffic flow on New York State Route 22, and city streets in Schenectady and street crossings. **Operations:** Potential for future temporary access limitations on roadways and railways.	**Construction:** Non-significant, temporary, and localized use limitations or disruptions affecting navigation, ferries, and other commercial and recreational transportation uses in the Hudson River. Non-significant disruptions affecting railroad operations and traffic flow on U.S. Route 9W in Stony Point, Haverstraw, and Clarkstown. **Operations:** Potential for anchor snags.	**Construction:** Non-significant, temporary, and localized use limitations or disruptions affecting navigation, ferries, and other commercial and recreational transportation uses in the Harlem and East rivers. Non-significant disruptions affecting railroad operations in the Bronx and city traffic flow in Astoria. **Operations:** Potential for anchor snags.	None expected. No new transportation, navigation, or traffic impacts would occur.
Water Resources and Quality	**Construction/Operations:** Non-significant, localized increases in turbidity and downstream sedimentation and resuspension of contaminated sediments in surface water by water jetting. Water quality impacts would be within regulatory standards.	**Construction/Operations:** Localized and non-significant increases in turbidity, suspension of sediments in surface waters, nearby groundwater wells, and wetland areas during construction.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment for the aquatic portion of the transmission line route and the Overland Segment for the terrestrial portion.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment for the aquatic portion of the transmission line route and the Overland Segment for the terrestrial portion.	None expected. No new water resources and quality impacts would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	Overland Segment	Hudson River Segment	New York City Metropolitan Area Segment	
Aquatic Habitats and Species	**Construction:** Localized non-significant disturbance to 612 acres (248 hectares) of lake bottom resulting in habitat degradation, avoidance, or loss; noise, and vibration; impacts on benthic communities; potential for accidental exposure to hazardous materials. Potential non-significant mortalities of individuals among non-mobile species could occur from inability to adapt to new sediment conditions. **Operations:** Non-significant generation of magnetic fields and induced electric fields detectable, and potentially avoided, by some fish and shellfish species. Sediment temperature increase above the cables might lead to localized habitat avoidance of benthic infauna. Emergency repair effects expected to be less than construction because they would be shorter-term and more localized.	**Construction/Operations:** Disturbance of streambeds would be the same as for the Lake Champlain Segment with temporary, localized, non-significant stream habitat degradation or loss from increased turbidity and downstream sedimentation and resuspension of contaminated sediments in surface water during the streambed restoration process.	**Construction/Operations:** Riverbed disturbance of 533 acres (216 hectares) would involve the same impacts as indicated for Lake Champlain Segment, and additional non-significant impacts on essential fish habitat (EFH), including water column and substrates, and associated species. Impacts on streams in terrestrial portions of the route would be the same as indicated for the Overland Segment.	**Construction/Operations:** Riverbed disturbance of 36 acres (15 hectares) would involve the same impacts as indicated for the Lake Champlain and Hudson River segments, and non-significant impacts from noise and vibration due to blasting.	None expected. No new impacts on aquatic habitats and species would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	**Overland Segment**	**Hudson River Segment**	**New York City Metropolitan Area Segment**	
Aquatic Protected and Sensitive Species	**Construction:** No effects on federally listed species. Localized non-significant effects on individuals among state-listed fish and shellfish species similar to those for non-listed species. **Operations:** Same effects as for non-listed aquatic species; detection and potential avoidance of magnetic fields and sediment temperature resulting in habitat avoidance of infauna during operation. Emergency repair effects would be shorter-term and more localized than those from construction.	**Construction/Operations:** No effects on federally listed or state-listed aquatic species expected.	**Construction:** Localized non-significant effects on individuals among federally listed and state-listed sturgeon species, including habitat degradation or loss, noise, and vibration; potential vessel collisions with shortnose and Atlantic sturgeon; increased turbidity and sedimentation and redeposition of sediments; potential for accidental exposure to hazardous materials that could affect abilities to forage and reproduce. **Operations:** Same effects as for non-listed aquatic species; detection and potential avoidance of magnetic fields and sediment temperature resulting in habitat avoidance of infauna during operation. Emergency repair effects would be shorter-term and more localized than those from construction.	**Construction/Operations:** Same non-significant effects on federally listed and state-listed sturgeon species as indicated for the Hudson River Segment, and non-significant impacts from noise and vibration due to blasting.	None expected. No new effects on aquatic protected and sensitive species would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	Overland Segment	Hudson River Segment	New York City Metropolitan Area Segment	
Terrestrial Habitats and Species	**Construction/Operations:** No significant impacts would be expected because the proposed CHPE Project route is installed underwater in this segment.	**Construction:** Permanent conversion of approximately 48 acres (19 hectares) of fringe forest habitat to scrub/shrub habitat. Non-significant, localized noise, dust, soil compaction, and habitat fragmentation impacts including removal of vegetation, habitat avoidance, and changes in species composition. Permanently reduced abundance would not be expected; known responses to narrow corridors do not involve permanent avoidance or population displacement; species could traverse the corridor post-construction. **Operations:** Some wildlife species would detect magnetic fields and heat generated by the transmission line during operation, but these conditions are unlikely to reduce health or productivity. Periodic vegetation maintenance in transmission line ROW would compact vegetation and soils and produce temporary fugitive dust impacts. Emergency repair impacts would be shorter-term and more localized than those from construction.	**Construction/Operations:** Same conversion of some fringe forest habitat to scrub/shrub habitat during construction, as described for the Overland Segment. Same non-significant, localized habitat alterations and resulting impacts as indicated for construction in the Overland Segment. Same non-significant, localized impacts from operation, maintenance and emergency repairs as indicated for the Overland Segment.	**Construction/Operations:** No significant construction impacts on terrestrial vegetation and habitats expected because installation would occur in the Hudson River and within developed urban land with little natural vegetation and habitat. Non-significant, localized disturbance of birds and bats that could display habitat or feeding avoidance during construction. Same non-significant, localized impacts from operation, maintenance and emergency repairs as indicated for the Overland Segment.	None expected. No new impacts on terrestrial habitats and species would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	Overland Segment	Hudson River Segment	New York City Metropolitan Area Segment	
Terrestrial Protected and Sensitive Species	**Construction:** Non-significant, localized noise or vessel lighting disturbances of federally and state-listed Indiana bat and the Federal proposed-endangered northern long-eared bat. **Operations:** Operations are not expected to result in reduced health or productivity of the Indiana bat or the northern long-eared bat. No effects anticipated during maintenance. Emergency repair impacts would be shorter-term and more localized than those from construction.	**Construction:** Conversion and disturbance of fringe forest habitat along the ROWs may affect, but is not likely to adversely affect, federally listed and state-listed species, including bat species listed or proposed for listing, the Karner blue butterfly, and migratory birds, potentially present during construction. **Operations:** Operations and maintenance activities are not expected to adversely affect terrestrial protected and sensitive species. Effects from emergency repairs would be similar to construction but for a shorter-term and more localized than those from construction.	**Construction:** Same non-significant effects on federally listed and state-listed species and migratory birds as indicated for Lake Champlain and Overland segments. Similar non-significant construction effects on bald eagles that might be encountered when activities are underway. **Operations:** Operations and maintenance are not expected to adversely affect terrestrial protected and sensitive species.	**Construction:** No effects on federally listed species because there is no suitable habitat for them where construction would occur. **Operations:** Operations and maintenance are not expected to adversely affect terrestrial protected and sensitive species.	None expected. No new effects on terrestrial protected and sensitive species would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	Overland Segment	Hudson River Segment	New York City Metropolitan Area Segment	
Wetlands	**Construction/Operations:** None expected.	**Construction:** Localized potential for habitat disturbance; non-significant impacts on 67.4 acres (27.3 hectares) of wetlands, including 16.2 acres (6.6 hectares) of forested wetlands and 51.2 acres (20.7 hectares) of non-forested wetlands; and significant, permanent change on 10.2 acres (4.1 hectares) of wetlands, including 2.0 acres (0.8 hectares) of forested wetlands that would be converted to scrub-shrub wetlands, and on 8.3 acres (3.4 hectares) of non-forested wetlands resulting in habitat degradation and loss. **Operations:** Non-significant impacts from operations because heat would dissipate well below the water surface. Periodic vegetation maintenance in transmission line ROW would compact vegetation and soils and result in temporary fugitive dust impacts. Emergency repair impacts would be shorter-term and more localized than those from construction.	**Construction:** Localized potential for non-significant impacts on 0.03 acres (0.01 hectares) of wetlands including one brook under which the transmission line would be installed, potentially resulting in habitat disturbance. **Operations:** Same non-significant, localized impacts from maintenance and emergency repairs as described for the Overland Segment.	**Construction/Operations:** None expected.	None expected. No new wetlands impacts would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	Overland Segment	Hudson River Segment	New York City Metropolitan Area Segment	
Geology and Soils	**Construction:** Temporary disturbance of 127,000 cubic yards (97,000 cubic meters) of sediment. **Operations:** Emergency repair impacts would be shorter-term and more localized than those from construction. No impacts from possible seismic events.	**Construction:** Temporary disturbance of approximately 585 acres (237 hectares) of upland area. Non-significant impacts from bedrock blasting and removal, increased erosion and sedimentation, and soil compaction on land and sediment disturbance in waterways and wetlands. **Operations:** Negligible increase in soil erosion and sedimentation from periodic vegetation maintenance. Emergency repair impacts would be shorter-term and more localized than those from construction.	**Construction:** Temporary disturbance of 229,000 cubic yards (175,000 cubic meters) of sediment. Temporary disturbance of approximately 47 acres (19 hectares) of upland area. Upland bedrock blasting and removal possible; erosion, sedimentation, and soil compaction over land. **Operations:** Same as indicated for the Lake Champlain and Overland segments.	**Construction/Operations:** Temporary disturbance of 11,000 cubic yards (8,400 cubic meters) of sediment. Temporary disturbance of approximately 14 acres (6 hectares) of upland area. Otherwise, same impacts as indicated for the Lake Champlain and Overland segments.	None expected. No new geology and soils impacts would occur.
Cultural Resources	**Construction:** Potential adverse effects on 5 underwater archaeological sites, 2 terrestrial sites extending into Lake Champlain, and 2 National Register of Historic Places (NRHP)-listed sites. **Operations:** No adverse effects are expected.	**Construction:** Potential adverse effects on 34 terrestrial archaeological sites, 16 NRHP-listed or -eligible sites, and 1 cemetery. **Operations:** No adverse effects are expected.	**Construction:** Potential adverse effects on 8 terrestrial archaeological sites, 6 underwater archaeological sites, 7 NRHP-listed or -eligible sites, and 1 cemetery. **Operations:** Potential visual impacts on 1 NRHP-listed site.	**Construction:** Potential adverse effects on 7 terrestrial archaeological sites and 10 NRHP-listed or -eligible sites. **Operations:** None expected.	None expected. No new cultural resources effects would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	Overland Segment	Hudson River Segment	New York City Metropolitan Area Segment	
Visual Resources	**Construction:** Non-significant impacts on visual resources from temporary presence of construction vessels and activities. **Operations:** Emergency repair impacts would be shorter-term and more localized than those from construction.	**Construction:** Non-significant impacts on visual resources from temporary presence of construction equipment and activities. **Operations:** Non-significant impacts from operation and maintenance of cooling stations consisting of a 128-square foot (12-square meter) building. Emergency repair impacts would be shorter-term and more localized than those from construction.	**Construction:** Same as indicated for the Lake Champlain Segment for the aquatic portion of the transmission line route and the Overland Segment for the terrestrial portion.	**Construction:** Same as indicated for the Lake Champlain Segment for the aquatic portion of the transmission line route and the Overland Segment for the terrestrial portion.	None expected. No new impacts on visual resources would occur.
Infrastructure	**Construction:** Non-significant impacts include intersecting utility lines, potential service disruption, increased fuel use, and generation of solid waste. **Operations:** Increased reliability and capacity of electricity provision. Increased fuel use during maintenance or emergency repairs.	**Construction:** Non-significant impacts include intersecting utility lines, potential service disruption of public water supply, increased fuel use, storm water management, and solid waste management. **Operations:** Increased reliability and capacity of electricity provision. Increased fuel use during maintenance or emergency repairs.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment for the aquatic portion of the transmission line route and the Overland Segment for the terrestrial portion.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment for the aquatic portion of the transmission line route and Overland Segment for the terrestrial portion.	None expected. No new infrastructure impacts would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	Overland Segment	Hudson River Segment	New York City Metropolitan Area Segment	
Recreation	**Construction:** Temporarily limited access to water area in active construction zone. Non-significant impacts on recreational resources from temporary presence of construction vessels and activities. **Operations:** Non-significant impacts during operations and maintenance. Emergency repair impacts would be shorter-term and more localized than those from construction.	**Construction:** Potential lane restrictions on roads near recreational facilities. Non-significant impacts on recreational resources from temporary presence of construction equipment and activities. **Operations:** Emergency repair impacts would be shorter-term and more localized than those from construction.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment for the aquatic portion of the transmission line route and the Overland Segment for the terrestrial portion.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment for the aquatic portion of the transmission line route and the Overland Segment for the terrestrial portion.	None expected. No new impacts on recreational resources would occur.
Public Health and Safety	**Construction:** Potential health and safety impacts on construction workers; no impacts are expected on general public health and safety. **Operations:** Potential health and safety impacts on contractors during operations; emergency repair impacts would be shorter-term and more localized than those from construction.	**Construction/Operations:** Impacts would not be expected from magnetic fields because magnetic field levels from the proposed CHPE Project would be within NYSPSC guidelines. Otherwise impacts expected to be same as indicated for Lake Champlain Segment.	**Construction/Operations:** Same as indicated for the Lake Champlain and Overland segments.	**Construction/Operations:** Same as indicated for the Lake Champlain and Overland segments.	None expected. No new public health and safety impacts would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	Overland Segment	Hudson River Segment	New York City Metropolitan Area Segment	
Hazardous Materials and Wastes	**Construction:** Storage of hazardous materials presents potential for spill contamination of water or land (staging areas); generation of waste and debris during installation. **Operations:** Limited amounts of oils, solvents, antifreeze, and other hazardous materials generated from routine maintenance and inspections; less than construction for emergency repair.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment.	None expected. No new hazardous materials and wastes impacts would occur.
Air Quality	**Construction:** Localized impacts from equipment and vessel exhaust. GHG emissions from use of vehicles and equipment with diesel fuel-powered internal combustion engines. **Operations:** GHG emissions from electricity sources used to power the converter station and cooling stations. Emergency repair impacts less than construction.	**Construction/Operations:** Localized, intermittent impacts from use of construction equipment, particularly from vehicle exhaust, fugitive dust, and GHG emissions.	**Construction/Operations:** Same as indicated for the Lake Champlain and Overland segments.	**Construction/Operations:** Same as indicated for the Lake Champlain and Overland segments. In addition, upon operation of the proposed CHPE Project, New York State power generation emissions would be reduced by an estimated by 1.5 million tons of CO_2, 751 tons of SO_2, and 641 tons of NO_x while meeting its existing annual electric power demand.	None expected. No new air quality impacts would occur; however, there would be no project-related GHG emissions reductions.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	**Overland Segment**	**Hudson River Segment**	**New York City Metropolitan Area Segment**	
Noise	**Construction:** Localized temporary noise level increases on the water and at land staging areas. **Operations:** No significant impacts are expected.	**Construction:** Localized temporary noise level increases in residential, commercial, and industrial areas. Temporary, localized construction noise impacts indicated for terrestrial and aquatic habitats and species. **Operations:** Short-term noise level changes during inspections and maintenance of the transmission line ROW. Emergency repair noise impacts would be shorter-term and more localized than those from construction. Noise levels would be within state thresholds for operation of cooling stations and would not be significant.	**Construction:** Localized temporary noise level increases in residential, commercial, and industrial areas. Temporary, localized construction noise impacts indicated for terrestrial and aquatic habitats and species. **Operations:** Short-term noise level changes during inspections and maintenance of the transmission line ROW. Emergency repair noise impacts would be shorter-term and more localized than those from construction. Noise levels would be within state thresholds for operation of cooling stations and would not be significant.	**Construction:** Localized temporary noise level increases in residential, commercial, and industrial areas. Temporary, localized construction noise impacts, including from blasting, indicated for terrestrial and aquatic habitats and species. **Operations:** Short-term noise level changes during inspections and maintenance of the transmission line ROW. Emergency repair noise impacts would be shorter-term and more localized than those from construction. Noise levels would be within state thresholds for operation of cooling stations and would not be significant.	None expected. No new noise impacts would occur.
Socioeconomics	**Construction:** Negligible increase in local employment and demand for local purchases. Temporary housing required for a small number of construction workers to the area. **Operations:** Potential electricity cost savings to some end users.	**Construction/Operations:** Real property tax revenue benefits; otherwise same as indicated for the Lake Champlain Segment.	**Construction/Operations:** Same as indicated for the Lake Champlain and Overland segments.	**Construction/Operations:** Same as indicated for the Lake Champlain and Overland segments.	None expected. No new impacts on socioeconomics would occur.

Comparison Factor/ Resource Area	Proposed CHPE Project				No Action Alternative
	Lake Champlain Segment	**Overland Segment**	**Hudson River Segment**	**New York City Metropolitan Area Segment**	
Environmental Justice	**Construction/Operations:** No disproportionately high and adverse human health or environmental effects on minority or low-income populations.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment.	**Construction/Operations:** Same as indicated for the Lake Champlain Segment.	**Construction/Operations:** Although populations in this segment have higher percentages of minority and low-income populations than New York State, no disproportionately high and adverse human health or environmental effects are expected.	None expected. No new effects on environmental justice would occur.

Note: * In this table, "Operations:" refers to operational, maintenance, and potential emergency repair activities during the operational phase of the proposed CHPE Project.

personnel. Construction activities on land would introduce temporary disturbances to normal routines (e.g., limitations to property access and the presence of construction activities or equipment). The Applicant would be required to obtain leases, easements, construction permits, revocable permits/consent, highway work permits, use and occupancy agreements/permits, or other agreements from private and public landowners authorizing use of land for the terrestrial construction activities or additional workspace to support the construction activities (e.g., at HDD locations or for construction staging area facilities). Temporary storage and staging activities to support transmission line installation would be within existing commercial or industrial areas. These activities would be compatible with surrounding land uses.

Impacts from Operations, Maintenance, and Emergency Repairs

The proposed CHPE Project transmission line would generally be underwater or underground and, therefore, it would not be visible and would not interfere with surrounding land uses.

Periodic inspection of aquatic portions of the transmission line using vessel-mounted instruments would result in a negligible amount of additional vessel traffic; however, no impacts on water-dependent commercial and recreational uses would occur. Emergency repair activities, if necessary, along the aquatic portion of the transmission line could result in temporary impacts on existing commercial and recreational uses in the immediate vicinity of the work site due to the presence of cable repair vessels at the site of the fault.

Impacts on land use would result from operation of the proposed CHPE Project because future use of the land within the transmission line ROW would be limited for the lifespan of the transmission line. The Applicant would be granted either control of (via fee or easement for private property), or other appropriate interest or rights to use (via revocable consent or use and occupancy permit for public ROWs such as roadways or state land or lease for the railroad ROWs) an up to approximately 20-foot (6-meter)-wide transmission line ROW. Property owners granting the use of portions of their lands as the transmission line ROW would be prohibited from taking any action on that land that would damage or interfere with the Applicant's maintenance, inspection, and emergency repair activities with the ROW. It is anticipated that easements negotiated with private landowners would be bilateral easements in which the Applicant and landowner mutually agree to the easement provisions. While use of eminent domain would be avoided to the maximum extent practicable, limited easements or leases for the transmission line ROW in areas outside of the roadway and railroad ROWs might need to be obtained via eminent domain as part of the NYSPSC Article VII approval process. However, property owners would receive just compensation for this loss of use.

Periodic inspection of the terrestrial portions of the transmission line ROW and the cooling stations and converter station, and maintenance of the cooling stations and converter station, would generally be non-intrusive and would not disrupt (i.e., disturb, interrupt, or otherwise change) adjacent land uses. Emergency repairs of the transmission line, cooling stations, or converter station could result in temporary disturbances (e.g., limitations to or temporary changes to property access from the presence of emergency repair activities or equipment).

S.8.2 Transportation and Traffic

Construction and operation of the proposed CHPE Project would not have significant impacts, occurring intermittently for short durations, to the existing aquatic- and terrestrial-based transportation and traffic network within the proposed construction corridor. Applicant-proposed measures to avoid or minimize impacts have been incorporated into the proposed CHPE Project.

Impacts from Construction

Impacts on aquatic navigational operations along the proposed CHPE Project route would occur from the installation of the aquatic transmission cables. Impacts would occur on commercial and recreational transportation uses in Lake Champlain, the Champlain Canal, the Hudson River, the Harlem River, and Spuyten Duyvil Creek. Construction activities associated with the installation of aquatic portions of the proposed CHPE Project would include the generation of additional vessel traffic and clearance of areas in the Harlem River due to blasting, which on a small scale could inconvenience and create minor navigational obstacles (e.g., temporary loss of use of portions of waterways) for commercial and recreational water-dependent uses. However, cables would not be buried in anchorage areas and use of waterways would resume following installation activities. Each blast event in the Harlem River would only take a few seconds; however, prior to each blast, the area would be cleared to a distance determined by the fire marshal and the harbormaster. Transmission cable installation would not prohibit water-dependent recreational or commercial activities because vessels could either transit around the work site or use a different area of the waterway. If conditions do not allow other vessels to transit around the work site, the Applicant would ensure that aquatic construction does not interfere with routine navigation by making adjustments to the work site as required. The guidance cables for the cable ferry crossing in Lake Champlain would be temporarily removed from the lakebed prior to the installation of the transmission cables, which may put the ferry temporarily out of service. Installation of the transmission cables would be coordinated with the ferry operator to minimize impacts on ferry operations. Disturbance to recreational and commercial uses would be temporary and localized at the work site. Construction would be coordinated with the USACE and USCG to avoid impacts on aquatic navigation, including avoidance of Federal-, state-, and private-owned navigation aids such as buoys and signs for boaters. For areas where the proposed aquatic transmission cables pass beneath bridges, construction would be coordinated with the owner of the bridge regarding clearances, distance from abutments and existing infrastructure, cable burial, and installation methods.

Impacts on railroad operations and traffic on roadways along the terrestrial portion of the proposed CHPE Project route would occur from the installation of the transmission cables. Impacts would occur on New York State Route 22 in Dresden and U.S. Route 9W in Haverstraw and Clarkstown, city streets in Schenectady and Queens, at ports used for land-based support, street crossings, and associated railroad corridors along the proposed CHPE Project route. Construction activities associated with the installation of the terrestrial transmission cables would generally be compatible with existing road and railroad operations, but could result in temporary minor disruptions (i.e., delays, temporary cancellations, or other changes) to these operations. Impacts would be limited to those impacting the flow of traffic which would occur when there is construction along the roadways or when roadways are crossed using trenching methods. Traffic levels of service would likely decrease due to slightly slower speeds through construction zones, but traffic flow would be maintained; therefore, impacts on traffic levels would not be significant. A Maintenance and Protection of Traffic Plan would be prepared to identify measures to minimize impacts on state highways. The Applicant would be required to obtain permissions in the form of easements, encroachment permits, highway work permits, or other agreements from private and public landowners for use of private property and road and railroad ROWs for terrestrial construction activities or additional workspace (e.g., at HDD locations or for support facilities).

Impacts from Operations, Maintenance, and Emergency Repairs

During operations, the transmission line would be underwater or underground and, therefore, it would not interfere with the aquatic- and land-based transportation and traffic network.

Activities impacting aquatic navigational operations along the aquatic portion of the proposed CHPE Project route would include those associated with operation, regular inspection, and possible emergency repairs of the transmission line. Regular non-intrusive inspection of aquatic portions of the transmission line using vessel-mounted instruments would result in negligible additional vessel traffic. If necessary, emergency repair activities along the aquatic transmission line would be expected to result in temporary navigational obstacles (e.g., temporary loss of use of portions of waterways) for commercial and recreational vessels in the immediate vicinity of the repair site. However, use of waterways would resume following repair activities. The transmission line would also create the potential for anchor snags. Transmission cables would not be located in anchorage areas and they would be buried to the depths prescribed by the USACE (see **Section S.6.2**), thereby avoiding potential for vessel anchors hooking and causing damage either to vessels or to the transmission cables. However, anchors could become snagged on the concrete mats that would be used to cover portions of the transmission line that cannot be buried. The total area where concrete mats would be used to cover the transmission line represents less than 0.001 percent of the acreage of the waterbodies along the entire aquatic portion of the proposed CHPE Project route. Therefore, impacts on vessels or vessel anchors are not expected to be significant. In the event that an anchor snag occurs, the vessel crew would notify the USCG and the Applicant; and the Applicant would repair the cable (if necessary), transport a new anchor to the barge, cut the snagged anchor chain, and recover the anchor (if possible). The Applicant would develop an Anchor Snag Manual, including a Navigation Risk Assessment, to address situations in which a vessel's anchor snags the transmission cables or concrete mats placed above the cables, and to identify appropriate protocols.

Decommissioning of the proposed CHPE Project transmission line would consist of de-energizing and abandoning the transmission line in place. There would be similar minimal impacts on anchorage from potential anchor snags on concrete mats as described for operation of the transmission line. If decommissioning plans change, applicable regulations at the time of decommissioning would be met.

Activities impacting transportation and traffic operations along the terrestrial portion of the proposed CHPE Project route would include those associated with operation, regular inspection, maintenance, and possible emergency repairs of the transmission line. Regular inspection of the terrestrial portions of the transmission line and aboveground infrastructure (i.e., cooling stations and converter station), and routine preventive maintenance of the aboveground infrastructure would generally be non-intrusive and not disrupt (i.e., delay, temporarily cancel, or otherwise change) transportation operations or traffic. If necessary, emergency repairs of the transmission line or aboveground infrastructure would be expected to result in temporary construction-related disturbances (e.g., temporary lane rerouting or closures from the presence of emergency repair activities) that would impact transportation uses along the proposed CHPE Project route. However, vehicular traffic flow would be maintained through emergency repair work zones.

S.8.3 Water Resources and Quality

Construction within Lake Champlain, the Hudson River, and the other surface waters and wetlands along the proposed CHPE Project route would require a CWA Section 404 and Section 10 permit from the USACE. The initial permit application and supporting information was submitted to the USACE in 2010 with supplemental information provided in February 2012. The Applicant received its State Section 401 Water Quality Certification from the NYSDPS in January 2013.

Impacts from Construction

Construction activities within the aquatic portions of the proposed CHPE Project route would include the installation of transmission cables in the lakebed and river bottoms using water-jetting and shear plow techniques, HDD, and blasting. Impacts on water quality would occur from localized increases in turbidity (a measurement of the cloudiness or amount of total suspended solids in the water) and resuspension of sediments resulting from trenching and disturbance within the waterbody. Increased turbidity has the potential to reduce light levels in aquatic habitats and could result in temporary changes to water chemistry, including impacts on pH and reduced dissolved oxygen.

Construction activities associated with installation in the terrestrial portions of proposed CHPE Project route would primarily include the transmission cables being buried beneath the ground within roadway and railroad ROWs. Ground disturbance would result in increased erosion and sedimentation in runoff. Runoff on construction sites would be managed on site using BMPs incorporated into the proposed CHPE Project as Applicant-proposed measures. In addition, the proposed CHPE Project route would cross several streams and rivers. Installation methods proposed for stream crossings could include trenching, HDD, and attaching to existing infrastructure such as bridges and railroad trestles. Trenching would result in impacts on water quality from increased turbidity and potential downstream sedimentation. HDD, which would also be used in transitions from water to land and entirely under the East River, has the potential for frac-out (i.e., leaks of HDD drilling fluid) that could cause drilling fluid to become suspended or dispersed and could impact water quality. However, the Applicant would develop and implement an SPCC Plan that would also address potential releases of drilling fluid, which would be contained in the cofferdam area or the land-based HDD staging area during construction if such releases occur.

Portions of the proposed CHPE Project route would cross floodplains and coastal flood zones associated with surface waters. Temporary clearing, ground disturbance, and construction activity would occur within these floodplains. The converter station is proposed to be constructed in a coastal flood hazard area, and could be subject to flooding or storm surges. To minimize the potential for damage, the construction of the converter station would involve raising the structure above the 100-year base flow elevation.

The blasting of bedrock would be required in the Harlem River, and could be required to trench the terrestrial transmission cables in some locations. Bedrock blasting is likely to increase bedrock fracturing near the blasting zone and could temporarily increase turbidity in groundwater wells and the Harlem River near the blast zone. Therefore, impacts on groundwater and surface water quality could occur if blasting of bedrock is required.

Impacts from Operations, Maintenance, and Emergency Repairs

During operation, heat loss from the transmission line would result in negligible temperature increase of the water in its immediate vicinity. If required, emergency repairs of the aquatic transmission line where the cables would have to be unburied would result in localized increases in turbidity and resuspension of sediments that would temporarily impact water quality. The impacts from repairs would be similar to those expected during original installation, but would be for a shorter duration and would disturb a smaller area. Operation of the transmission line in terrestrial portions of the proposed CHPE Project route, would not impact water quality, water availability, or floodplains. Emergency repair activities would require ground disturbance as the damaged lines must be uncovered. Although these actions would result in increased potential for erosion and sedimentation to nearby surface waters, these impacts would be managed on site. Therefore, significant impacts would not be expected.

S.8.4 Aquatic Habitats and Species

Construction activities within Lake Champlain, the Hudson River, and the other surface waters along the proposed CHPE Project route would result in temporary impacts on aquatic habitat and species due to sediment disturbance, habitat alteration, noise and vibration, and possible shock waves from blasting. Impacts from operation of the proposed CHPE Project would include permanent habitat changes (e.g., reductions in substrate suitable for vegetation growth) at areas where concrete mats would be installed over soft bottom and temperature increases in sediments above the transmission line. A review of available scientific literature yielded inconclusive evidence that the magnetic fields produced or potentially altered by the proposed CHPE Project would impact aquatic species or habitats. Some fish species would be able to detect these magnetic fields, but the magnetic fields would not impact species' reproduction or capacity to forage or survive.

Impacts from Construction

Construction activities within the aquatic portions of the proposed CHPE Project would include the installation of transmission cables in the lakebed and river bottoms using water-jetting and shear plow techniques, and blasting in the Harlem River. Impacts on aquatic habitats and species, including essential fish habitat (EFH), would be caused by localized increases in turbidity and associated water quality degradation, sediment redeposition, underwater blasting, temporary noise and vibration, and potential accidental releases of hazardous materials.

The impacts of sedimentation and use of concrete mats on benthic organisms could include smothering, reduction of filtering rates, toxicity from exposure to anaerobic sediments, reduced light intensity, and physical abrasion. Additionally, mortalities among sessile species could occur if individuals are unable to adapt to the new sediment conditions. Increased turbidity could reduce light levels in aquatic habitats and temporarily impact water pH and reduced dissolved oxygen levels. The aquatic habitats directly affected by cable installation would primarily be confined to the footprint of the jet and shear plows, of anchors or spuds used to stabilize the barge, and of concrete mats; and those habitats affected by blasting in the Harlem River. Anchorage would be anticipated in specific areas such as locations of construction and removal of the five temporary cofferdams and cable landings at water-to-land transitions, marine splicing locations, and possibly along the 460-foot length of bedrock blasting in the Harlem River (at MP 324.5). The anchors would have a total impact area of approximately 15 square feet (1.4 square meters) per deployment. The collective length of all work where anchors might be deployed and cause impacts on benthic habitat is less than 1 percent of the approximately 197-mile (317-km) aquatic portion of the proposed CHPE Project route. Midline buoys would be used to prevent anchor sweeps that might otherwise affect benthic habitat. Concrete mats would be installed as protective covering over the transmission cables for 3.0 miles (4.8 km) in Lake Champlain and the Hudson and Harlem rivers, representing 1.5 percent of the length of the aquatic portion of the entire transmission line route. Blasting would occur for approximately 460 feet (140 meters) of bedrock in the Harlem River. Therefore, the total benthic habitat area of Lake Champlain and the Hudson and Harlem rivers affected by plowing, anchorage, concrete mats, and blasting during cable installation would be relatively small, and the impacts would be temporary and non-significant.

Expected underwater noise levels from proposed construction activities would be above the NMFS threshold of 150 decibels relative to 1 micropascal (dB re 1 μPa) root-mean-square (rms) for behavioral impacts on fish, but impacts would be expected to be localized. Behavioral responses of fish could range from a temporary startle to avoidance of an area affected by noise. No injury or physiological impacts would be expected.

The proposed CHPE Project route would avoid directly transiting 18 of the 22 Significant Coastal Fish and Wildlife Habitats (SCFWHs) in the Hudson River within 1 mile of the route, but would cross 5 SCFWHs (Catskill Creek, Esopus Estuary, Kingston-Poughkeepsie Deepwater Habitat, Hudson Highlands, and Lower Hudson Reach). Although the transmission line would cross the Catskill Creek SCFWH at MPs 221 to 222, it would cross beneath this SCFWH via HDD; therefore, no impacts on this SCFWH would occur. Construction activities would have temporary, localized effects on the four other SCFWHs crossed by the proposed CHPE Project due to sediment disturbance, turbidity, and associated water quality degradation. This would impact spawning fish in these areas. Additionally, concrete mats would be installed over approximately 1.0 mile (1.6 km), or 1.0 acres (0.4 hectares), of SCFWHs, which represents less than 0.01 percent of the affected SCFWHs. Therefore, concrete mat coverage would be small relative to the total available habitat along the aquatic portion of the proposed CHPE Project.

Overland portions of the proposed CHPE Project route would cross surface water bodies. The transmission lines would be installed over these water bodies by bridge attachment, or beneath the water bodies via HDD or dry ditch crossing methods. Crossings by bridge attachment and HDD would avoid impacts on aquatic habitats and species. HDD would also be used in transitions from water to land and could result in frac-out (i.e., leaks of HDD drilling fluid into the surrounding sediment and water column) that could impact aquatic species and habitat. However, an SPCC Plan would be adopted, and releases of drilling fluid would be remediated during construction.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation of the proposed CHPE transmission system on aquatic habitats and species would include non-significant temperature increases in the sediment, changes in habitat from use of concrete mats, and production or alteration of magnetic and electric fields. During operation of the transmission line, heat loss from the cables could be expected, and would result in increased temperatures in the sediments around the cables. For a cable buried at 4 or 8 feet (1.2 and 2.4 meters) below the sediment surface, the maximum estimated temperature rise over ambient soil temperature at 8 inches (20.3 cm) below the surface of the sediments would be 9 °F and 4 °F (5.0 °C and 2.56 °C), respectively. However, the temperature increase at the sediment surface directly above the cable is estimated to diminish to 1.8 °F (1.20 °C and 1.24 °C at 4 and 8 feet [1.2 and 2.4 meters], respectively), and the temperature change in the water column would be less than 0.001 °F (0.0001 °C and 0.0002 °C, respectively). It is likely that these are overestimated because they do not take into account the cooling effect from natural water flow, which would result in further heat dissipation, the proposed deeper burial of the transmission line, or the insulation provided by the sheathing surrounding the transmission cables. Heat from the cables would dissipate in the sediments, just below the sediment and water interface, which is the biologically productive zone in the sediments. Where the transmission cables are covered with concrete mats, the increase in ambient water temperature surrounding the cables would be 0.25 °F (0.14 °C) and the increase in ambient temperature in the top 2 inches (5 cm) of sediment along the sides of the concrete mat is expected to be 1.26 °F (0.70 °C) or less. The effect of the temperature increases would be extremely localized to the area directly above the cables. Therefore, significant impacts on benthic resources from temperature during operation of the transmission line would not be anticipated.

The magnetic field produced by the transmission line would be less than 162 mG in the area directly over the buried transmission line in Lake Champlain and the Hudson, Harlem, and East rivers. According to studies, the survival and reproduction of benthic organisms are not thought to be affected by long-term exposure to static magnetic fields. Experiments that exposed fathead minnows, juvenile sunfish, juvenile channel catfish, and striped bass to 360,000 mG showed no evidence in changes in activity. Evidence indicates that electrosensitive organisms such as sturgeon can also detect the weak induced electric fields generated from magnetic fields and respond by attraction or avoidance. However, electric fields used in these studies were higher than the expected induced electric fields at the sediment bed for the proposed CHPE Project transmission line. The change in the induced electric field calculated from the proposed CHPE Project is a small increase (17 percent) over that produced by the ambient geomagnetic field and quickly diminishes with distance from the transmission cables. As such, significant impacts on demersal and electrosensitive species such as Atlantic and shortnose sturgeon that occur in the Hudson River Segment are not expected. Additionally, the effect of magnetic fields on fish eggs and larvae is expected to be negligible.

Pre- and post-energizing sediment temperature and magnetic field surveys, and a hydrophone study to determine the movements of adult Atlantic sturgeon in the Hudson Estuary would be developed and implemented as required by the proposed CHPE Project's NYSPSC Certificate (NYSPSC 2013).

Areas where concrete mats or rip-rap (i.e., rock or concrete protective armoring) would be installed to help protect the transmission lines where an appropriate level of cable burial cannot be achieved, for example where there is exposed bedrock or existing submerged utility lines, would cause a change in benthic habitat type equal to the area of their footprint, and would also result in impacts on submerged aquatic vegetation (if present), shellfish, and benthic communities. However, the concrete mats would eventually provide additional new hard-bottom habitat for benthic organisms to colonize, essentially functioning as small patch reefs.

Since the installed transmission cables would not require maintenance, no impacts from maintenance activities are anticipated on aquatic habitats or species. However, impacts could result from localized increases in turbidity and redeposition of sediments resulting from disturbance within the waterbody if the transmission line fails or becomes damaged during operation and requires emergency repair. The cables would have to be dug out of the sediment, repaired, and then reburied. Impacts from repair activities would be similar to the original installation, but would have a smaller area of disturbance and would occur over a shorter duration.

S.8.5 Aquatic Protected and Sensitive Species

Installation, operation, and emergency repairs of the proposed aquatic transmission cable may affect, but are not likely to adversely affect, the federally listed shortnose sturgeon and Atlantic sturgeon (includes the New York Bight distinct population segment [DPS], Gulf of Maine DPS, and Chesapeake Bay DPS of the Atlantic sturgeon). No effects on federally listed marine mammals or non-threatened/non-endangered marine mammals would be expected from the proposed CHPE Project, as occurrences of these species are rare in the Hudson, Harlem, and East rivers. In addition, the proposed CHPE Project transmission line would cross under the East River via HDD. Observations of federally listed sea turtles have been reported in western Long Island Sound. Although it is possible that sea turtles may enter the East River from the Sound, they are generally considered extralimital and would likely occur only as occasional transients. Therefore, the potential for impact from the CHPE Project on sea turtles is so low, it is considered discountable. Additionally, neither the NMFS nor the USFWS have designated or proposed designated critical habitat along the proposed CHPE transmission line installation route; therefore, the proposed CHPE Project would have no effect on designated or proposed to be designated critical habitat. Applicant-proposed measures developed in coordination with Federal and state natural resources agencies would avoid or minimize impacts on aquatic species during construction and operational activities. A BA has been prepared to assist in determining the impacts of the proposed CHPE Project and to facilitate ESA Section 7 consultation and will be included in **Appendix Q** of the Final EIS.

Impacts from Construction

Sediment disturbance, temporary increases in turbidity and associated water quality degradation, sediment redeposition, installation of rip-rap or concrete mats, noise and vibration, vessel strikes, and accidental release of hazardous materials could affect federally listed shortnose sturgeon and Atlantic sturgeon in the Hudson and Harlem rivers during cable installation. The sensitivity of fish to localized and temporary increases in turbidity, suspended sediment, and downstream sedimentation is species- and life-stage-specific, and associated impacts might include impairment of feeding, impaired ability to locate predators, and reduced breeding activity. The Applicant would restrict construction activities to specific timing windows to protect ESA-listed and candidate fish species during spawning migrations, which are the most vital and sensitive portions of their lifecycle.

The NYSPSC Certificate issued for the proposed CHPE Project established construction work schedule windows identifying times of the year when work associated with the underwater portion of the transmission line may take place (NYSPSC 2013). These work windows were subsequently supplemented through consultation with NMFS. These established work windows and time of year restrictions were developed to avoid impacts on overwintering, spawning migrations, spawning activity, and larval stages of ESA- and state-listed fish and EFH species. NYSDOS has conditionally concurred with these construction windows as part of its CMP consistency certification for the proposed CHPE Project. Restriction of construction activities to specific windows of time would protect ESA-listed fish species during spawning migrations, which are the most vital and sensitive portions of their life cycle.

Installation of rip-rap or concrete mats and blasting in the Harlem River would be permanent alterations of habitat and could affect shortnose and Atlantic sturgeon, where the concrete mats or rip-rip replaces some soft sediment (forage habitat) with hard-bottom habitat. The affected area would be very small relative to the overall area of available habitat, adjacent habitat would still be available, and new communities of benthic organisms that are prey for shortnose and Atlantic sturgeon would be expected to recolonize over time. Effects of blasting, as described in **Section S.8.4**, on sturgeon are considered to be remote because sturgeon are transient species in this area of the Harlem River, and sturgeon eggs and larvae are not expected to occur in the Harlem River. However, in addition to detonating the charge in bore holes and stemming the charge with pea gravel, avoidance and minimization of blasting effects on sturgeon could be accomplished by not blasting during slack tides, chasing fish from the site with an air-gun prior to blasts, and surrounding the site with a bubble curtain to minimize fish entry into the shock zone. Noise generated by cable-laying vessels and blasting would elicit temporary behavioral responses by ESA-listed fish species. Most of these effects would be either temporary or intermittent, and it is expected that only a few individuals would be affected relative to the populations and that they would react by moving away from noise sources.

Vessel collisions could impact shortnose and Atlantic sturgeon. However, Applicant-proposed measures, such as operation of vessels at decreased speeds in shallow waters, would reduce noise levels and provide shortnose and Atlantic sturgeon species an opportunity to move out of the way of moving vessels, thereby making it unlikely that a collision would occur.

Any state-listed lake sturgeon or state-listed mooneye present in Lake Champlain during proposed construction activities could be affected by sediment disturbance, temporary increases in turbidity and associated water quality degradation, sediment redeposition, installation of rip-rap or concrete mats, temporary noise and vibration, and potential accidental releases of hazardous materials. The installation of the proposed aquatic transmission line would cause a temporary disturbance on benthic habitat, which supports benthic prey items for state-listed lake sturgeon, but would remain usable as potential foraging habitat for these species. Impacts on the state-listed lake sturgeon could occur from the installation of concrete mats or rip-rap; however, the placement would result in a very small area of overall affected habitat, and sturgeon would be able to utilize adjacent areas for foraging and other activities. Effects on the state-listed giant floater and state-listed pink heelsplitter in Lake Champlain could occur because individuals of these mussel species could be lost during installation due to increases in turbidity and associated water quality degradation, sediment redeposition, installation of rip-rap or concrete mats, and accidental releases of hazardous materials.

As specified in the proposed CHPE Project's Certificate issued by NYSPSC, the Applicant would conduct a series of pre- and post-energizing studies, including benthic macroinvertebrate and sediment sampling and bathymetry surveys, for use in post-installation compliance monitoring (NYSPSC 2013). All studies would be developed in consultation with appropriate resource agencies. The Applicant also would establish the Hudson River and Lake Champlain Habitat Enhancement, Restoration, and Research/Habitat Improvement Project Trust to support items such as such as habitat restoration, enhancement, or protection; habitat research; fish and wildlife species restoration, enhancement, or protection; and water quality improvement.

Impacts from Operations, Maintenance, and Emergency Repairs

Increased temperature, magnetic fields, and weak induced electric fields during operation of the proposed transmission line could impact the protected species identified. During operation, the buried aquatic transmission cables would emit a magnetic field of less than 160 mG measured at the sediment surface, and induced electric fields could be created by water currents or the movement of an animal through the magnetic field. Evidence indicates that electrosensitive organisms (including all sturgeon species) can detect induced electric fields and respond by attraction or avoidance. In some cases, freshwater sturgeon exposed to electromagnetic fields in laboratory studies exhibited temporarily altered swimming behaviors; however, these exposures were at greater magnitudes than those modeled for the proposed aquatic transmission cable. The change in the induced electric field calculated from the proposed CHPE Project is a small increase (17 percent) over that produced by the ambient geomagnetic field and quickly diminishes with distance from the transmission cables. Fish migration would not be affected because migratory species use multiple stimuli for migration, not magnetic detection alone, and species are also exposed to other natural alterations in the Earth's geomagnetic field such as magnetic anomalies in sediments. Additionally, the effect of magnetic fields on fish eggs and larvae is expected to be negligible.

Increases in temperature associated with operation of the transmission line at the sediment-water interface would not be expected to affect pelagic fish, but could have the potential to affect demersal fish that would be closer to the bottom. At burial depths of 4 and 8 feet (1.2 and 2.4 meters) below the surface, the temperature increase at the sediment surface directly above the cable is estimated to be 1.8 °F (1.20 °C and 1.24 °C, respectively), and the temperature change in the water column would be less than 0.001 °F (0.0001 °C and 0.0002 °C, respectively). A measurable amount of local heat generation would not pose a physical barrier to ESA- or state-listed fish passage, and would allow benthic organisms to colonize and demersal fish species (including demersal eggs and larvae) to use surface sediments without being affected. Therefore, effects on reproduction or feeding would not be significant. The potential increase in temperature of the riverbed surface would be within the normal temperature range of all life stages of shortnose and Atlantic sturgeon. Heat could be released from exposed gaps in the concrete mats and rip-rap placed over the aquatic transmission line where it cannot be buried. The estimated increase in ambient water temperature surrounding the transmission cables covered by the concrete mats is expected to be less than 0.25 °F (0.14 °C). The cooling effect of moving water should quickly dissipate this heat. Therefore, significant effects from operation of the proposed CHPE Project transmission line on protected species would not be expected.

No effects would be anticipated from maintenance because the transmission cable itself would be maintenance-free. Emergency repairs, if necessary, would result in sediment disturbance resulting in temporarily increased turbidity and decreased water quality, and noise could impact protected species. These impacts would be similar to those described for construction but on a smaller scale and over a shorter duration.

As specified in the proposed CHPE Project's Certificate issued by NYSPSC, the Applicant would conduct a series of pre- and post-energizing studies, including sediment temperature and magnetic field surveys and Atlantic sturgeon hydrophone surveys, for use in post-installation compliance monitoring (NYSPSC 2013). The Atlantic sturgeon study would document the species' movements in relation to transmission line operation.

S.8.6 Terrestrial Habitats and Species

Construction and operation of the proposed CHPE Project would generally include the permanent removal and crushing of vegetation, soil compaction, and dust generation. Noise would temporarily increase during construction and maintenance and emergency repair activities, which could result in impacts on wildlife through reduced communications ranges, interference with predator/prey detection, or habitat avoidance. The direct displacement of species would occur during vegetation removal; however, habitat fragmentation and permanent displacement of entire breeding populations would not occur because construction activities would be in fringe habitat within or along existing ROWs.

Impacts from Construction

Impacts on vegetation and habitat could occur from permanent removal of vegetation, root damage associated with excavation, vegetation crushing, soil compaction, potential spread of invasive species, and the generation of dust. In total, approximately 236 acres (96 hectares) of existing forest cover could be temporarily disturbed and 48 acres (19 hectares) changed permanently to managed grasses or shrub habitat to accommodate proposed construction corridors and any necessary additional workspace. However, the habitat along the proposed CHPE Project route would be removed primarily along existing roadway and railroad ROWs, where most vegetation is disturbed. Some fringe forest habitat within and immediately adjacent to these ROWs would be converted to shrub habitat as a result of transmission line installation. In areas where the ROW cannot support installation of the transmission line, deviation areas would be used. Typically, deviation areas identified along the proposed CHPE Project route would be located immediately adjacent to existing ROWs and would extend to an outer boundary ranging up to approximately 200 feet (61 meters) away from the ROW. Like the existing ROWs, deviation areas would primarily be composed of forest fringe (i.e., at the edge of the forest) habitat, and would also include some interior forested areas, streams, residential areas, urban developed areas, and highways or roadways with maintained vegetation. Forested habitat in deviation areas could be more suitable to wildlife because it extends away from the ROWs. Therefore, construction in these areas could result in habitat fragmentation impacts greater than those incurred from construction within the ROWs. Applicant-proposed measures, including clearly marking areas to avoid, using appropriate vegetation-removal and dust-control methods, and developing and implementing an Invasive Species Management Plan, would be implemented to reduce further impacts on vegetation and habitat.

Noise created during construction could result in reduced communication ranges, interference with predator/prey detection, or habitat avoidance. Prior exposure to noise is the most important factor in the response of wildlife to noise because wildlife can become accustomed (or habituated) to the noise. The proposed construction activities would primarily occur along road and railroad ROWs where there is a high level of ambient noise.

Temporary direct displacement of wildlife species during vegetation removal and habitat reduction could occur; however, habitat fragmentation resulting in permanent or significant displacement of entire breeding populations would not occur because construction activities would be in fringe habitat within or along existing ROWs. Wildlife that could be displaced include birds, burrowing animals, and other species that use forests for foraging, breeding, and nesting. However, studies on forest habitat fragmentation indicated that displacement impacts associated with 26-foot (8-meter)-wide corridors were not significant. Interior-forest dwelling species did not avoid inhabitance along the corridor’s edges; however, species composition was altered as an edge-preferring species abundances in these areas increased. Additionally, presence of the transmission line corridor, which would primarily be a mixture of grasses and shrubs, would not preclude wildlife from crossing the corridor to reach habitat on the other side. Construction of the up to approximately 20-foot (6-meter)-wide corridor for the proposed CHPE Project would be expected to result in similar localized and temporary changes in community composition (e.g., tree removal and possible displacement of wildlife). However, construction would occur in habitat previously disturbed by noise, emissions from railroads and cars, and human activity. Since only a small percentage of habitat available for wildlife would be impacted, and mobile species that currently inhabit and prefer these areas likely would relocate to seek out similar habitat, construction of the proposed CHPE Project corridor and installation of the transmission line would not be expected to impact the habitats in these areas significantly. Additionally, Applicant-proposed measures, including constructing outside of the breeding season, avoiding sensitive habitat, and using HDD would be implemented to reduce further impacts on wildlife.

Impacts from Operations, Maintenance, and Emergency Repairs

Magnetic and electric fields have the potential to enhance growth response in certain plant species; however, the effects of such on plants are inconclusive. Operation of the transmission line would increase the ambient soil temperature, which could alter biodiversity of terrestrial vegetation and habitat; however, temperature would quickly dissipate as distance from the transmission line increases.

The transmission line ROW would be maintained (i.e., vegetation would be trimmed or removed) to protect the buried transmission line and cooling stations from damage caused by tree roots, to maintain the function of permanent storm water management or access control features, and to replace location and identification markers as necessary. Vegetation management along the ROW would establish stable low-growing vegetation with shallow root systems that would not interfere with the transmission line and would allow adequate access to cooling stations. Vegetation clearing and selective cutting of trees would occur as needed. Such activities would be short-term in duration, but would occur periodically over the operating life of the proposed CHPE Project.

Impacts on vegetation and habitat from maintenance or emergency repair activities could occur from removal of vegetation, root damage associated with excavation, soil compaction, and the generation of dust, but such activities would only occur as necessary and be of a very short duration and small area of disturbance.

Although there is evidence that wildlife can detect magnetic and electric fields associated with transmission lines, previous studies have shown that behaviors would not be affected by relatively small changes in magnetic and electric fields and such fields do not cause any adverse health, behavioral, or productivity effects in animals, including both wildlife and livestock. Operation of the transmission line would increase the ambient soil temperature, which could alter biodiversity of terrestrial vegetation and habitat thereby affecting foraging, nesting, and avoidance behavior in wildlife that use that habitat; however, temperature would quickly dissipate within increasing distance from the transmission line and would be restricted to the maintained transmission line ROW.

Impacts from maintenance and emergency repair activities on wildlife would occur because the permanent ROWs would be permanently maintained as scrub-shrub habitat with woody vegetation less than 20 feet (6 meters) tall. The proposed maintenance could also displace adult or breeding birds, burrowing animals, and other species that use forest edge habitats for foraging, breeding, and nesting. Wildlife species could be displaced permanently if such activities cause a long-term disturbance of breeding habitats, but this would be unlikely as the ROW is fringe habitat or in a previously disturbed area and vegetation in the ROW would be regularly maintained.

S.8.7 Terrestrial Protected and Sensitive Species

Federally listed species that could occur in the proposed CHPE Project transmission line construction corridor include Karner blue butterfly, Indiana bat, and northern long-eared bat. The proposed CHPE

Project may affect, but is not likely to adversely affect, the federally listed Indiana bat and Karner blue butterfly and the northern long-eared bat that is proposed for listing as endangered. Indiana bats and northern long-eared bats roosting or foraging within or adjacent to the construction corridor could be disturbed. The proposed CHPE Project could affect the Karner blue butterfly from removal of nectar habitat, which is used for foraging. Wild blue lupine, which is the host plant for the butterfly larvae, would not be affected. There is no critical habitat designated or proposed-designated in the vicinity of the proposed CHPE Project. A BA has been prepared to assist in determining the impacts of the proposed CHPE Project and to facilitate ESA Section 7 consultation and is included in **Appendix Q** of the Final EIS.

The federally listed small whorled pogonia, northern wild monkshood, bog turtle, piping plover, roseate tern, and New England cottontail and the red knot that is proposed for listing could, but are not likely to, be present in the proposed construction corridor; research to date indicates no recorded presence of these species or their suitable habitats along the transmission line route. Therefore, no impacts on these species would be expected.

Construction activities could result in non-significant disturbances (i.e., noise, dust, and lighting) to bat species listed or proposed for listing, bald eagles, state-listed birds, and migratory birds. Such disturbances can cause habitat avoidance by birds in the immediate vicinity of construction. However, these activities would be temporary and localized. Additionally, birds (including protected species of birds) would be able to move away from the construction area; therefore, effects on foraging, productivity and survival would not be significant. Effects from disturbance and habitat fragmentation on state-listed plant and insect species could occur as a result of habitat loss from construction activities; these effects would be similar to those described for non-listed species. However, implementation of several Applicant-proposed measures to prevent direct take of protected and sensitive species during construction would avoid or minimize impacts.

Impacts from Construction

Non-significant effects on protected and sensitive species from construction would include disturbance to the foraging, resting, and nesting/breeding bats and birds. Bats and birds could encounter temporary, increased noise from underwater and underground cable installation and increased construction traffic. Noise associated with the construction vehicles and equipment would produce sound at varying frequencies and intensities that might influence the behavior of species. The effects would vary depending on the species, type of vessel or machinery, relative noise level, distance, frequency, and season. Most bats and birds along the terrestrial transmission line routes are not expected to shift farther away given the current level of disturbance from the actively used railroad ROW being used for the line. Any that would move into similar adjacent habitats nearby during construction would likely return to the area once construction is completed, which would last less than 2 weeks in any given location along the transmission line route. The Luyster Creek HVDC Converter Station is proposed to be sited in an industrial area with no suitable habitat for protected and sensitive species; therefore, no effects would be expected from construction of this facility.

Effects on protected species and their habitats that result from vegetation clearing would be the same as described for non-listed species and habitats. These would include habitat loss or degradation via crushing, removal, or other disturbances, changes in community composition, and potential for displacement. However, in the immediate vicinity of the railroad ROW, where most of the clearing would occur, much of the habitat consists of disturbed open lands and secondary forest lacking suitable habitat for most protected and sensitive species. All construction including HDD installation and trenching would avoid direct impacts on all Karner blue butterfly lupine habitat. Approximately 1.8 acres (0.7 hectares) of mapped Karner blue butterfly nectar habitat occurs within the 33-foot (10-meter) construction corridor proposed for trenching installation of the transmission line along the CP railroad ROW. The final work around the boundary would be identified in the EM&CP and fenced to keep all construction activities within it. Following construction activities, the impacted nectar habitat would be restored by seeding species that would provide nectar sources.

Since the corridor would be relatively narrow (i.e., up to approximately 20 feet [6 meters] wide), interior-dwelling species would not likely avoid inhabitance along the edges of the proposed CHPE Project corridor. Also, presence of the transmission line corridor, which would primarily be a mixture of covered with grasses and shrubs, would not preclude wildlife from crossing the corridor to reach habitat on the other side. Several Applicant-proposed measures, including use of HDD under sensitive habitat and marking all known locations of protected and sensitive species on construction drawings and in the field, would be implemented to avoid or minimize impacts on protected and sensitive species. Construction personnel would be trained to identify known and potential rare, threatened, and endangered species where possible, and to follow the identification and protection measures included in the EM&CP, including avoiding areas flagged as sensitive habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

During the operational phase of the transmission line, vegetation management would be conducted within the transmission line ROW to prevent the growth of large woody vegetation to avoid damage to the transmission cables, or to provide access to the ROW in the event that emergency repairs or other maintenance of the cables are required. Potential effects from vegetation management would be discountable and would be avoided and minimized through implementation of protective measures during operation and maintenance of the proposed CHPE Project. No herbicides or pesticides would be used within occupied Karner blue butterfly and frosted elfin butterfly habitats, except as approved by the USFWS and NYSDEC. Any vegetation management, emergency repairs, or other operational maintenance activities required within Karner blue butterfly or frosted elfin butterfly habitats would be implemented in accordance with a mitigation plan for these species being developed by the Applicant in consultation with USFWS and NYSDEC.

No significant effects from the magnetic fields generated by the transmission line would be anticipated. There is no evidence to suggest that magnetic and electric fields associated with transmission lines result in any adverse effects on the health, behavior, or productivity of animals. The research indicates that some species of animals, including birds, are able to detect magnetic fields at levels that could be associated with transmission lines; however, detection is not a conclusive indicator of adverse effects.

S.8.8 Wetlands

Wetlands can provide a variety of functions, including wildlife habitat, groundwater recharge or discharge, sediment and shoreline stabilization, flood storage, nutrient removal, sediment and toxicant retention and production export, and, in some cases, aesthetic and recreational value. Impacts are expected on a total of 77.7 acres (31.4 hectares) of wetlands along the proposed CHPE Project route. Construction activities within the construction corridor along the proposed CHPE Project route would result in impacts on wetland areas due to soil disturbance, changes in surface runoff patterns, and vegetation clearing. Long-term impacts from operation of the proposed CHPE Project would include permanent habitat changes to forested wetlands.

Impacts from Construction

Construction activities within Lake Champlain, the Hudson River, and the Harlem and East rivers would include the installation of the transmission line in the lakebed and river bottom. While these water bodies are considered open water, not wetlands, there are freshwater and tidal wetlands along the shores of these features. Additionally, although installation of the transmission line would occur in portions of SCFWHs along the Hudson River, the proposed CHPE Project would not cross or impact any wetlands contained therein. Impacts on wetlands adjacent to the underwater transmission line in Lake Champlain, the Hudson River, and the Harlem and East rivers are not anticipated as the installation activities would occur more than 100 feet (30 meters) from wetlands, construction would take place over a short period of time, and construction-related sediment releases into the water column would comply with water quality standards. The proposed cooling stations and the Luyster Creek Converter Station would not be located in wetlands.

Transmission line construction in the Overland Segment would directly impact approximately 67 acres (27 hectares) of wetlands within the construction corridor. The Hudson River Segment of the proposed CHPE Project would have an 8-mile (13-km) terrestrial segment that would cross three additional wetland areas in Stony Point and Haverstraw totaling 0.8 acres (0.3 hectares). The transmission line would cross a 0.03-acre (0.01-hectare) wetland in Haverstraw; the other two crossings would be by HDD. No delineated wetlands are present in the construction corridor of the New York City Metropolitan Area Segment.

The construction sequence within wetlands along the proposed Overland Segment would typically consist of vegetation clearing within the construction corridor (tree stumps would only be removed from the trench line or where necessary), removal and stockpiling of the upper 18 inches (46 cm) of hydric soils, followed by excavation of a trench approximately 3.5 feet (1.1 meters) deep and up to 9 feet (2.7 meters) wide at the surface, or the use of HDD technology. The cables would then be placed in the trench, and then the trench would be backfilled. Land restoration would include placing the removed wetland soils back onto the excavated trench area to facilitate wetlands restoration, and the disturbed area would be mulched or hydro seeded. Restoration of wetlands would be completed within 24 hours after backfilling is completed.

Temporary impacts would occur on 16.2 acres (6.6 hectares) of forested wetlands and 51.2 acres (20.7 hectares) of non-forested wetlands. Following completion of construction activities and surface restoration, these 67.4 acres (27.3 hectares) of wetlands would be expected to re-establish themselves naturally. Emergent wetland vegetation would re-establish quickly following construction, and woody species would follow. Forested wetlands would be expected to go through several stages of successional vegetation before returning to the pre-construction vegetation cover type. Wetland functions and values, including wildlife habitat, groundwater recharge or discharge, sediment and shoreline stabilization, flood storage, nutrient removal, sediment and toxicant retention, and production export would be expected to be restored to these disturbed wetlands.

Permanent, significant impacts would occur on 2.0 acres (0.8 hectares) of forested wetlands that would be converted to emergent or scrub-shrub wetlands and on 8.3 acres (3.4 hectares) of non-forested wetlands. This conversion would alter the wetland vegetation from trees greater than 20 feet (6 meters) to woody vegetation less than 20 feet (6 meters), including true shrubs and young trees. Impacts on forest-dwelling wetland species would be expected once the wetland has been converted from a forested wetland to a shrub-scrub wetland. Wetland mitigation would be required for any permanent impacts on wetlands. As part of its Section 404 and Section 10 permit application, the Applicant has submitted a conceptual wetland mitigation plan to the USACE to address this permanent change in habitat type. To mitigate for permanent impacts on wetlands, per the mitigation plan, the Applicant would establish 1 acre (0.4 hectares) of new wetland and preservation and enhancement of 10 acres (4 hectares) of wetlands for each 1 acre (0.4 hectares) of permanently impacted wetlands.

HDD would be used in some locations to reduce the level of impacts on wetlands when compared to trenching. A total of 0.5 miles (0.8 km) of wetlands would be crossed by use of HDD. Where used, the HDD borehole would be drilled underneath the wetland, a conduit would be pulled into the borehole, and then the transmission cables would be pulled into the conduit. The HDD drilling equipment and drill entry point would be located outside the wetland and the drill would exit beyond the other boundary of the wetland, avoiding direct impacts on wetlands. As required in the EM&CP, an SPCC Plan would be in place to respond to any frac-outs of bentonite.

Impacts from Operations, Maintenance, and Emergency Repairs

Significant impacts on wetlands from operation of the proposed CHPE Project would not be expected because the installed transmission line would not require maintenance. Thus, maintenance activities would be confined to routine ROW vegetation management in the Overland Segment as established in the EM&CP Vegetation Management Plan. These activities would consist of cutting woody vegetation by hand or by mechanical means every few years. The 2.0 acres (0.8 hectares) of forested and 8.3 acres (3.4 hectares) of non-forested wetlands that would be permanently impacted (for a total of approximately 10.2 acres [4.1 hectares] of impacted wetlands) would be subject to routine vegetation management activities. These activities would not be expected to alter wetland hydrology, compact wetland soils, or otherwise change the physical characteristics or functions and values of the wetlands in the transmission line ROW.

Although the transmission line is designed to be maintenance free, trenching or excavation could be required to conduct emergency repairs of defective cable segments under wetlands. These activities would be infrequent and would occur in accordance with applicable Federal, state, and local permits. Impacts from these emergency repairs would be similar to the initial construction, as the defective section would be dug up, a new section spliced in, and the cable reburied.

Where the cables would be installed by HDD, impacts on wetland areas from emergency repairs would be avoided because the transmission cables would be cut and pulled out of the installed conduit and the new cable pulled into it without affecting the wetland.

Additionally, significant impacts would not be expected on nearby wetlands from emergency repair activities on aquatic transmission line segments. Localized increases in turbidity and redeposition of sediments from disturbance within the waterbody would result from emergency repair actions; however, these repair actions would occur over a short period of time and in a more limited area than initial installation, and, therefore, impacts on nearby freshwater or tidal wetlands would not be anticipated.

S.8.9 Geology and Soils

Impacts from Construction

Construction activities associated with the installation of the aquatic portions of the proposed CHPE Project would result in localized modification of lakebed and river microtopography; and suspension, transport, and resettlement of riverine and lacustrine sediments. Pre-existing conditions would likely be reacquired over time and impacts minimized through the use of Applicant-proposed measures, such as the use of a shear plow in the southern portion of Lake Champlain.

Impacts from construction activities associated with the installation of the terrestrial portions of the proposed CHPE Project would include short-term increases in soil erosion, soil compaction, and bedrock blasting. Exact locations of bedrock blasting are yet to be determined. Applicant-proposed measures, such as silt fences, would minimize impacts and, once installation is completed and trenches have been filled, local drainage characteristics and soils would be returned to previous conditions.

Impacts from Operations, Maintenance, and Emergency Repairs

No impacts would be expected from the operation of the aquatic portion of the transmission line because there would be no thermal or magnetic or electric field impacts on geology and soils. Maintenance for the transmission line itself is not anticipated to be necessary as it is designed to be maintenance-free. No impacts would be expected on physiography, topography, geology, or seismicity, apart from intermittent emergency repair activities, as required. The proposed transmission cables would be insulated and armored cables would be designed to accommodate seismic events. If the transmission line failed due to a seismic event, its protection system would quickly de-energize the transmission system and the HVDC transmission cables would dissipate very limited energy under short circuit (i.e., fault) conditions; therefore, it would not result in direct impacts on the environment, navigation, or public safety. A cable repair procedure would be implemented, as appropriate, immediately following any seismic events.

For the terrestrial portion of the transmission line, periodic mowing or tree-clearing maintenance activities of the terrestrial ROW could result in soil erosion or sedimentation, but impacts would not be significant, and soils would be retained on site with the use of Applicant-proposed measures (i.e., BMPs). Maintenance for the transmission line itself is not anticipated to be necessary as it is designed to be maintenance-free. Maintenance of the cooling stations and converter station would occur, but would not result in any impacts on geology and soils. Emergency repairs of the terrestrial portion of the transmission line would result in impacts on soils similar to, but less than, those described for construction activities because a smaller area would be disturbed for a shorter duration. The impacts of such activities also would be minimized through the use of Applicant-proposed measures.

S.8.10 Cultural Resources

Ground-disturbing activities associated with the installation of the transmission cables could result in adverse effects on historic properties in the proposed CHPE Project Area of Potential Effects (APE). Geographic Information System (GIS) analysis indicates that there are 51 terrestrial archaeological sites, 2 terrestrial sites that extend into Lake Champlain, 11 underwater sites, 36 National Register of Historic Places (NRHP)-listed or -eligible architectural properties, and 2 historic cemeteries in the APE.

Impacts from Construction

Ground-disturbing activities associated with construction could damage archaeological features and would be expected to disturb the context of artifacts of terrestrial archaeological sites, underwater sites, and historic cemeteries. In the case of terrestrial and underwater archaeological sites that are listed or eligible for listing in the NRHP, this could constitute an adverse effect under 36 CFR 800.5(a)(1). Consultation regarding potential adverse effects on historic properties is ongoing through the Section 106 process, and a Programmatic Agreement (PA) (see **Appendix T** of the Final EIS) has been developed to manage and resolve adverse effects through avoidance, minimization, or mitigation. Because the transmission line would be underground or underwater and would avoid any standing structures, the adverse effects from construction on the NRHP-listed and -eligible architectural properties in the APE would be limited to exposure to temporary noise, dust, and vibrations and short-term visual effects from the proximity of construction activities and equipment. The effects would not require mitigation. HDD would be used to install the transmission line under Stony Point Battlefield Historic Park.

As specified in the conditions of the NYSPSC Certificate for the proposed CHPE Project ("Certificate Conditions"), Part Q, Conditions 107–112 (available at http://www.chpexpresseis.org/docs/NYSPSC_

Order.pdf or see **Appendix C** of this EIS), the Applicant shall develop a Cultural Resources Management Plan (CRMP) that would include an outline of "the processes for resolving adverse effects on historic properties within the APE and determining the appropriate treatment, avoidance, or mitigation of any effects of the [CHPE Project] on these resources." Applicant-proposed measures would be implemented to mitigate the CHPE Project's adverse effects on known terrestrial and underwater archaeological sites found to extend into the APE. Mitigation measures might include minor rerouting to avoid the sites, Phase III data recoveries of terrestrial and underwater archaeological sites that are listed or eligible for listing in the NRHP and cannot be avoided, and documentation following Section 106 of the NHPA for NRHP-listed or -eligible architectural properties that cannot be avoided by project activities. Circumventing known underwater sites or anomalies would avoid potential damage to the integrity of the site. A PA pursuant to 36 CFR 800.14(b) has been prepared (see **Appendix T**) and additional formal surveys and evaluations must be conducted before it can be fully determined in detail what cultural resources require mitigation measures under Section 106 of the NHPA. Measures identified at this time, including development of a CRMP by the Applicant and addressing unanticipated cultural resources discoveries, are discussed in detail in **Appendix G**.

Impacts from Operations, Maintenance, and Emergency Repairs

The operation of the proposed CHPE Project would have no effects on terrestrial and underwater archaeological sites in the APE. Because the proposed CHPE Project would involve an underground transmission line, operations would have no adverse effects on 33 of the 36 architectural properties in the APE. The operation of the proposed cooling station at MP 112 could have noise and visual impacts on the McMore Residence (National Register Eligible [NRE] 15) and the Main Street Historic Bridge (National Register Listed [NRL] 19). Operation of the proposed cooling station at MP 296 could have noise and visual impacts on Stony Point Battlefield Historic Park. Depending on the exact location of the cooling station, these impacts could constitute an adverse effect under 36 CFR 800.5(a)(1). Consultation regarding potential adverse effects on historic properties is ongoing through the Section 106 process, and a PA (see **Appendix T** of the Final EIS) has been prepared to manage and resolve adverse effects through avoidance, minimization, or mitigation. Vegetation maintenance activities and emergency repairs, if necessary, would occur in areas previously disturbed by construction of the transmission line and, in some cases, in areas purposefully selected to avoid cultural resources sites; therefore, effects would not be expected from such activities.

S.8.11 Visual Resources

Construction and operation of the proposed CHPE Project would generally be consistent with the existing visual environment. Impacts would be anticipated during construction from the presence of construction equipment and activities along the project route. Constructed facilities, such as cooling stations and the converter station, would be visible during operations, but would only result in minimal changes to the existing visual landscape.

Impacts from Construction

Construction equipment and materials would be visible along the proposed CHPE Project route during the construction period. Along the aquatic portions of the proposed CHPE Project route, the transmission cables would be buried beneath the beds of existing waterways and a cable-laying vessel, support vessels, and barges would be visible on the water surface. Minimal land-based support would be required. Land-based support facilities would be constructed within existing ports with existing heavy lift facilities and would be within the existing industrial context of the viewsheds. Additionally, construction materials on the water surface would only be visible in one place for a short duration as construction progresses though the waterway, thereby minimizing impacts on visual and aesthetic resources.

Along the terrestrial portions of the proposed CHPE Project route, construction equipment would temporarily be visible in the locations of active construction on land along existing road and railroad ROWs. Equipment necessary for clearing, trench excavation, cable installation, backfilling, and restoration would be located briefly at each construction site. Temporary support facilities would also be established along the terrestrial portions of the proposed CHPE Project route. These facilities would be sited within the road or railroad ROWs and use the minimum space required to facilitate safe installation. Following construction, impacted areas within terrestrial portion of the proposed CHPE Project route would be seeded and allowed to revegetate naturally. Depending on the type of vegetation involved, natural conditions could return in a matter of months to a few years.

Where the proposed CHPE Project route would cross aesthetic resources such as Stony Point Battlefield State Park and Rockland Lake State Park, the Applicant would use HDD techniques, which would allow installation of the transmission line without disturbing the surface features of the parks. This would eliminate any potential impacts on these aesthetic resources from construction activities. Construction equipment would be visible during construction at the HDD staging area sites.

Impacts from Operations, Maintenance, and Emergency Repairs

No visual impacts or impacts on aesthetic resources would be anticipated along the aquatic portion of the proposed CHPE Project route during operations, because no permanent facilities would be present. Minimal visual impacts during inspection and emergency repair activities along the aquatic portion of the route would be anticipated from the temporary presence of vessels and repair activities that would be visible along the proposed CHPE Project route.

Along the terrestrial portions of the proposed CHPE Project transmission line, visual impacts during maintenance and emergency repair activities would be anticipated from the temporary presence of ROW vegetation maintenance and repair activities and equipment along the proposed CHPE Project route.

Cooling stations would be present along the proposed CHPE Project route within aesthetic resources, such as Saratoga Spa State Park and Spensieri Park. However, the cooling stations would not result in significant visual impacts or would have impacts on aesthetic resources because the cooling stations would be small and only minimally change the character of the existing viewshed.

Operation of the Luyster Creek Converter Station would not be expected to result in any impacts on sensitive aesthetic resources because no sensitive aesthetic resources are present in the immediate vicinity of the converter station site. Additionally, operation would not be anticipated to result in visual impacts because the converter station would be in character with the existing industrial nature of the visual environment, and would be comparable in scale to its surroundings and not break the existing established horizontal skyline.

S.8.12 Infrastructure

Impacts from Construction

Construction of the aquatic portions of the proposed CHPE Project would require crossing existing electrical, water supply, communications, natural gas, sanitary sewer, and other utility lines in waterways. Temporary disruptions (i.e., interruptions) in utility services would be avoided to the extent practicable and coordinated with utility owners. Installation of the aquatic portion of the transmission line would potentially disturb and suspend sediment, some of which might be contaminated, that could temporarily adversely impact water supply systems along the proposed CHPE Project route. However, the NYSPSC Certificate contains conditions that set forth procedures the Applicant must follow to avoid or minimize impacts on water supply systems along the proposed CHPE Project route. Model results indicate that, in conjunction with Applicant-proposed measures, acute toxicity-based water quality standards likely would not be exceeded under the proposed CHPE Project. Impacts on solid waste management facilities would occur due to the generation and management of soils and debris during construction and HDD activities, but contributions to area landfills (which have capacity) would be not be significant.

Construction of the terrestrial portions of the proposed CHPE Project would also require crossing utility lines that intersect road and railroad ROWs. Construction would be coordinated with local utilities to eliminate or minimize disruption to utility service. Capacities of solid waste management facilities would be reduced due to the disposal of construction-related debris and appropriate disposal of contaminated soils. Clean excavated soils would be reused as fill, and waste would be recycled to the maximum extent practicable, thus minimizing the proposed CHPE Project's contributions to regional landfill capacities.

Impacts from Operations, Maintenance, and Emergency Repairs

Electrical infrastructure in New York State would benefit over the long term because the proposed CHPE Project would increase reliability, efficiency, and capacity and reduce congestion in the New York Control Area.

Since the transmission line would be maintenance-free and inspections would be non-intrusive, impacts on other electrical infrastructure, storm water management systems, communications lines, natural gas supply lines, or sanitary sewer systems in the aquatic operational portions of the proposed CHPE Project corridor would not be expected. Any emergency repair activities that could impact utilities would be coordinated with the utility providers. Operation of the terrestrial portions of the proposed CHPE Project would not result in impacts on other electrical infrastructure, communications, natural gas supply, or sanitary sewer systems in the proposed CHPE Project corridor.

S.8.13 Recreation

Construction and operation of the proposed CHPE Project would result in limited, temporary impacts, but would not permanently impact any recreational resources along the proposed CHPE Project route.

Impacts from Construction

Construction activities associated with the installation of aquatic portions of the proposed CHPE Project would include the generation of additional vessel traffic, which could inconvenience recreational water-dependent uses and possibly create temporary navigational obstacles. During underwater cable installation, there would be construction vessel activity along the proposed route. Access to shoreline recreational areas (i.e., boat launches and piers) would be maintained, as feasible, but could be partially limited during construction for safety reasons.

Construction activities associated with the installation of the terrestrial portion of the proposed CHPE Project, which would be buried underground along existing railroad and roadway ROWs, could reduce the number of traffic lanes in local roadways accessing recreational resources along the proposed route. Access to recreational areas would be maintained at all times during construction activities using traffic flaggers or other traffic management methods in coordination with park operators. Following construction, the Applicant would reseed the construction area and allow it to revegetate naturally, thereby returning any recreational areas and adjacent areas to their natural conditions. Use of HDD would avoid adverse impacts on recreational users by allowing installation of the transmission line without disturbing the surface features or uses of park lands. Staging areas for HDD would be outside of park boundaries, though equipment could be visible during construction; however, no permanent impacts on recreational resources would be anticipated. No cooling stations would be constructed on park lands or in recreational areas, and access to recreational areas would be maintained during construction.

Impacts from Operations, Maintenance, and Emergency Repairs

During operations, the proposed CHPE Project transmission line would generally be underwater or underground and, therefore, it would not be visible or interfere with recreational resources. Maintenance activities, including inspection and preventive maintenance of the cooling stations and converter station, would be expected to occur throughout the life of the transmission line; however, these activities would occur on an intermittent basis.

Periodic non-intrusive inspection of aquatic portions of the transmission line using vessel-mounted instruments would result in negligible additional vessel traffic, and would not impact recreational water-dependent uses. If necessary, emergency repair activities along the aquatic transmission line would result in temporary inconveniences and navigational obstacles for recreational vessels in the immediate vicinity of the repair site for up to approximately 2 weeks.

Periodic inspections of the terrestrial portions of the transmission line and aboveground infrastructure (i.e., cooling stations and converter station), and routine preventive maintenance or emergency repairs of the aboveground infrastructure, would generally be non-intrusive and would not disrupt (i.e., disturb, interrupt, or otherwise change) adjacent recreational resources.

S.8.14 Public Health and Safety

Construction and operation of the proposed CHPE Project would be conducted in accordance with the activity-specific Health and Safety Plans (HASPs) and Emergency Contingency Plan to be developed by the Applicant. The HASPs would identify requirements for minimum construction and operational distances from residences or businesses, and requirements for temporary fencing around staging, excavation, and laydown areas during construction, including blasting. The HASPs would identify measures to be employed during operations to limit public access to the proposed facilities (i.e., permanent fencing around the cooling stations and converter station). The HASPs would include provisions for worker protection, as required under the National Electrical Safety Code and by the Federal Occupational Safety and Health Administration.

Impacts from Construction

Specialized equipment would be necessary for the installation of the proposed transmission cables in the aquatic environment. Construction personnel would be performing the work on a vessel designed solely for the purpose of installing transmission cables. Operation of the aquatic installation equipment and vessels would be performed by personnel specifically trained to use this equipment. An Aquatic Safety and Communications Plan detailing USCG regulations for safely operating vessels and requiring coordination with the USCG Waterways Management and Vessel Traffic Services would be developed to meet regulatory permit conditions regarding working over or near water.

Construction activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adherence to established Federal and state safety regulations. The activity-specific HASPs would contain hazard communications information, hazard identification, risk assessment, and the information necessary to perform the work safely (e.g., Safety Data Sheets and personal protective equipment to be used). Blasting activities and safety measures during such activities would be managed with a blasting plan. All construction sites in both aquatic and terrestrial environments would be managed to prevent harm to the general public. The public would be notified prior to commencement of construction activities and temporary fencing around staging, excavation, and laydown areas would be installed during construction activities.

Impacts from Operations, Maintenance, and Emergency Repairs

An ERRP would be prepared prior to the proposed CHPE transmission system being put into operation that would identify procedures necessary to perform maintenance and emergency repairs. The ERRP would detail the activities, methods, and equipment involved in repairs and maintenance of the transmission system. Contractors would follow all guidelines detailed in the ERRP when conducting maintenance or emergency repair activities.

All aquatic transmission cables would be accessible by either divers or ROVs, and periodic non-intrusive inspections would be performed in accordance with manufacturer's specifications to ensure equipment integrity and protection is maintained. Contractors would follow all guidelines detailed in the ERRP when conducting maintenance or emergency repair activities.

The aquatic transmission cables require no fluid for insulation and would be buried at depths or otherwise protected to prevent disturbance from unrelated operations in waterways. Before the proposed CHPE transmission system would be put into operation, the terrestrial portions of the route would be appropriately marked, and the final route and placement of the transmission cable and associated equipment would be provided to the NYSPSC for addition to the "Call Before You Dig" database. This would be expected to prevent any accidental damage of, or contact with, the cables once they are operational.

Magnetic and electric field levels associated with the proposed CHPE Project transmission line would be below any established health effect levels and would comply with NYSPSC siting guidelines.

S.8.15 Hazardous Materials and Wastes

Impacts from Construction

The installation of the aquatic and terrestrial transmission cables would require the transport, handling, use, and onsite storage of hazardous materials and petroleum products, and small amounts of hazardous wastes would be generated as by-products of the transmission cable installation and burial process.

The installation of the aquatic transmission cables has the potential to suspend temporarily and transport sediment and any associated contaminants from water-jetting activities. However, a majority of the sediments would be redeposited in close proximity to its source. The transmission cables would enter the Hudson River approximately 45 miles (72 km) downstream of the southern end of the Hudson River Polychlorinated Biphenyl (PCB) Dredging Project; therefore, the proposed CHPE Project would not impact the Hudson River PCB Dredging Project.

The installation of the terrestrial transmission cables could disturb contaminants potentially deposited in the soil due to the extended use of portions of these areas as railroads and the current and former use of nearby areas for industrial and commercial operations.

Construction of the cooling stations along the route of the transmission line and the Luyster Creek HVDC Converter Station and would involve the transport, handling, use, and onsite storage of hazardous materials and petroleum products.

Construction of the converter station would not interfere with the ongoing Resource Conservation and Recovery Act (RCRA) investigations and remedial activities occurring on the former Astoria Gas Works site to the west. Construction of cooling stations would be sited in consultation with the NYSDEC to ensure that they do not conflict with ongoing remedial investigation activities, as applicable.

Impacts from Operations, Maintenance, and Emergency Repairs

Minimal amounts of hazardous materials and petroleum products would be needed to operate the vessels, remote diving vehicles, trains, trucks, and other equipment needed to conduct terrestrial ROW maintenance activities, routine non-intrusive inspections, and potential emergency repairs of the aquatic and terrestrial transmission cables.

Should any sections of the transmission cables need to be unearthed for inspection or emergency repair, localized disturbances of soil and sediment potentially containing contaminants would be required. However, because the transmission cables themselves are designed to be maintenance-free and require infrequent inspections, any impacts from maintenance and emergency repairs on hazardous materials and wastes would not be significant. The transmission cables do not contain any hazardous fluids, thereby eliminating any potential for sediment contamination from the cables themselves.

A type of refrigerant gas, presumably a non-halogenated hydrocarbon, would be used with the heat exchange process in the chiller system at the cooling stations. If released, this refrigerant would vaporize and not result in air, soil, or groundwater contamination at the cooling stations. Operation of these cooling stations would require limited amounts of hazardous materials and petroleum products for equipment lubrication, cleaning, routine maintenance, and emergency repairs. Minimal amounts of hazardous materials would also be required for standard operations, maintenance, and emergency repairs at the Luyster Creek HVDC Converter Station.

S.8.16 Air Quality

Temporary impacts on air quality would result from construction and maintenance equipment emissions, and no direct emissions would occur from operation of the proposed CHPE Project.

Impacts from Construction

Construction-related air pollutant and GHG emissions associated with the installation of aquatic portions of the proposed CHPE Project primarily would occur from diesel fuel-powered internal combustion engines. Heavy equipment, barges, generators, and boats would emit pollutants such as carbon monoxide (CO), CO_2, sulfur oxide (SO_x), particulate matter (PM), NO_x, and volatile organic compounds (VOCs), including aldehydes and polycyclic aromatic hydrocarbons (PAHs). All emissions associated with aquatic cable installation in a single waterbody would occur during a 1-year construction season. Emissions associated with construction of the aquatic portions of the proposed CHPE Project would not exceed the General Conformity Rule *de minimis* thresholds established in 40 CFR 93.153(b) for individual nonattainment pollutants.

Construction-related air and GHG emissions associated with the installation of the terrestrial portion of the transmission cable and the converter station would primarily be from diesel internal combustion engines and fugitive dust from earthmoving activities. Bulldozers, rock trenchers, bucket loaders, cranes, and other heavy equipment use diesel internal combustion engines, and would emit air pollutants. Fugitive dust emissions would result as the construction corridor is generally unpaved and most of the heavy equipment use would occur within the construction corridor. Applicant-proposed measures would be implemented to reduce impacts from emissions and minimize fugitive dust.

All emissions associated with construction would be temporary and spread over approximately 3 years of planned work activities. It is anticipated that construction emissions associated with the terrestrial portions of the proposed CHPE Project would not exceed the General Conformity Rule *de minimis* thresholds and, therefore, a General Conformity Determination is not required for any portion of the proposed CHPE Project.

The construction emissions are not expected to cause or contribute to a violation of any national or state ambient air quality standard, expose sensitive receptors to substantially increased pollutant concentrations, increase the frequency or severity of a violation of any ambient air quality standard, exceed any evaluation criteria established by the State Implementation Plan (SIP), or delay the attainment of any standard or other milestone contained in the SIP.

Impacts from Operations, Maintenance, and Emergency Repairs

Air pollutant and GHG emissions associated with maintenance, inspection, and emergency repair activities would stem from vehicle and equipment engine use and the generation of fugitive dust. Fugitive dust would be created during earthmoving activities and traveling along unpaved roads. Although maintenance, inspection, and emergency repair activities would occur for the life of the proposed CHPE Project, there would not be significant impacts on the regional air quality due to the sporadic small-scale nature and likely short duration of these activities. The types of heavy equipment and vehicles used would be similar to those described for construction; however, their usage would be considerably less. The resulting increase in emissions would not be significant. In addition, maintenance and emergency repair activities associated with the proposed cooling stations and converter station would not have significant impacts on the regional air quality.

In addition, the proposed CHPE Project would introduce 7.65 terawatt hours (TWh) per year of low-carbon renewable energy from Canada into New York's power markets. Upon operation of the proposed CHPE Project, it has been estimated that annual New York State power generation emissions would be reduced by 1.5 million tons of CO_2, 751 tons of SO_2, and 641 tons of NO_x while meeting its annual electric power demand.

S.8.17 Noise

Construction and operation of the proposed CHPE Project would be in compliance with all applicable noise policies and codes.

Impacts from Construction

Construction of the aquatic portions of the transmission line would cause a temporary increase in noise levels in the construction area. Aquatic construction activities would generally occur at distances greater than 600 feet (183 meters) from noise-sensitive receptors. However, in some locations construction activities would occur at distances approximately 100 to 500 feet (30 to 152 meters) from shore. There would be noise impacts on residents along the shoreline when vessels and heavy equipment are within 500 feet (152 meters) of the shoreline. At this distance range, the noise level was conservatively estimated to range from 62 to 70 A-weighted decibels (dBA). Given the nature of the continuously progressing installation along the aquatic transmission line route, it is likely that nearby receptors on the shoreline would be subject to noticeable sound increases for no more than a few hours as the work would progress at a rate of approximately 1.5 miles (2.4 km) per day.

The blasting program required to excavate rock along the proposed CHPE Project route in the Harlem River would consist of drilling boreholes and use of either pre-packaged chemical demolition agent or water gel dynamite to generate the expansive force necessary to fracture the rock. Nominal noise and vibration would be expected from the drilling process, and noise would result primarily from air compressors mounted on the barge. It is unlikely that blasting would generate appreciable aboveground noise. The proposed blasting activities would comply with frequently used vibration thresholds. Blasting and its noise and vibration effects on nearby land uses and structures would be managed with a blasting plan for each site. With proper implementation of a blasting plan, whereby all nearby existing buildings and structures are accounted for, the increase in noise and vibration levels would be managed to minimize noise impacts on potential receptors.

Construction of the terrestrial portion of the transmission line would cause a temporary increase in noise levels. Terrestrial transmission cable installation requires a wide range of site preparation and cable installation activities and equipment that generate noise. Terrestrial construction would generally occur approximately 100 to 500 feet (30 to 152 meters) from residences and users of recreational resources along the terrestrial portions of the project route. At these distances, the noise level was conservatively estimated to range from 66 to 86 dBA. However, in a few places along the transmission line route, including the Overland Segment, Stony Point, Haverstraw, and Queens, construction activities would occur within 100 feet (30 meters) of residences. Noise levels within this distance would be approximately 80 to 85 dBA, similar to those produced by a motorcycle at 50 feet (15 meters). Noise at these levels could result in speech or sleep interference in areas close to the operating construction equipment. Applicant-proposed measures such as equipping construction equipment with appropriate sound-muffling devices (i.e., Original Equipment Manufacturer [OEM] or better), maintaining equipment in good operating condition at all times, and limiting high-noise construction activities to daylight hours in areas with sensitive noise receptors would minimize impacts. The Applicant would notify residents ahead of time regarding construction activities in residential areas traversed by the transmission line.

HDD installation activities at the major water-to-land transitions would result in temporary noise level increases at nearby noise-sensitive receptors. Noise generated from the HDD operation would be relatively constant and, at a level of up to 89 dBA within 100 feet (30 meters) of the HDD equipment, slightly louder than typical construction noise levels. HDD operations at the major water-to-land transitions would be in place for up to approximately 2 weeks, and, where warranted, the Applicant has proposed to erect wooden sound barriers in addition to the above-cited noise minimization measures, or in extreme cases, offer temporary lodging for affected residents.

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from the operation of cooling stations and the converter station and maintenance and emergency repair activities would be expected. The increase in sound levels resulting from periodic inspection and vegetation maintenance activities in the transmission line ROW would not be significant and primarily would be associated with noise generated from additional vessel and construction vehicle traffic. Such activities would be short-term in duration, but could occur multiple times over the operating life of the transmission line. Noise levels generated from emergency repair activities would be similar to those expected during construction but with less equipment, only in a discrete area where repair activities are required, and for a shorter duration.

The cooling stations would be designed by the Applicant to limit noise generated to levels of 50 dBA at 100 feet (30 meters) away. Residential areas are present along the proposed CHPE Project route and some residences could be within 100 feet (30 meters) of the cooling stations. However, cooling station noise levels at nearby receptors would comply with the NYSDEC Noise Policy of 65 dBA for new noise sources. In addition, cooling stations would only operate as required to cool the transmission cables, primarily during summer months. The operation of the Luyster Creek HVDC Converter Station would add to baseline environmental noise levels in the immediate area; however, operations would be compliant with the New York City zoning exterior standard for exterior uses bordering an M3 industrial zone, the New York City Noise Code, and the NYSDEC Noise Policy.

S.8.18 Socioeconomics

Construction and operation of the proposed CHPE Project would require relatively few specialized workers and laborers over the lifetime of the project. Project requirements for non-specialized construction workers and local housing units along the CHPE Project corridor should be adequate to meet labor demands associated with the project. Tax receipts and revenue associated with construction expenditures would increase for local municipalities and an annual reduction in wholesale electrical energy market prices would occur.

Impacts from Construction

Over the approximated 4-year construction period, the proposed CHPE Project would result in an estimated average 300 direct construction jobs. Additionally produced indirect and induced jobs would be associated with supplying materials and providing other services for construction of the proposed CHPE Project.

Relatively few (i.e., approximately 20) specialized workers would be required during construction activities and would be on site only for the duration of those activities (i.e., 2 weeks or less) in any given location. Non-specialized workers would be hired from the existing construction workforce along each segment of the proposed CHPE Project corridor. Therefore, it is unlikely that large numbers of workers would permanently migrate to the area to meet the labor demands of the project. The few specialized workers travelling to the area for construction of the proposed CHPE Project would likely be housed either in local hotels or other short-term boarding units. Given the low number of specialized workers required for construction, existing housing options along each segment of the proposed project corridor should be adequate to meet the temporary increase in demand.

Spending associated with construction (e.g., purchase of building materials, construction workers' wages, and purchases of goods and services) would temporarily increase tax receipts and revenue for local economies. Building materials required for the proposed CHPE Project would be purchased as needed from local sources. Construction activities within roadways could interfere with access to local businesses. However, construction zones would be established in a given location for 2 or less weeks at a time and a Maintenance and Protection of Traffic Plan would be developed to ensure continuous road access to businesses.

Easements would be acquired by the Applicant, where appropriate, along the proposed CHPE Project corridor and the Applicant would pay for any associated land restoration costs following construction activities in these areas. Since construction activities would be temporary and property would be returned to pre-construction conditions once completed, it is unlikely that property values would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

Approximately 26 direct, full-time employees would be hired to operate the proposed CHPE Project; of this total, 21 employees would be located in the New York City metropolitan area. A negligible number of indirect jobs could also be created for maintenance inspections and possible emergency repairs that, if needed, would be conducted by contractors. Considering the low number of jobs that would be created, the existing workforce within the project area would be able to meet the employment and housing demands of the proposed CHPE Project.

The Applicant would pay fees, as appropriate, to New York State agencies for use of state lands occupied by the proposed CHPE Project. Some elements of the proposed CHPE Project transmission system facilities would be taxable as real property. Local municipalities would impose a tax on the facilities and the Applicant would pay the tax. Tax receipts are estimated to be 2 percent of the annually assessed municipal property value; this percentage is calculated per New York State tax regulations and is subject to change.

Residents throughout the New York City metropolitan area are projected to receive approximately $200 million in annual energy savings. The vast majority (i.e., 91 percent) of savings is expected for the New York City metropolitan area. Costs associated with operation of the transmission system would be borne (as a merchant project) by investors; they would not be directly passed on to ratepayers.

The transmission line would typically be buried primarily in road and railroad ROWs and would not be visible; therefore, its presence would not present a general detriment to private property values. Easement payments to landowners would compensate landowners for any access or use restrictions placed on private properties and would offset any potential impacts on property values. The Applicant would also pay for any land restoration costs associated with any emergency repairs to the system that might be required. Because maintenance and emergency repair activities would only occur in a given location for 2 weeks or less, no change in private property values would be expected.

S.8.19 Environmental Justice

Construction and operation of the proposed CHPE Project would not result in disproportionately high and adverse effects on minority and low-income populations.

Impacts from Construction

The census tracts along the proposed CHPE Project transmission line corridor have minority or low-income population levels that generally are lower than those for New York State, except for census tracts closest to New York City where a larger number of minority and low-income populations reside, particularly in Queens. Human health and environmental effects from increases in air emissions, noise, dust, and construction vehicle traffic on all populations, including minority and low-income populations, would be small, and occur only on a transitory, temporary schedule. Portions of the transmission line would be constructed in aquatic environments, which would further reduce construction-related effects on minority and low-income populations because activities would occur farther from populations residing on land. Cooling stations would be constructed along the proposed CHPE Project route primarily in existing railroad ROWs, and the Luyster Creek HVDC Converter Station would be constructed in an industrial area with no permanent residents. Therefore, no disproportionately high and adverse effects on minority and low-income populations would occur from construction.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation of the transmission line would create magnetic fields; however, no adverse effects from magnetic fields on minority and low-income populations would be expected because the cables would be placed underground in the same trench, and no known human health effects from exposure to magnetic fields at the level to be emitted by the proposed CHPE Project have been identified. Human health and environmental effects would be limited to operation of the converter station and maintenance and emergency repairs of the transmission system. Effects from increases in air emissions, noise, and traffic on all populations, including minority and low-income populations, would be small, and would occur only on an intermittent, temporary schedule in primarily aquatic environments and existing roadway and railroad ROWs at durations and frequencies less than that for construction. Portions of the transmission line in aquatic environments would have less maintenance and emergency repair-related effects on minority and low-income populations because activities would occur farther from populations residing on land. Noise levels would be expected to increase as a result of cooling station and converter station operation; however, those levels would primarily occur in industrial areas or railroad or roadway ROWs. Therefore, no disproportionately high and adverse impacts on minority and low-income populations would occur from operations, maintenance, and emergency repairs.

S.8.20 Cumulative Impacts

Impacts from Construction

Construction activities along aquatic portions of the proposed CHPE Project route could result in, on a temporary basis, increased water turbidity, disturbance and resuspension of sediments, disturbances to aquatic species, localized degradation of aquatic species habitat, increased vessel traffic, increased air emissions, and increased noise levels. Recolonization of impacted areas by benthic organisms would begin to occur within months after activities have ceased. Cumulatively, other construction activities occurring in the same time and vicinity, and past and reasonably foreseeable construction activities, would have similar impacts on the aquatic environment. Other projects identified along the aquatic segments of the proposed CHPE Project include the maintenance dredging of the Hudson River at the North Germantown Reach (although this should be complete prior to the commencement of the proposed CHPE Project); the Tappan Zee Hudson River Crossing Project; the Grande Isle Intertie and New England Clean Power Link in Lake Champlain; and the Spectra-Algonquin Incremental Market Natural Gas Pipeline Project, West Point Transmission Project, and one portion of the proposed West Point Net Zero Project in the Hudson River (though the timing of these projects are not yet established). Multiple activities occurring at the same time and in the same vicinity would have greater impacts than just one project. If construction activities overlap in this area, then the construction-related impacts, such as disturbed substrate, temporary water quality degradation, sediment redeposition, increased turbidity, increased noise and vibration, and the potential for spills could be greater than for just one project. However, construction of the proposed CHPE Project would not affect any one area for an extended period of time (i.e., generally no more than 2 weeks), so the possible short temporal overlap between the proposed CHPE Project and another project would limit cumulative impacts.

Construction activities along terrestrial portions of the proposed CHPE Project route could result in vegetation clearing, disturbances to wildlife, localized degradation of wildlife habitat, direct mortality of wildlife individuals, soil disturbance and erosion, storm water runoff into surface water, increased traffic, increased air emissions, and increased noise levels. These potential impacts would all be short-term in nature or limited in area or degree. Cumulatively, other construction activities occurring in the same time and vicinity would have similar impacts on terrestrial environments. Other projects identified along the terrestrial portions of the proposed CHPE Project include CSX Track Expansion between Ravenna and Haverstraw, the Haverstraw Water Supply Project, the redevelopment of the Stony Point waterfront, and the Luyster Creek Energy Project and ConEd Learning Center in Astoria. Multiple activities occurring at the same time and vicinity would have greater impacts than just one project. Construction of the proposed CHPE Project would not affect any one area over an extended period of time (i.e., generally no more than several weeks), so the short temporal overlap would limit cumulative impacts for concurrent projects.

Impacts from Operations, Maintenance, and Emergency Repairs

The proposed CHPE Project individually would not be considered a strong source of magnetic fields. Other existing and proposed transmission lines that would be crossed by the proposed CHPE Project would be an additional source of magnetic fields at the location of the crossing. Individuals of a migrant aquatic species (e.g., shortnose sturgeon) might encounter crossing submerged cables emitting magnetic fields along an entire migratory route. A review of scientific literature yielded inconclusive evidence that magnetic field emissions associated with transmission lines result in adverse effects on the health, behavior, or productivity of animals. However, the cumulative impacts of magnetic fields on aquatic and terrestrial species over a lifetime are poorly understood.

In general, the strongest magnetic and electric fields around the outside of a substation, such as in the vicinity of the proposed Luyster Creek HVDC Converter Station, are from power lines entering and leaving the substation. Beyond the substation fence or wall, the magnetic field produced by the substation equipment is usually indistinguishable from background levels. Though the proposed CHPE Project would not generate magnetic fields above the 200 mG NYSPSC interim standard, the project could contribute to magnetic emissions greater than 200 mG in those areas where the proposed HVAC transmission line crosses other utility lines. Other sources of magnetic fields in outdoor urban areas include existing power lines and streetlights. People are exposed to numerous sources of magnetic fields on a daily basis from sources like power lines, but also from electric devices in home and office environments. The research available on the health impacts of magnetic field exposure are not definitive, and no conclusions regarding the health impacts can be drawn based on what is presently known about the health impacts of magnetic fields.

Several factors could impact the energy generation market over the next few years. Energy policies are putting increasing emphasis on energy conservation and providing reliable, clean, and renewable sources of energy. Existing generating plants in the state that are not meeting air quality, water quality, or other safety standards could be forced either to upgrade equipment or to retire affected generating units earlier than planned. Proposed upgrades in the electrical transmission infrastructure along the proposed CHPE Project corridor would increase the viability of wind energy, including offshore wind energy, as an important source of clean, renewable energy in the long term; however, the upgrades necessary to make this happen would not likely occur within the next few years. Other proposed HVDC transmission projects, in addition to the proposed CHPE Project, would facilitate the importation of energy into New York City from interstate or Canadian sources. The proposed CHPE Project would be expected to contribute to cumulative increases in electrical capacity, efficiency, and reliability and decreases in transmission congestion in the New York Control Area.

The proposed CHPE Project is intended to reduce criteria pollutant and GHG emissions by alleviating the need to operate older, more emissive fossil-fueled power plants. New York State currently derives approximately 21 percent of its electricity generation needs from renewable resources, most of which comes from hydroelectric power, and the majority of the remaining generation is fossil-fuel based. The proposed CHPE Project would reduce annual emissions of CO_2, SO_2, and NO_x. As older, more emissive fossil-fueled sources of power generation are retired, the proposed CHPE Project would be expected to have long-term, beneficial, cumulative impacts on air quality, particularly in the New York City area where there are many fossil-fueled generating units and high-energy demand.

Since the proposed CHPE Project transmission line would be designed to be maintenance-free, cumulative impacts from maintenance and emergency repair activities would be limited to a negligible increase in vessel and maintenance vehicle traffic in the transmission line ROW. Potential clearing of land adjacent to the transmission line ROW, along with management of vegetation growth in the transmission line ROW during operation of the proposed CHPE Project, would also cumulatively reduce the amount of forested areas and availability of wildlife habitat.

1. Purpose of and Need for the Action

1.1 Background

The proposed Champlain Hudson Power Express (CHPE) Transmission Line Project (proposed CHPE Project) would consist of an approximately 336-mile (541-kilometer [km])-long, 1,000-megawatt (MW), high-voltage merchant electric power transmission system that includes a transmission line that would run from the U.S./Canada border to Astoria, Queens, New York, and associated equipment. In addition to the transmission line itself, the system would include transmission line cooling stations at certain locations along the route, a direct current (DC) to alternating current (AC) converter station, improvements to the Astoria Annex Substation, and high-voltage alternating current (HVAC) interconnection from this substation to the Consolidated Edison Company of New York, Inc. (ConEd) Rainey Substation in Queens.

On January 25, 2010, Champlain Hudson Power Express, Inc.[2] (CHPEI) (the Applicant) applied to the U.S. Department of Energy (DOE) for a Presidential permit pursuant to Executive Order (EO) 10485, as amended by EO 12038, and the regulations codified 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."[3] Subsequently, Transmission Developers, Inc. (TDI), on behalf of the Applicant, submitted amendments to the Presidential permit on August 5, 2010; July 7, 2011; and February 28, 2012.

The February 28, 2012, amendment reflected route and project changes that resulted from negotiations, including more than 50 settlement conferences held between November 2010 and February 2012, with state agencies and stakeholder organizations pursuant to the New York State Public Service Commission's (NYSPSC) Article VII Certificate of Environmental Compatibility and Public Need process review of the project (Joint Proposal). The Applicant and 13 signatory parties submitted the Joint Proposal to the NYSPSC on February 24, 2012. TDI submitted it to DOE as an amendment to the Presidential Permit on February 28, 2012. The NYSPSC issued an Order granting a Certificate of Environmental Compatibility and Public Need (Certificate) for the proposed CHPE Project on April 18, 2013 (NYSPSC 2013). DOE is reviewing, and this Environmental Impact Statement (EIS) analyzes, the proposed CHPE Project as amended by the Joint Proposal and the Certificate.

An overview of the proposed CHPE Project is provided in the following paragraphs, and additional project information is provided in **Chapter 2** (*Proposed Action and Alternatives*). The DOE Web site for the EIS is found at http://www.chpexpresseis.org, and additional project information is available on the Web site associated with the Applicant at http://www.chpexpress.com.

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 U.S. international border. The Presidential permit for the Applicant (OE Docket Number

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2 CHPEI is a joint venture of TDI–USA Holdings Corporation (TUHC), a Delaware corporation, and National Resources Energy, LLC. TUHC, the majority shareholder in CHPEI (75 percent), is a subsidiary of Transmission Developers Inc. (TDI), a Canadian Corporation. National Resources Energy is a wholly owned subsidiary of National RE/sources Group, a limited liability corporation duly organized under the laws of the State of Connecticut. TDI's lead investor is the Blackstone Group, an energy investment company.

3 Additionally, the Applicant formally applied for the DOE Section 1705 Loan Guarantee Program in January 2010. The program closed on September 30, 2011, and the Applicant did not receive any funding from this program. The Applicant applied for and was granted the right to enter the DOE Section 1703 loan program when the 1705 program closed. However, the Applicant withdrew its application in September 2012 and is no longer seeking a Loan Guarantee from the DOE.

PP-362), if issued, would authorize the Applicant to construct, operate, maintain, and connect the United States portion of the project at the international border.

DOE has determined that the issuance of a Presidential permit would constitute a major Federal action and that an EIS is the appropriate level of environmental review under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [U.S.C.] 4321 *et seq.*).

DOE has prepared this EIS in compliance with the requirements of NEPA, the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR Parts 1500–1508), DOE implementing procedures for NEPA (10 CFR Part 1021), and other applicable regulations.

This EIS was prepared to meet the following key objectives:

- Identify baseline conditions along the proposed CHPE Project corridor
- Identify and assess potential impacts on the natural and human environment that might result from implementation of the proposed CHPE Project in the United States
- Describe and evaluate reasonable alternatives to the proposed CHPE Project in the United States, including the No Action Alternative
- Identify specific mitigation measures, as appropriate, to minimize environmental impacts
- Facilitate decisionmaking by DOE and other applicable Federal and New York State regulatory agencies responsible for the issuance of associated permits and approvals.

1.1.1 Overview of the Presidential Permit Process

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." In determining whether the issuance of a Presidential permit would be consistent with the public interest, DOE assesses the environmental impacts of the proposed project, the impact of the proposed project on electric reliability, and any other factors that DOE considers relevant to the public interest.

1.1.2 Description of the Proposed CHPE Project

The proposed CHPE Project would cross the international border from Canada into the United States underwater in the Town of Champlain, New York, and extend approximately 336 miles (541 km) south through New York State to the New York City metropolitan area electricity market. The Applicant would construct, operate, and maintain the aquatic (underwater) and terrestrial (underground) transmission line system that ultimately terminates in Queens, New York. Although primarily underwater or underground, some specific project components of the transmission system, including various cooling equipment and the converter station, would be aboveground.

Figure 1-1 depicts, in general, the proposed route of the proposed CHPE Project. Detailed maps of the entire route are provided in **Appendix A**.

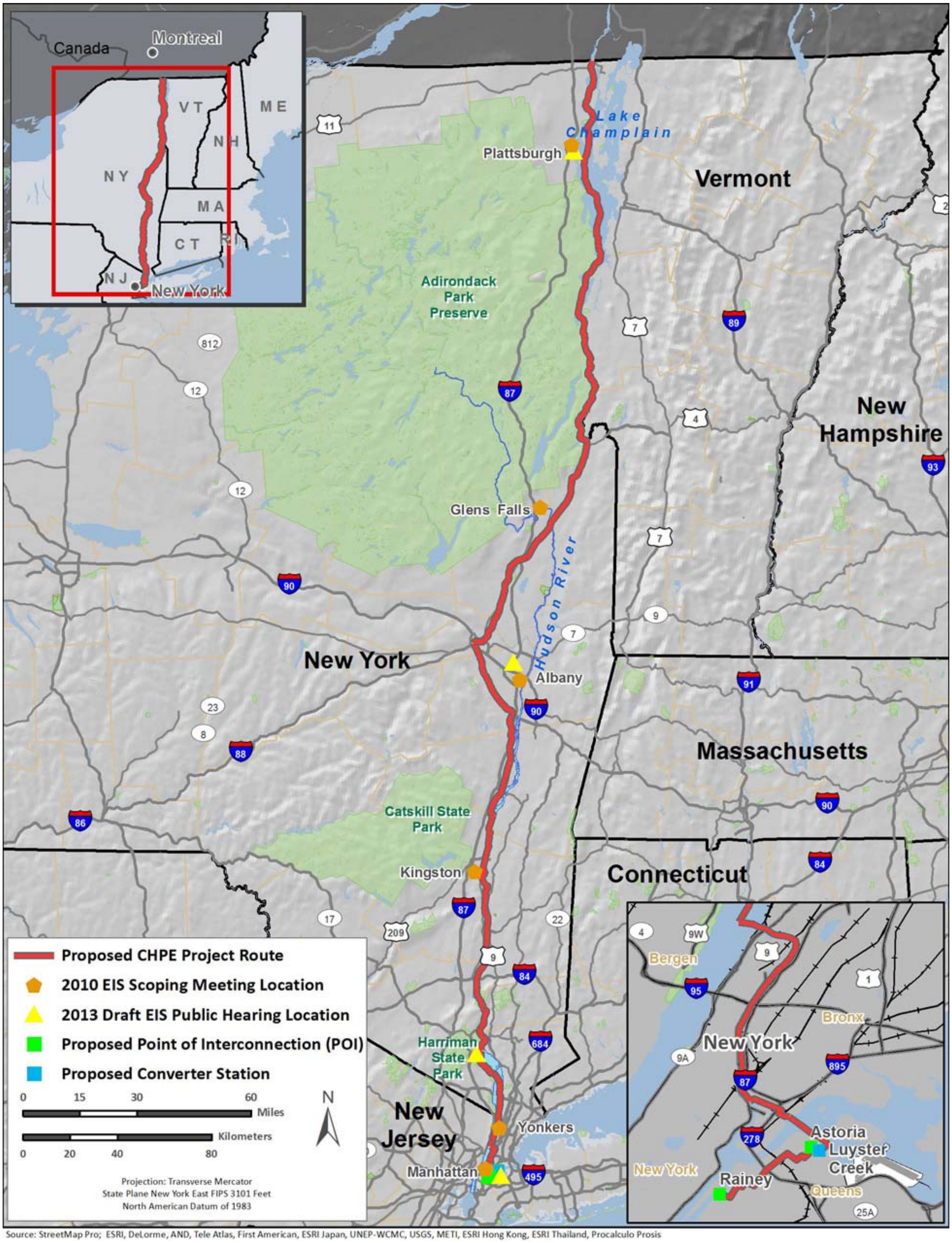


Figure 1-1. Proposed CHPE Project Location Overview Map

1.2 DOE's Purpose of and Need for Agency Action

The purpose of and need for DOE's action is to decide whether or not to grant a Presidential permit for the proposed CHPE Project. DOE will consider the impact analysis contained within this EIS when it decides whether or not to grant the permit for the proposed CHPE Project.

1.3 DOE's Proposed Action

The proposed Federal action is the granting of the Presidential permit for the construction, operation, and maintenance of the proposed CHPE Project facilities that would cross the international border. This EIS analyzes potential environmental impacts from the Proposed Action (Preferred Alternative) and the No Action Alternative. Because the proposed CHPE Project would involve actions in floodplains and wetlands, in accordance with 10 CFR Part 1022, *Compliance with Floodplain and Wetland Environmental Review Requirements,* this Final EIS includes a floodplain and wetland impact analysis. If granted, the Presidential permit would authorize the international border crossing.

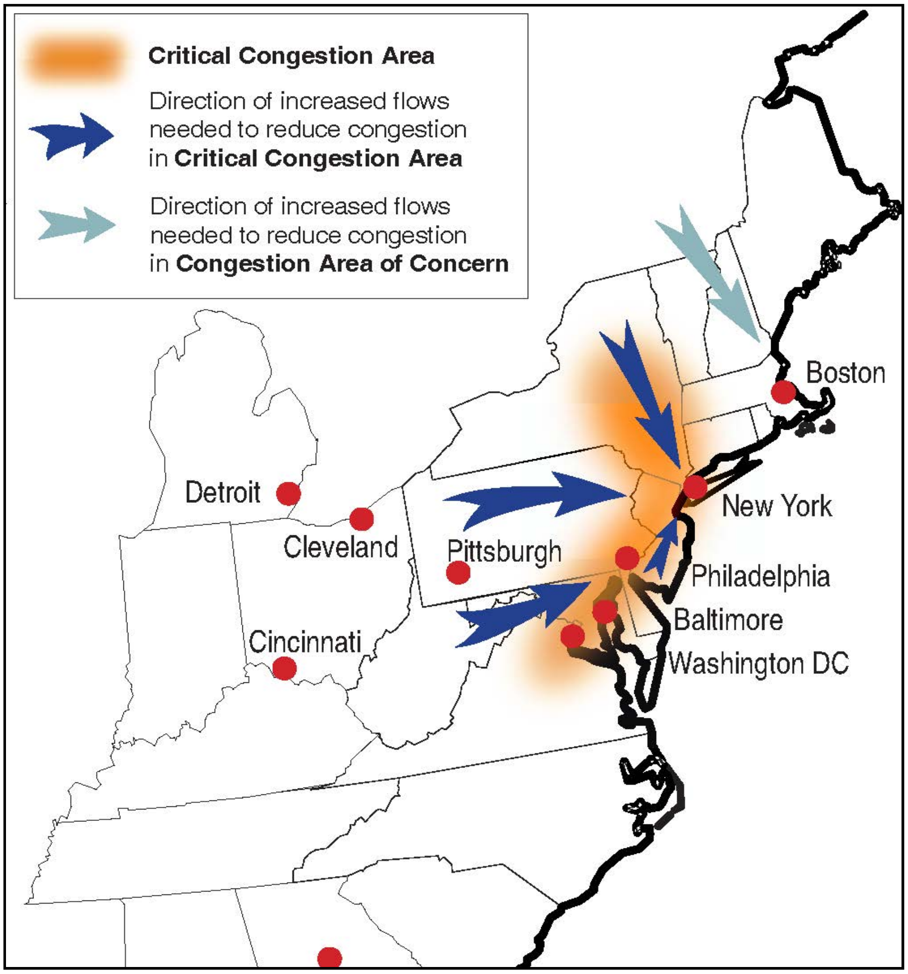
1.4 Applicant's Objectives

According to the Presidential permit application, the proposed CHPE Project would be a merchant transmission facility that would provide needed electrical energy, primarily hydroelectric and wind energy generated in Canada, to the New York City metropolitan area, which the Applicant states would result in lower wholesale electric power prices, reductions in emissions, greater fuel diversity, and increased energy supply capability and system reliability.

DOE has designated southeastern New York State as a Critical Congestion Area, defined as "Areas where it is critically important to remedy existing or growing congestion problems because the current and/or projected effects of the congestion are severe" (DOE 2009a). The *U.S. Department of Energy's National Electric Transmission Congestion Study* (DOE 2006) determined that consumers in the Mid-Atlantic area of the United States, including southeastern New York State, are adversely affected by transmission congestion. These adverse effects on consumers result in consistently higher energy prices and reduced reliability of electricity. The outcome of the 2006 report included the designation of two congestion corridors within the United States. The Mid-Atlantic Area National Electric Transmission Corridor includes parts of New York, New Jersey, Pennsylvania, Maryland, Delaware, and the District of Columbia, as shown in **Figure 1-2**. The other congestion corridor, the Southwest Area National Interest Electric Transmission Corridor, includes southwestern states and would not be affected by the proposed CHPE Project.

The 2009 update of the 2006 DOE congestion study indicated that providing electricity to southeastern New York State is the greatest challenge for the Mid-Atlantic Electric Transmission Corridor. In particular, the southeastern portion of New York State is densely populated, and land for new or expanded transmission rights-of-way (ROWs) is generally not available. In addition, residents of New York State, along with other consumers in the Mid-Atlantic Electric Transmission Corridor, pay more for electric power than non-congested areas in the United States (DOE 2009a).

The 2006 study found that "New York City's electricity supply problems are especially complex and difficult. Building new generation capacity within the city is extremely challenging because of air quality restrictions, high real estate values, fuel supply problems, and local opposition to power plants. Some additional generation is being added north of the city to serve the city's requirements. Adding major new transmission lines to the north and northwest would increase the options available to the city for power. During the summer, the city could be served by excess, relatively inexpensive hydropower from Canada" (DOE 2006).



Source: DOE 2009a

Figure 1-2. Mid-Atlantic Corridor Critical Transmission Congestion Map

The 2009 update discussed the ongoing efforts of the New York State Department of Public Service (NYSDPS) program to reduce transmission congestion in the southeastern portion of New York State through policy actions, energy efficiency, and effective demand response (NYSEPB 2009). These efforts, along with the recent economic slow-down, have reduced the forecasted growth rates. However, the study suggests that high-load growth and extreme hot weather would continue to reduce the reliability of the electric power transmission system in New York State (DOE 2009a). Furthermore, the New York Independent System Operator (NYISO), which manages New York's energy transmission grid in the New York (State) Control Area (NYCA), forecasts the electricity demand in New York State to increase by approximately 0.6 percent annually between 2012 and 2022, from 163,000 gigawatt hours (GWh) in 2011 to approximately 173,000 GWh in 2022 (NYISO 2012).

> A Smart Grid is a digitally enabled electrical grid that acts on information about the behavior of energy sources and demand loads within the system and automatically takes corrective actions to improve the efficiency, reliability, and sustainability of electricity services.

The Applicant expects the proposed high-voltage direct current (HVDC) transmission system technology to be supportive of NYISO's planning to implement Smart Grid-enabling technologies. The HVDC voltage source converter technology that would be used to convert the DC into AC electricity is able to independently control the reactive and real power flow at the AC system to which it is connected. Power flows, both reactive and real, must be carefully controlled for a power system to operate within acceptable voltage limits. When power flows are outside of acceptable limits, higher losses and reduced overall transmission efficiency result. When there is not enough reactive power, the voltage levels decline and it is not possible to push the power demanded by loads through the lines. Post-event evaluations attribute the August 14, 2003, blackout that affected the northeast United States and portions of Ontario, Canada, to inadequate levels of reactive power, which ultimately caused the power plant and transmission line failures and set the blackout in motion (US-C Task Force 2004).

A generator typically produces some mixture of "real" and "reactive" power, and the balance between them can be adjusted on short notice to meet changing conditions. Real power is the form of electricity that powers equipment. Reactive power, a characteristic of AC systems, is the energy supplied to create or be stored in electric or magnetic fields in and around electrical equipment.

The reactive voltage injected by voltage source converters can be controlled to regulate active power flow in the receiving transmission line. While one voltage source converter regulates the DC voltage, another controls the reactive power flows in the lines. Since each is also able to provide reactive compensation, the converter station is able to carry out an overall real and reactive power compensation of the total transmission system to which it is connected, improving system stability and reliability.

According to the Applicant, the voltage source converter technology would increase the efficiency of the transmission and distribution system, incorporate greater levels of renewable energy, improve power quality and stability to support new digital demands, increase operational flexibility, and greatly reduce the risk of failure that might affect the entire grid (DOE 2009b, CHPEI 2010a).

The Federal Energy Regulatory Commission (FERC) issued an Order to CHPEI (Docket No. ER10-1175-000, dated July 10, 2010) allowing CHPEI to presubscribe 75 percent of the Project's transmission capacity through supply contracts (75 *Federal Register* 26218). The Applicant would be required to conduct an open bid for the remaining 25 percent capacity to meet fair-trade requirements through Order No. 888, *Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities* (FERC Stats. & Regs. 31036 [1996], as amended [18 CFR Parts 35 and 385]). The Applicant stated that it would solicit supply contracts to presubscribe 75 percent of the transmission capacity of electrical energy delivered to the New York City metropolitan area, and the remaining 25 percent would be allocated through an open season process. As hydroelectric resources currently represent approximately 98 percent of the power generation in the Hydro-Québec control area where the CHPE system would originate (Hydro-Québec 2011), the Applicant expects that most of the power transported through the proposed CHPE Project would be from renewable resources, primarily hydropower.

Studies performed for the proposed CHPE Project showed that in addition to power being delivered by the CHPE Project to the New York City metropolitan area electrical market, it is anticipated that this power would be of lower cost. Therefore, the Applicant has stated that the proposed CHPE Project power would be purchased first and displace natural gas and oil-fueled sources of electrical generation supplying the region. This would result in the potential to reduce regional greenhouse gas (GHG) emissions. Using the initial year of operation of 2018 as an illustration, NYSDPS predicted that the proposed CHPE Project would reduce annual emissions of carbon dioxide (CO_2) by approximately 1.5 million tons, sulfur dioxide (SO_2) by 751 tons, and nitrogen oxides (NO_x) by 641 tons (NYSDPS 2012a). A study completed for the Applicant by London Economics International (LEI) in 2011 estimated that the project would result in annual emissions reductions of approximately 3.5 million tons of CO_2, 130 tons of SO_2, and 560 tons of NO_x (LEI 2011, Frayer 2012). LEI also estimated that importing 1,000 MW of lower-cost Canadian energy into the power markets in New York City would be expected to save consumers in the New York Control Area between $554 million to $654 million per year (LEI 2011). Independent modeling conducted by the NYSDPS projected that ratepayer benefits in the New York Control Area would total approximately $405 million to $720 million per year (CHPEI 2012e). LEI also estimated that Independent System Operator-New England (ISO-NE) ratepayers would see reduced energy prices and receive ratepayer benefits systemwide in the range of $20 million to $25 million per year (LEI 2011).

A previous study conducted by LEI in 2010 stated that the proposed CHPE Project would result in an improvement to the overall reliability of the NYISO's electricity system, because the CHPE Project would provide supplemental power capacity from Quebec, thereby improving resource adequacy and reducing loss of load expectations (LEI 2010). The HVDC technology proposed for use in the proposed CHPE Project would possess four-quadrant control technology, allowing the transmission supplier to control voltage and power separately, thereby providing reactive power (i.e., used to control voltage on the transmission system to improve system efficiency) for real-time voltage control. The proposed CHPE Project would also have the ability to provide black start service. "Black start" capability refers to the ability of a generating unit or station to start operating and delivering electric power without assistance from the electric system. Black start units are essential to restart generation and restore power to the grid in the event of an outage (CHPEI 2010a).

The Applicant notes that the proposed CHPE Project intends to accomplish the following:

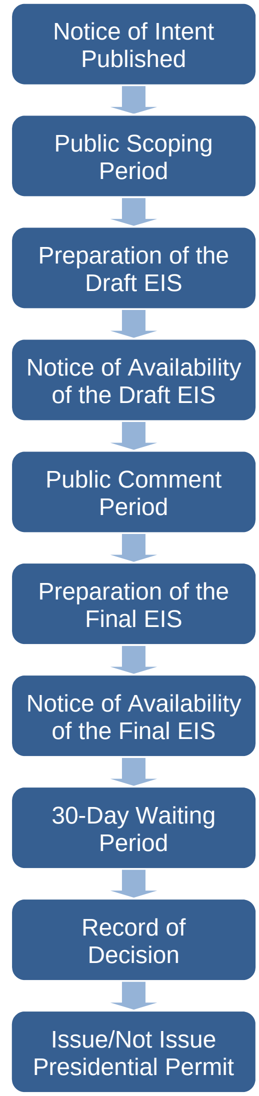
- Provide 1,000 MW (7,640 GWh per year) of electricity to New York City without contributing to additional transmission congestion on the existing electricity transmission infrastructure in the United States
- Provide additional new transmission infrastructure capacity into New York City using HVDC and HVAC cables that would be buried to avoid potential visual impacts from traditional overhead transmission lines
- Apply downward pressure on the price of electricity in the Location Marginal Price (LMP) spot markets operated by Independent System Operators (ISOs) in the New York City market
- Reduce air pollution and GHG emissions within the New York City area by alleviating the need to operate one or more existing fossil-fueled power plants within the region during periods of transmission congestion
- Improve stability of the electric grid serving the New York City metropolitan area due to the highly reliable and controllable nature of HVDC technology and its compatibility with Smart Grid initiatives
- Reduce the dependency of the New York City region on fossil fuels, such as coal, oil, and natural gas.

1.5 Overview of Public Participation in the NEPA Process

DOE determined that the appropriate level of NEPA review for the Proposed Action is an EIS. DOE prepared this Final EIS in compliance with the requirements of NEPA (42 U.S.C. Part 4321 *et seq.*), CEQ regulations for implementing NEPA (40 CFR Parts 1500–1508), and DOE implementing procedures for NEPA (10 CFR Part 1021) and floodplain and wetlands environmental review requirements (10 CFR Part 1022).

In 2010, DOE issued in the *Federal Register* a Notice of Intent (NOI) to prepare an EIS for the Proposed Action and conducted public scoping (75 *Federal Register* 34720). In 2012, DOE issued an Amended NOI to modify the scope of the EIS to reflect Applicant-proposed revisions to the project and conducted additional public scoping (77 *Federal Register* 25472) (see **Section 1.7**). These revisions included moving the transmission line out of the narrows of lower Lake Champlain, the middle Hudson River, and

Haverstraw Bay into nearby road and railroad rights-of-way (ROWs) on land. DOE provided a 45-day public review period starting November 1, 2013, which was extended for an additional 30 days and ended on January 15, 2014, and held public hearings for the Draft EIS. The public review period was initiated through publication of a Notice of Availability (NOA) in the *Federal Register* by the U.S. Environmental Protection Agency (USEPA). Methods similar to those used during the scoping period were used to notify the public and applicable Federal and state agencies of the public review period for the Draft EIS, including distributing the document to individuals or parties who submitted scoping comments, and to other interested parties that requested a copy of the EIS. The distribution list for the EIS is provided in **Appendix E**. DOE made the Draft EIS available online at the CHPE EIS Web site (http://www.chpeexpresseis.org) and on the DOE NEPA Web site (http://energy.gov/nepa). The Draft EIS was also circulated to Federal, state, and local agencies with jurisdiction by law or special subject matter expertise and to any person, stakeholder organization, or agency that has requested a copy (40 CFR 1502.19). The Final EIS includes, in **Appendix P**, a summary of the Draft EIS public review period, all comments on the Draft EIS that were received during the public comment period, and responses to the comments. All comments on the Draft EIS received or postmarked during the comment period were considered in preparing the Final EIS. Comments received after the end of the comment period were addressed to the extent practicable.



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

A chronology of the Presidential permit application process and EIS public notices to date for the proposed CHPE Project is provided in **Table 1-1**.

1.6 Public Participation and Interagency Coordination

Public participation and interagency coordination are integral elements of the NEPA process and are intended to promote open communication between DOE and regulatory agencies, Native American tribes, potential stakeholder organizations, and the public.

1.6.1 Cooperating Agencies

DOE has invited several Federal and state agencies to participate in the preparation of this EIS as cooperating agencies because of their special expertise or jurisdiction by law, such as a permitting authority (40 CFR 1501.6). The cooperating agencies are USEPA Region 2, the New York District of the U.S. Army Corps of Engineers (USACE), the New York Field Office (Region 5) of the U.S. Fish and Wildlife Service (USFWS), the U.S. Coast Guard (USCG), the NYSDPS, and the New York State Department of Environmental Conservation (NYSDEC). Each agency's role relative to this EIS is as follows:

Table 1-1. Proposed CHPE Project Presidential Permit Application Milestones

Date	Action	Summary
January 25, 2010	Initial Presidential permit application submitted	Project consists of two 1,000-MW HVDC cables; one routed to the New York City metropolitan area and the second to Bridgeport, Connecticut.
March 5, 2010	Notice of Application published in the *Federal Register*	DOE issued a Notice of Application announcing that the Applicant had applied for a Presidential permit.
June 18, 2010	DOE issued NOI to prepare an EIS and initiate public scoping	DOE announced its intention to prepare an EIS and conduct public scoping meetings.
August 5, 2010	Amendment to the Presidential permit application submitted	The Applicant submitted an amendment to DOE identifying elimination of the facilities serving Connecticut from the application and confirming that the Presidential permit application would be for a single 1,000-MW cable to the New York City metropolitan electric power market.
July 7, 2011	Amendment to the Presidential permit application submitted	The Applicant amended its application to incorporate five conditions proposed by the New York State Department of State (NYSDOS) in its June 8, 2011, Coastal Zone Conditional Consistency Certification.
February 28, 2012	Amendment (i.e., Joint Proposal) to the Presidential permit application submitted	The Applicant submitted the Joint Proposal developed under the NYSPSC Article VII review process as an amendment to the Presidential permit application. This amendment included relocation of portions of the transmission line out of the southern end of Lake Champlain; onto city streets within the City of Schenectady; out of the Hudson River between Coeymans and Catskill, New York; out of the Hudson River around Haverstraw Bay on road and railroad ROWs; out of portions of the Harlem and East rivers, and relocation of the HVDC converter station from Yonkers to Queens. It also identified the addition to the project of a buried 3-mile (5-km) HVAC line that would interconnect the Astoria and Rainey substations in Queens.
April 30, 2012	Amended NOI to modify scope of EIS	DOE issued an amended NOI announcing intent to modify the scope of the EIS analysis to reflect the February 28, 2012, amendment and to conduct additional public scoping.

- ***USEPA.*** The USEPA is required under Section 309 of the CAA to review and publicly comment on the environmental impacts of major Federal actions including actions that are the subject of draft and final EISs, and is responsible for implementing certain procedural provisions of NEPA (e.g., publishing the Notices of Availability of the draft and final EISs in the *Federal Register*) to establish statutory timeframes for the environmental review process.

- ***USACE.*** The USACE will use the EIS in their decisionmaking for the permits that would be required under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (CWA). A complete alternatives analysis under 40 CFR 230.404(b)(1) of the CWA is required during the USACE permitting process. That alternatives analysis is included in this EIS as **Appendix B**. In accordance with 33 CFR Part 325 Appendix B (8)(c), the USACE is coordinating with DOE to ensure that this EIS can be adopted by USACE in support of its decisionmaking requirements on the Section 10 and Section 404 permit applications submitted by the Applicant.
- ***USFWS.*** The USFWS' role as a cooperating agency will include evaluation of environmental impacts on fish and wildlife and their habitats, including trust resources such as migratory birds, interjurisdictional fish, federally listed threatened and endangered species, and land administered by the USFWS. Regulations that could apply to this project include the Endangered Species Act (ESA), the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act, and the Fish and Wildlife Coordination Act.
- ***USCG.*** The USCG has requested cooperating agency status to coordinate its review with DOE. The USCG's role as a cooperating agency will include evaluation of navigational risks. The USCG provides recommendations concerning possible impacts on navigational safety and security under the authority of the Ports and Waterways Safety Act (33 U.S.C. Part 1231) and the Rivers and Harbors Act (33 U.S.C. Part 471).
- ***NYSDPS.*** Construction and operation of the proposed CHPE Project requires a Certificate of Environmental Compatibility and Public Need (Certificate) and a CWA Section 401 Water Quality Certification, which were issued by the NYSPSC and NYSDPS respectively in early 2013 (NYSPSC 2013, NYSDPS 2013). The NYSDPS, which serves as staff to the NYSPSC, is participating as a cooperating agency in DOE's preparation of this EIS to coordinate its review with DOE.
- ***NYSDEC.*** NYSDEC has responsibility for the review and approval of projects that would affect water quality, wetlands, fish and wildlife, and air quality within the state and has promulgated a number of regulations that would affect the development of the proposed CHPE Project. NYSDEC has requested cooperating agency status to participate in reviewing the scope and the analysis included in the EIS. NYSDEC may review the EIS and provide feedback on the EIS to DOE.

1.6.2 Federal Authorizations and Approvals

Federal agencies that could have permitting, review, or other approval responsibilities related to certain aspects of the proposed CHPE Project are discussed in the following paragraphs. Federal agencies may use all or part of this EIS to fulfill their regulatory responsibilities for their actions related to the proposed CHPE Project.

To construct and operate the proposed CHPE Project, the Applicant would be required to consult with and obtain permits and approvals from several government agencies. **Table 1-2** lists the permits, approvals, and consultations that would be associated with the proposed CHPE Project. The roles of the agencies shown in **Table 1-2** are more fully addressed in various chapters of this EIS, where relevant to particular environmental resources and conditions. Full text of the laws can be accessed at the following Web site: http://uscode.house.gov/lawrevisioncounsel.shtml. EOs can be accessed at the following Web site: http://www.archives.gov/federal-register/executive-orders/disposition.html. The following paragraphs describe the authorizations and approvals potentially required for the proposed CHPE Project by Federal agencies.

Table 1-2. Potential Permits and Approvals Associated with the Proposed CHPE Project

Agency	Permit/Approval/Consultation
Federal	
Department of Energy Office of Electricity Delivery and Energy Reliability	Review of applications for Presidential permits for construction, operation, and maintenance of a cross-border facility for the transmission of electrical energy. Determination of public interest includes potential environmental impacts, impacts on system reliability, and other factors.
FERC	Section 205 of the Federal Power Act (FPA).
USACE	Section 404 of the CWA.
	Section 10 of the Rivers and Harbors Act.
USFWS	ESA Section 7, MBTA, and Golden and Bald Eagle Act consultation, as necessary.
National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS)	ESA Section 7 and Marine Mammal Protection Act (MMPA) consultation, and Magnuson-Stevens Fishery Conservation and Management Act (MSA) EFH review.
State of New York	
NYSPSC	Certificate of Environmental Compatibility and Public Need under Article VII of the New York State Public Service Law.
	Water Quality Certification under Section 401 of the Clean Water Act.
NYSDOS	Coastal Zone Management Act (CZMA) Consistency Review.
NYSDEC	New York State Pollutant Discharge Elimination System (SPDES) permit (storm water management during construction), state threatened and endangered species consultation.
New York State Historic Preservation Office (SHPO)	National Historic Preservation Act (NHPA) Section 106 consultation.
New York State Office of General Services	Use and occupancy of state-owned underwater lands.
New York State Department of Transportation	Use and occupancy of state-owned highway areas.
New York State Thruway Authority and New York State Canal Corporation	Use and occupancy of state-owned highway and canal areas.
Municipal	
Municipalities along the proposed CHPE Project route in New York	Permits and consents for use of municipal lands for construction and operation of transmission line, with PSC endorsement as necessary under the Public Service Law.
Various City of New York Departments	Building, street excavation, street closure, and structural welding permits; permits under the City of New York Fire Code, Construction Codes, and Electrical Code; permits for the discharge of wastewater or storm water to city's sewer system, permits for the use and supply of water; and forestry permits.

Sources: CHPEI 2010a, CHPEI 2010c

DOE. DOE would review CHPEI's Presidential permit application and determine whether to issue a Presidential permit for the proposed CHPE Project. Applications are evaluated based on the potential impacts that a proposed project could have on the environment, the operating reliability of the United States electric power supply, and any other factors relevant to the public interest. DOE is responsible for developing this EIS in accordance with NEPA to address the impacts of issuing the Presidential permit for the international border crossing and the connected action of constructing, operating, and maintaining the proposed CHPE Project.

USACE. The USACE would review and could issue a permit for the proposed CHPE Project under Section 10 of the Rivers and Harbors Act and Section 404 of the CWA. Section 10 requires approval prior to the commencement of construction activities in or over navigable waters of the United States, or that affect the course, location, condition, or capacity of such waters. CWA Section 404 requires approval prior to discharging dredged or fill material into jurisdictional waters of the United States, including wetlands.

In a June 17, 2010, letter, the USACE agreed to participate in the development of this EIS as a cooperating agency. The USACE may adopt this EIS to provide necessary environmental review to support its decision whether the construction and installation of the proposed CHPE Project is not contrary to the public interest, which would result in the issuance of a Department of the Army permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the CWA, as amended.

FERC. The proposed CHPE Project would be a public utility subject to regulation by FERC under the Federal Power Act (FPA). FERC's authority under the FPA includes the review of all issuances of securities under FPA Section 204 and review of all rate filings under FPA Sections 205 and 206. On July 1, 2010, FERC issued an Order to the Applicant, which authorized the Applicant to charge negotiated rates for transmission rights on the proposed CHPE Project that would link the Quebec electric grid to the New York City metropolitan electric market (Docket No. ER10-1175-000) (CHPEI 2010a).

USFWS. Section 7 of the ESA requires that Federal agencies consult with the USFWS when the agency determines an action may affect a listed species or critical habitat. The MBTA requires Federal agencies to consult with the USFWS to determine if an agency's proposed action would have, or is likely to have, measurable negative effects on migratory bird populations, and if so, to develop measures intended to avoid any negative effects on migratory birds. The Bald and Golden Eagle Protection Act requires consultation with the USFWS to determine if a proposed project may have potential impacts on bald and golden eagles and, if applicable, to develop habitat conservation plans intended to avoid and minimize the project's impacts on the bald and golden eagles.

NMFS. Section 7 of the ESA requires that Federal agencies consult with the National Marine Fisheries Service (NMFS) when the agency determines that an action may affect a listed species or critical habitat. NMFS is also responsible for protecting whales, dolphins, porpoises, seals, and sea lions under the MMPA. The MSA requires Federal agencies to consult with NMFS regarding any of their actions authorized, funded, or undertaken, or proposed to be such that may adversely affect essential fish habitat (EFH).

USEPA. For the proposed CHPE Project, the USEPA would be consulted by the USACE for CWA Section 404 permitting. Of particular concern to the USEPA would be the CHPE Project storm water management plan and the potential disturbance of contaminated soils during cable installation.

USCG. The USACE would consult with the USCG for its Section 10 and Section 404 permitting decisions. Consultation would be expected throughout all stages of the proposed CHPE Project to identify methods to avoid or minimize impacts on marine navigation. The Applicant would also seek approval from the USCG when construction activities would be expected to infringe on any designated safety and security areas (CHPEI 2010a).

1.6.3 New York State Approvals and Authorizations

NYSPSC. Construction and operation of the proposed CHPE Project would require that a Certificate of Environmental Compatibility and Public Need, pursuant to Article VII of the Public Service Law, be obtained from the NYSPSC. Article VII of the Public Service Law supersedes the State Environmental Quality Review (SEQR) Act, so the Certificate would also satisfy the need for a SEQR review. In addition, the NYSPSC would approve an Environmental Management and Construction Plan (EM&CP) for the proposed CHPE Project.

On April 18, 2013, the NYSPSC issued an Order Granting a Certificate of Environmental Compatibility and Public Need (Certificate) to the Applicant associated with construction and operation of the proposed CHPE Project (NYSPSC 2013). The Certificate (without attachments such as the Certificate conditions) is provided as **Appendix C**.

NYSDOS. Under the Federal Coastal Zone Management Act (CZMA), the New York State Department of State (NYSDOS) must issue a Coastal Zone Consistency Certification prior to any Federal agencies approving any action for projects that would occur within and directly affect a state's coastal area. NYSDOS issued a Conditional Coastal Consistency Determination for the proposed CHPE Project on June 8, 2011 (NYSDOS 2011a) (see **Appendix F**).

NYSDEC. NYSDEC is responsible for processing requests for a General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities in accordance with the New York SPDES requirements. NYSDEC is also responsible for verifying compliance with the state Tidal Wetlands and Freshwater Wetlands Acts of 1973 and 1975, respectively. NYSDEC is also consulted with regarding potential impacts on state-listed species.

New York State Office of General Services. The New York State Office of General Services is responsible for managing the use and occupation of underwater lands in New York State and may authorize a construction permit and an easement for the use and occupation of underwater state-owned lands under the New York State Public Lands Law.

New York SHPO. Under Section 106 of the National Historic Preservation Act (NHPA), the State Historic Preservation Office (SHPO), which is under the New York State Office of Parks and Recreation, is authorized to review all projects that could have a significant impact on historical structures or protected archaeological sites.

New York Natural Heritage Program (NYNHP). The NYNHP reviews the location of projects, activities, and actions for any records of rare species or significant natural communities in their database that could be impacted by a project or action.

Table 1-2 listed the permits, approvals, and consultations that could be associated with the proposed CHPE Project.

1.7 Public Involvement

1.7.1 Public Scoping Process

Initial Public Scoping. On June 18, 2010, DOE published in the *Federal Register* its *Notice of Intent to Prepare an Environmental Impact Statement and to Conduct Public Scoping Meetings; Notice of Floodplains and Wetlands Involvement; Champlain Hudson Power Express, Inc.* (75 *Federal Register* 34720). This and other relevant documents are available on the EIS Web site: http://www.chpexpresseis.org. The NOI explained that DOE would prepare an EIS to assess the potential environmental impacts from its proposed Federal action of granting a Presidential permit to CHPEI to construct, operate, maintain, and connect its proposed new electric transmission line. The NOI also announced DOE's plans to conduct scoping meetings and invited the public to participate in the scoping process.

The purpose of conducting scoping for an EIS is to provide interested agencies, stakeholder organizations, Native American tribes, and members of the public an opportunity to submit comments to assist DOE in identifying potentially significant environmental issues and in determining the appropriate scope of the EIS. Scoping helps ensure that relevant issues are identified early in the NEPA process and are properly studied.

The NOI was sent to interested parties including Federal, state, and local officials; agency representatives; stakeholder organizations; and local libraries, newspapers, and radio and TV stations in the vicinity of the proposed CHPE Project area. Issuance of the NOI initiated a 45-day public scoping period that ended on August 2, 2010. The NOI noted that comments submitted after the deadline "would be considered to the extent practicable."

DOE placed the NOI in 18 local and regional newspapers along the proposed CHPE Project corridor to announce the dates and times of the scoping meetings and invite the local public to attend. Copies of newspaper advertisement tear sheets and affidavits are included in the Scoping Summary Report, which is available on the EIS Web site: http://www.chpexpresseis.org. In addition, press releases were sent out to 10 local radio and 17 television stations and to 26 newspapers prior to the scoping meetings. **Appendix D** includes the Scoping Summary Report.

During the initial public scoping period, DOE conducted seven scoping meetings: one in Connecticut and six within the Lake Champlain and Hudson River Valley corridors of New York State. **Figure 1-1**, which provides an overview of the route of the proposed CHPE Project, also indicates where the scoping meetings were conducted. The scoping meetings occurred between July 8 and July 16, 2010, as noted in the meeting information summary provided in **Table 1-3**.

Table 1-3. Public Scoping Meeting Dates and Locations

Meeting Date	Location	Number of Attendees
July 8, 2010	City Hall, Bridgeport, CT	10
July 9, 2010	Federal Building, Manhattan, New York City	25
July 12, 2010	Royal Regency Hotel, Yonkers, NY	27
July 13, 2010	Holiday Inn, Kingston, NY	28
July 14, 2010	Holiday Inn, Albany, NY	31
July 15, 2010	Ramada Inn, Glens Falls, NY	18
July 16, 2010	North Country Chamber of Commerce, Plattsburgh, NY	28

The scoping meetings provided the public with the opportunity to learn more about the proposed CHPE Project and to provide comments on potential environmental issues associated with implementation of the CHPE Project. A total of 33 individuals provided verbal comments at the meetings, and their comments were transcribed by court reporters. Transcripts of the verbal comments received at the scoping meetings, along with materials and handouts provided at the meetings, are presented in the Scoping Summary Report. In addition, DOE received scoping comments in the form of 22 written letters or emails from government agencies, non-governmental organizations, and private citizens. The transcripts, meeting notices, and comment letters received during the initial scoping period are available on the EIS Web site: http://www.chpexpresseis.org.

Additional Public Scoping. In response to the Applicant's submission of the Joint Proposal amendment, DOE published on April 30, 2012, an *Amended Notice of Intent to Modify the Scope of the Environmental Impact Statement for the Champlain Hudson Power Express Transmission Line Project in New York State* (77 *Federal Register* 25472). DOE announced that it would revise the scope of the EIS to address the proposed changes and that it was accepting public comment on the revised scope until June 14, 2012.

DOE received scoping comments and prepared scoping reports for both scoping periods, which are available as **Appendix D** of this EIS and available for review on the EIS Web site.

During April 2012, the NYSPSC held six public statement hearings on the Joint Proposal. While DOE did not conduct separate scoping meetings, it recognized that comments provided by the public during the NYSPSC's public statement hearings might be relevant to DOE's NEPA process. Therefore, DOE announced that it would review the April NYSPSC public statement hearing transcripts and consider them, in addition to scoping comments submitted directly to DOE on the EIS, as potential scoping comments for purposes of the EIS. **Appendix D** contains a Scoping Summary Report Addendum summarizing comments related to the Joint Proposal amendment. The full versions of the scoping reports and the NYSPSC hearing transcripts are available on the EIS Web site: http://www.chpexpresseis.org.

1.7.2 Issues Raised During Public Scoping

A variety of general issues and concerns were raised as a result of the public scoping process, including the following:

- Impacts on protected, threatened, endangered, or sensitive flora or fauna species
- Impacts on water quality for Lake Champlain and the Hudson River
- Cultural or historic resources impacts
- Human health and safety impacts, with particular focus on the potential for the disturbance of known contaminants within the Hudson River
- Impacts on air quality
- Impacts from the development of additional electric generation facilities in Canada
- Visual impacts
- Impacts on navigation, future navigational improvements, and road traffic
- Justification of the need for additional electrical energy.

Additionally, specific issues and concerns were raised during the scoping process, including the following:

- Comments questioned the purpose of and need for the proposed CHPE Project and asserted that the EIS needs to provide evidence that the necessary electricity demand exists (or will exist) for the CHPE Project.
- Comments requested that the alternatives analysis include an evaluation of energy efficiency and conservation measures as an alternative to building the proposed CHPE Project.
- Comments stated that the proposed project would not lower electricity rates, improve the electricity grid, alleviate congestion, grow or improve New York State's electricity infrastructure, or provide local or long-term jobs to the communities along the proposed transmission line, and would instead send jobs and economic development to Canada.
- Comments expressed support for more electricity and lower costs to obtain electricity.
- Comments expressed concern that the proposed CHPE Project would be inconsistent with or would undercut Governor Cuomo's "energy highway" initiative that seeks to invest in New York State resources to upgrade the state's energy infrastructure and Article X legislation designed to expedite construction of new power generation in New York State. Comments stated that the proposed project would bypass the existing grid and existing New York generators who would not be able to access the line and could lead to the closure of upstate power generators.
- Comments raised questions about how the use of "green power" would be guaranteed. Other comments stated support for the use of "clean energy." Other comments stated that the proposed project would impede the development of renewable energy and New York State's ability to meet the Renewable Portfolio Standard goal of 30 percent renewable resources by 2015.
- Comments expressed concerns about the HVDC converter station. Comments noted potential visual impacts, land use issues, impacts on cultural resources, health and safety concerns, potential air quality impacts, and concerns about the converter station resulting in disproportionate impacts on low-income and minority populations.
- Comments expressed concern that the use of ROWs and approval of the proposed project could create a competitive monopoly for CHPE and lead to lawsuits related to access to land.
- Comments stated that there could be potential environmental impacts from burying the transmission cables in Lake Champlain and the Hudson River. Comments expressed concerns regarding sediment disturbance and the impacts that sediment would have on wildlife, fish habitat, endangered species, and benthic habitat. Comments also noted that the sediment disturbance could cause suspension of polychlorinated biphenyls (PCBs) and other contaminants in the water column and have an adverse impact on drinking water quality and human health and safety.
- Comments requested that the EIS contain an analysis of the effects of electromagnetic fields (EMFs) and thermal effects produced by both DC and AC transmission cables on the public and aquatic ecosystems, including behavior and reproduction of fish and other animals.
- Comments expressed concerns about the impacts of the transmission system on existing infrastructure. Comments noted the presence of pipelines, power cables, outfalls, and other electricity lines that the proposed CHPE Project could impact.
- Comments expressed concerns about impacts on navigation and potential interaction of the transmission cables with anchors and ship apparatus in Lake Champlain and the Hudson River.
- Comments stated that the route of the proposed CHPE Project would contain many important visual resources and that the EIS should analyze the impact that construction of the transmission line would have on these resources.

- Comments stated that the proposed project could be a violation of Article 14 of the New York State Constitution, which specifies that lands constituting a Forest Preserve cannot be sold to a private entity, and that the Attorney General of New York had previously stated that underwater lands adjacent to Adirondack Park were considered Forest Preserve lands.
- Comments stated that the EIS needs to address potential impacts on future land use in residential areas and from eminent domain and impacts on existing agricultural lands and recreation areas.
- Comments identified potential alternatives.
- Comments requested that DOE assess alternative land-based transmission line route alternatives for the proposed CHPE Project, including use of railroad ROWs the entire route or the use of interstate highway median strips.
- Comments requested that DOE discuss a siting alternative to the CHPE interconnection at the Astoria Annex Substation.
- Comments requested that alternative converter station sites in Yonkers be examined, including the possible reuse of the former Glenwood Power Plant building.
- Comments stated that the transmission line from the Astoria Annex Substation to the ConEd Rainey Substation should be placed in the East River rather than through neighborhoods in Queens.
- Comments requested that alternatives to the use of HVDC technology be examined.
- Comments stated that other entities have proposed similar projects within portions of the Hudson River and asked how many other lines could be located along the same route. Other comments expressed concern that approval of the proposed project could lead to construction of additional transmission lines from Canada.
- Comments requested that the EIS address the health, environmental, cultural, and socioeconomic impacts from existing and future hydropower development in Canada in general and specifically on traditional lands and activities of Canadian First Nations.

1.7.3 Draft EIS Public Review Period

DOE provided a 45-day public review period starting November 1, 2013, which was extended for an additional 30 days and ended on January 15, 2014, and held public hearings for the Draft EIS. The public review period was initiated through publication of a Notice of Availability (NOA) in the *Federal Register* by the USEPA. Methods similar to those used during the scoping period were used to notify the public and applicable Federal and state agencies of the public review period for the Draft EIS, including distributing the document to individuals or parties who submitted scoping comments, and to other interested parties that requested a copy of the EIS.

DOE made the Draft EIS available online at the CHPE EIS Web site (http://www.chpexpresseis.org) and on the DOE NEPA Web site (http://energy.gov/nepa). The Draft EIS was also circulated to Federal, state, and local agencies with jurisdiction by law or special subject matter expertise and to any person, stakeholder organization, or agency that requested a copy (40 CFR 1502.19).

During the Draft EIS public review period, DOE conducted four public hearings in Queens, Stony Point, Albany, and Plattsburgh, New York. **Figure 1-1**, which provides an overview of the route of the proposed CHPE Project, also indicates where the public hearings were conducted. The public hearings occurred between November 18 and 20, 2013, as noted in the meeting information summary provided in **Table 1-4**.

Table 1-4. Draft EIS Public Hearing Dates and Locations

Hearing Date	Location	Number of Attendees
November 18, 2013	LaGuardia Courtyard by Marriott, Astoria, Queens, NY	40
November 18, 2013	Stony Point Center, Stony Point, NY	215
November 19, 2013	Holiday Inn, Albany, NY	68
November 20, 2013	West Side Ballroom, Plattsburg, NY	41

DOE received 107 comment documents on the Draft EIS, which have been categorized into eight series based on the type of commenter as follows:

- 100 series – Public Hearing Transcripts: 45 comment documents
- 200 series – Federal Agencies: 5 comment documents
- 300 series – Federal and State Elected Officials: 6 comment documents
- 400 series – State Agencies: 3 comment documents
- 500 series – Local Elected Officials: 4 comment documents
- 600 series – Local Agencies: 2 comment documents
- 700 series – Stakeholder Groups: 22 comment documents
- 800 series – Other Groups and Members of the Public: 20 comment documents.

The Final EIS includes, in **Appendix P**, a summary of the Draft EIS public review period and comments received, a table of substantial changes made from the Draft EIS, all comments on the Draft EIS, and responses to the comments. All comments submitted on the Draft EIS were considered in preparing the Final EIS. **Appendix P** also contains, in Table P-4, a summary of representative comments provided during the Draft EIS comment period, and changes made to the Draft EIS in response to comments or new information received in Table P-5. Following are DOE responses to major issues raised by agencies and the public during the Draft EIS public comment period and major conclusions made by DOE regarding the Proposed Action, in accordance with CEQ NEPA regulations (40 CFR 1502.12).

Issues Raised During Draft EIS Public Review Period

NEPA Process. Several comments requested an extension of the public comment period on the Draft EIS due to the length of the EIS and potentially complicated issues addressed in the document. *DOE response:* DOE extended the comment period by 30 days to provide additional time for the public to review the Draft EIS and submit comments.

Land Use. Comments expressed concern that portions of the proposed CHPE Project route would be outside of the existing road and railroad ROWs in deviation areas, which would require the taking of private property, including residential and commercial properties, through eminent domain. Some comments also expressed concern that the presence of the transmission line could limit use of some private property. *DOE response:* Evaluations of the potential impacts on use of land outside the existing road and railroad ROW were included in the EIS. Where acquisition of land outside existing ROWs would be required, the process established under the New York State Public Service Law would be followed.

Transportation and Traffic. Several comments expressed concern that the proposed transmission line would be installed within the Federal navigation channel in various locations, which could prevent some vessels from deploying anchors due to risk of anchor damage, or could result in anchor snags on the transmission cables or concrete mats. Other comments expressed concern that the presence of the transmission line would prevent dredging of the Federal navigation channel or other locations along the Hudson River. *DOE response:* Through ongoing discussions among the USACE, USCG, maritime stakeholders, and the Applicant, the Applicant has revised its proposed cable burial depths which are reflected in the Final EIS, and has agreed to relocate the transmission line in the area of a proposed anchorage area in the lower Hudson River and elsewhere in the Hudson and Harlem rivers to reduce potential impacts on navigation as appropriate.

Aquatic and Terrestrial Protected and Sensitive Species. One comment stated that it would be beneficial to also discuss species proposed for listing under the Endangered Species Act (e.g., northern long-eared bat) in the EIS. Other comments requested additional evaluation of the potential impact of magnetic and induced electrical fields and the use of concrete mats on sturgeon. *DOE response:* The Applicant, in consultation with the relevant resource agencies including USFWS and the NMFS, made revisions to the proposed CHPE Project and developed revised management measures to avoid or minimize potential impacts on protected or sensitive species. In particular, the Applicant has agreed to conduct tree clearing activities in the winter months to avoid impacts on Indiana bats and to avoid any construction or maintenance activities that would adversely affect Karner blue butterfly habitat. DOE has prepared a Biological Assessment (BA) that concludes that the proposed CPHE Project construction, operation, and maintenance activities may affect, but is not likely to adversely affect shortnose and Atlantic Sturgeon, Indiana and Northern long-eared bats, and the Karner blue butterfly. The proposed CHPE Project would have no effect on other species listed under the ESA.

Cultural Resources. Several comments were concerned that the proposed CHPE Project route would cross and disrupt the Waldron Cemetery and Stony Point Battlefield Historic Park. *DOE response:* DOE has developed a Programmatic Agreement (PA) (see **Appendix T**) with the New York SHPO to ensure that cultural resources are identified, avoided, or mitigated through continued consultation during project development.

Socioeconomics. Some comments stated that the proposed CHPE Project would result in additional local employment and other economic benefits in New York State, while other commenters expressed concerns that the CHPE Project would outsource jobs from New York State to a foreign county, lead to the reduction of in-state employment (including some due to closing of existing power plants), and increase the U.S. dependence on foreign energy. Other comments expressed concern that the proposed CHPE Project would decrease property values, including residential and commercial properties, and reduce revenue from taxes to local jurisdictions. *DOE response:* Information concerning project employment and potential impacts on municipal tax collections is included in the EIS.

Transmission System Reliability. Comments stated that the proposed CHPE Project would not be in the National Interest and would be detrimental to the existing energy grid in New York State because existing power plants and renewable energy projects would not be able to connect to the transmission line, and it would not strengthen the New York State transmission system. Other comments expressed concern that the proposed CHPE Project would prevent other renewable and non-renewable proposed energy projects in New York State from being developed. *DOE response:* DOE is reviewing system interconnection and reliability studies to determine whether the proposed CHPE Project would have an adverse effect on electrical system reliability.

Impacts in Canada. Comments stated that impacts in Canada from the hydroelectric facilities that would be the source of the power should be addressed in the EIS, and without this analysis the EIS does not address potential impacts of the entire proposed CHPE Project. *DOE response:* DOE does not agree that such an analysis is appropriate for several reasons. First, the Federal action evaluated in the EIS is not the building of the potential electrical generating facilities, but the permitting of the construction, operation, maintenance, and connection of an electric transmission facility at the U.S./Canada international border.

Secondly, NEPA does not require an analysis of environmental impacts that occur within another sovereign nation that result from actions approved by that sovereign nation. EO 12114 requires Federal agencies to prepare an analysis of significant impacts from a Federal action in certain defined circumstances and exempts agencies from preparing analyses in others. The EO does not require Federal agencies to evaluate impacts outside the U.S. when the foreign nation is participating with the U.S. or is otherwise involved in the action [Section 2-3(b)]. The Quebec Provincial Government is conducting an environmental review for impacts in Canada, as applicable, as part of its authorization process associated with the construction of facilities (i.e., a new transmission line from a proposed new HVDC converter station at Hertel, in La Prairie, Quebec, to the U.S./Canada border) in the province. The Canadian Government, through the National Energy Board, would also have the authority to authorize the project and consider potential environmental impacts in its analysis.

Finally, the Federal action would not affect the global commons (e.g., outer space, Antarctica), and would not produce a product, emission, or effluent that is "prohibited or strictly regulated by Federal law in the U.S. because its toxic effects on the environment create a serious public health risk" or which involves regulated or prohibited radioactive materials.

Other Alternatives. Several comments stated that instead of the proposed CHPE Project, energy conservation and efficiency measures should be implemented and the power should be produced locally in New York State through renewable energy projects, distributed generation, existing power plants in upstate New York or in the Hudson Valley Region, or by constructing new power plants in New York State. *DOE response:* Energy efficiency and conservation measures were considered in the Draft EIS but eliminated from further detailed analysis because DOE determined that these measures alone were not a reasonable alternative to the proposed CHPE Project. As presented in Section 1.2 of the Draft EIS, the purpose of and need for DOE's Proposed Action is whether to issue a Presidential permit for the proposed transmission line crossing of the U.S. international border (i.e., proposed CHPE Project). Continued operation or development of other new in-state power sources or transmission lines is not the subject of the application for a Presidential permit and, therefore, is outside the scope of this EIS.

Major Conclusions

In the Draft EIS, DOE analyzed a No Action alternative and the proposed Federal action of granting the Presidential permit for the construction, operation, and maintenance of the proposed CHPE Project facilities that would cross the international border. Under the No Action alternative, DOE would not issue a Presidential permit for the U.S. portion of the proposed CHPE Project and the transmission line would not be built. Under the proposed Federal action of granting the Presidential permit, the transmission line would be constructed and maintained from the U.S./Canada international border to the Con Ed substation in Queens, New York as described in the Draft EIS. DOE has determined that issuance of a Presidential permit to the Applicant for construction, operation, and maintenance of the proposed CHPE Project would not result in a significant impact to the environment.

Before granting a Presidential permit, DOE must also determine if a proposed international electric transmission line would have an adverse impact on the reliability of the U.S. electric power supply system. In reaching this determination, DOE considers the operation of the electrical grid with a specified maximum amount of electric power transmitted over the proposed line. DOE is reviewing the interconnection studies conducted by the Applicant and NYISO to determine whether a Reliability Finding should be issued for the CHPE Project.

1.7.4 Issues Outside the Scope of this EIS – Impacts in Canada

During the scoping process, several comments requested that the EIS address environmental and socioeconomic impacts in Canada, not just in the United States. DOE does not believe that such an analysis is appropriate.

While development of the proposed CHPE Project would require the construction of a new transmission line from a proposed new HVDC converter station at Hertel, in La Prairie, Quebec, to the U.S. border, NEPA does not require an analysis of environmental impacts that occur within another sovereign nation that result from actions approved by that sovereign nation. This approach is consistent with EO 12114, *Environmental Effects Abroad of Major Federal Actions* (January 4, 1979), which requires Federal agencies to prepare an analysis of potentially significant impacts from a Federal action in certain defined circumstances and exempts agencies from preparing analyses in others. Section 2-3[b] of the EO does not require Federal agencies to evaluate impacts outside the United States when the foreign nation is participating with the United States or is otherwise involved in the action. The Government of Quebec, through the Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs, would conduct an environmental review for impacts of the project in Quebec as part of its authorization process associated with the facilities to be constructed in the province. The Canada Government, through the National Energy Board, would also authorize the project and consider the environmental impacts in its analysis. In both cases, Hydro-Québec would provide an environmental impact study to the authorities with the filings for the project approval.

The electrical power to be supplied by the proposed CHPE Project would be transmitted through a proposed new HVDC converter station at Hydro-Québec TransÉnergie's 735/315-kilovolt (kV) Hertel Substation, south of Montreal in Quebec, Canada. A new transmission line would carry this electricity to the proposed CHPE Project facilities at the border between the United States and Canada. The CHPE transmission line would cross into the United States near the Town of Champlain, New York (see **Figure 1-1**). The Canadian portion of the transmission system between the Hertel Substation and the U.S. border would be approximately 31 miles (50 km) in length. As in the United States, the transmission line in Canada would consist of one 1,000-MW HVDC bipole consisting of two underground cables connected as a bipole pair.

Hydro-Québec Production has filed an interconnection request (Number 157T) to Hydro-Québec TransÉnergie for the construction and operation of the facilities in Canada with the Canadian National Energy Board and the Québec Régie de l'énergie. The transmission line project, referred to as the Hertel-New York Interconnection, is scheduled to be commissioned in the fall of 2017 (see http://www.hydroquebec.com/hertel-new-york) (Hydro-Québec TransÉnergie 2013). The National Energy Board considers the environmental impacts as part of its analysis. Hydro-Québec TransÉnergie would file its Environmental Impact Statement at the provincial level with the Government of Quebec, through the Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs and with the National Energy Board at the Federal level. In accordance with the National Energy Board Electricity Regulations, an environmental assessment of the proposed Hertel-New York Interconnection would be carried out either under the Canadian Environmental Assessment Agency or under provincial laws. Hydro-Québec TransÉnergie states it would file an environmental impact study with the Québec Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs to obtain the permits required to carry out the project (Hydro-Québec TransÉnergie 2013). The Hertel-New York Interconnection review would follow the Bureau d'audiences publiques sur l'environnement's (BAPE) environmental impact assessment process, which includes review of the environmental assessment study, public consultation, and approval by Quebec provincial authorities (BAPE 2013).

During scoping for the proposed CHPE Project, public comments were received regarding the potential impacts of constructing the new hydroelectric facilities that would provide the power that the proposed CHPE Project would transmit. The sources of power that would be transmitted on the proposed CHPE Project transmission line are expected to be from the bulk electric transmission system. As such, the source of supply can be any generating station interconnected to the Hydro-Québec TransÉnergie electric transmission system. Among these sources would be the four-station, 1,500-MW Romaine hydroelectric generating complex that is currently under construction by Hydro-Québec in Canada. This hydroelectric facility is expected to be put into service starting in 2015 (NYSPSC 2012). The development of this hydroelectric facility is independent of and not connected to the proposed CHPE Project and would not be affected by the possible Federal action of issuing a Presidential permit.

For the foregoing reasons, potential environmental impacts in Canada are not addressed in this EIS.

1.8 Organization of this EIS

This EIS examines the environmental impacts of the Proposed Action and the No Action Alternative. The following environmental resource areas are being addressed in detail for the proposed CHPE Project:

- Land Use
- Transportation and Traffic (including navigation and marine security)
- Water Resources and Quality (including floodplains)
- Aquatic Habitat and Species
- Aquatic Protected and Sensitive Species (including EFH)
- Terrestrial Habitat and Species
- Terrestrial Protected and Sensitive Species
- Wetlands
- Geology and Soils
- Cultural Resources
- Visual Resources
- Infrastructure
- Recreation
- Public Health and Safety (including intentional destructive acts)
- Hazardous Materials and Wastes
- Air Quality
- Noise
- Socioeconomics
- Environmental Justice
- Cumulative Impacts.

Where relevant, the environmental laws, regulations, permits, and EOs that might apply to the proposed CHPE Project are described in more detail in the appropriate resource area sections.

This EIS is organized into 12 chapters followed by appendices. **Chapter 1** provides the purpose of and need for the agency action and describes DOE's Proposed Action. **Chapter 2** contains a description of the proposed CHPE Project and alternatives considered. **Chapter 3** contains a general description of the physical resources and baseline conditions that could be affected by the proposed CHPE Project. **Chapter 4** presents an analysis of the potential environmental consequences from implementing the No Action Alternative. **Chapter 5** presents an analysis of the potential environmental impacts from implementing the proposed CHPE Project. **Chapter 6** includes an analysis of the potential cumulative impacts. **Chapter 7** addresses public participation and interagency coordination activities. **Chapter 8** lists the preparers of the document. **Chapter 9** lists references used in the preparation of the document. **Chapter 10** contains a list of acronyms used throughout the document. **Chapter 11** contains a glossary of terms, and **Chapter 12** contains an index.

Appendix A contains an atlas of detailed maps showing the proposed CHPE Project transmission line and associated facilities. **Appendix B** contains the Least Environmentally Damaging Practicable Alternative (LEDPA) analysis prepared by the Applicant as part of its CWA Section 404 permit application and reviewed by USACE. **Appendix C** contains the NYSPSC Order granting the Certificate of Environmental Compatibility and Public Need for the proposed CHPE Project. **Appendix D** includes the Scoping Summary Report and Addendum. **Appendix E** contains the distribution list for the EIS. **Appendix F** contains Coastal Zone Consistency documentation and land use tables. **Appendix G** includes a listing of Applicant-proposed impact avoidance and minimization measures and best management practices (BMPs) that the Applicant has committed to implementing as part of construction and operation of the proposed CHPE Project and that were considered in the environmental evaluation supporting this Final EIS. **Appendix H** contains information on ESA Section 7 consultations with USFWS and NMFS. **Appendix I** contains a summary of wetlands and soil types found along the proposed CHPE Project route. **Appendix J** contains information on cultural resources and the Section 106 consultation. **Appendix K** identifies visual and recreational resources along the route. **Appendix L** contains information used in the environmental justice analysis. Information related to air quality and noise analysis is presented in **Appendices M** and **N**, respectively. **Appendix O** provides the Contractor Disclosure Statement. **Appendix P** includes comments received on the Draft EIS and responses to those comments. The BA and Essential Fish Habitat Assessment for the proposed CHPE Project are in **Appendix Q** and **Appendix R**, respectively. **Appendix S** contains the Floodplain Statement of Findings that has been prepared in accordance with 10 CFR Part 1022. **Appendix T** includes the Programmatic Agreement that has been prepared to resolve the proposed CHPE Project's potential adverse effects on historic properties. **Appendix U** contains the Navigation Risk Assessment for the aquatic portions of the proposed CHPE Project that has been prepared by the Applicant.

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2. Proposed Action and Alternatives

This section describes the proposed CHPE Project and alternatives to the project. It provides a description of the Proposed Action (**Section 2.1**), which is the issuance of a Presidential permit for the proposed CHPE Project; the No Action Alternative (**Section 2.2**); a description of the Applicant's preferred project proposal (**Section 2.3**), which is the proposed CHPE Project; proposed CHPE Project location, design, and construction methods (**Section 2.4**); other alternatives considered but eliminated from further detailed analysis (**Section 2.5**); and a summary of environmental impacts that could result from the proposed CHPE Project (**Section 2.6**).

2.1 Proposed Action

DOE's Proposed Action (Preferred Alternative) is the issuance of a Presidential permit that would authorize the construction, operation, and maintenance of the proposed CHPE Project that would cross the U.S./Canada border. This EIS has been prepared to comply with NEPA and to support DOE's decisionmaking associated with the issuance of the Presidential permit for the proposed CHPE Project.

2.2 No Action Alternative

CEQ and DOE regulations require consideration of the No Action Alternative. The No Action Alternative serves as a baseline against which the potential environmental impacts of a proposed action can be evaluated. Under the No Action Alternative, DOE would not issue a Presidential permit for the proposed CHPE Project and the transmission system would not be constructed, and the potential impacts from the project would not occur.

2.3 Proposed CHPE Project Overview

CHPEI, as the Applicant for the Presidential permit, would develop the proposed CHPE Project as a merchant transmission facility to connect renewable sources of power generation in Canada with load centers in the New York City metropolitan area (TDI 2010). According to the Applicant, the estimated total capital cost for the proposed CHPE Project would be approximately $2.2 billion and it could be in service by 2017 (CHPEI 2012b). By some projections, the proposed CHPE Project would create an average of 300 direct construction jobs during its estimated 4-year construction period (TDI 2010).

The proposed CHPE Project would include construction, operation, and maintenance of an approximately 336-mile (541-km)-long, 1,000-MW, high-voltage electric power transmission system that would have both aquatic (underwater) and terrestrial (and primarily underground) segments. The underwater portions of the transmission line would be buried in the beds of Lake Champlain and the Hudson, Harlem, and East rivers, and the terrestrial portions of the transmission line would be buried underground, principally in railroad ROWs and, to a lesser extent, roadway ROWs. The HVDC transmission system would consist of one 1,000-MW HVDC transmission line, communications cable, and ancillary aboveground facilities, including an HVDC converter station and cooling stations at selected locations where required. The transmission line would be a bipole consisting of two transmission cables, one positively charged and the other negatively charged. The transmission line would connect from an HVDC transmission line in the Canadian Province of Quebec and transmit electric power to a new HVDC converter station in the New York City metropolitan area. The new HVDC converter station would convert the electrical power from DC to AC and then connect to two points of interconnection (POIs) within the New York City electrical grid. Cooling stations would be installed along the terrestrial portions of the transmission line route in certain locations to disperse accumulated heat in long cable segments installed by horizontal directional drilling (HDD). The proposed CHPE Project would be owned and operated in the United States by the Applicant.

The CHPE transmission system would deliver 1,000 MW of power to the POI in the New York City metropolitan area. Two solid dielectric (no fluids), cross-linked polyethylene (XLPE) cables would be used for the HVDC portion of the proposed CHPE Project. The HVDC portion would be approximately 333 miles (536 km) in length and have a nominal operating voltage of approximately 300 kV, but would be operated periodically at the maximum operating voltage of 350 kV during periods of peak demand. Two underground HVAC lines rated at 345-kV would also be installed to interconnect to an existing electrical substation in Queens. This underground circuit would be approximately 3 miles (5 km) in length.

The entire length of the transmission system would be buried, with the majority of the route beneath Lake Champlain and the Hudson River, and the exceptions would be bridge attachments, if practicable, and ancillary aboveground facilities, such as at the converter station and cooling stations.

By burying transmission cables underwater and underground, landscape and visual impacts normally associated with overhead transmission lines would be avoided. In addition, when HVDC electric transmission cables are buried, electric field levels can be reduced. For more than 25 percent of the proposed CHPE Project route, the transmission cables would be buried underground along the ROW of two railroads to avoid identified sensitive features, including the Champlain Canal system and the Hudson River PCBs dredging project within the Upper Hudson River between Hudson Falls, New York, and the Federal Dam at Troy, New York.

In addition to these features, other geographic, infrastructure, and development features that would affect placement of the transmission cables were considered when developing the proposed CHPE Project route, such as the following:

- The locations of existing commercial, industrial, and residential development
- The locations and nature of previously disturbed ROWs that could be used for new transmission cable installation, including those ROWs associated with existing railroad lines and electric transmission cables
- The locations and nature of Adirondack Park Forest Preserve lands.

2.3.1 Evolution of the Proposed CHPE Project

DOE and NYSPSC Permitting Processes. Following the Applicant's Presidential permit application filing, DOE published a notice in the March 5, 2010, *Federal Register* (75 *Federal Register* 10229) announcing the receipt of the Presidential permit application for the proposed CHPE Project. On March 30, 2010, the Applicant filed an application for a Certificate of Environmental Compatibility and Public Need (Original NYSPSC Application), a CWA Section 401 State Water Quality Certificate, and other environmental permits with the NYSPSC in accordance with Article VII of the New York State Public Service Law. Article VII establishes the review process for the NYSPSC to consider any application to construct and operate an electric transmission line with a design capacity of 100 kV or more extending for at least 10 miles (16 km), or with a capacity of 125 kV and extending for a distance of greater than 1 mile (1.6 km) within the State of New York.

As described in **Section 1.7**, DOE issued an NOI to prepare an EIS and to initiate public scoping on June 18, 2010, and held public scoping meetings on the proposed CHPE Project as described in the original application.

The Original NYSPSC Application was supplemented by the Applicant on July 22, 2010; July 29, 2010; August 6, 2010; and August 11, 2010. The Applicant's July 22, 2010, supplement informed the NYSPSC and the 30 active stakeholders that have been identified as a party to the settlement negotiations as part of the NYSPSC Article VII process for this project[4] that the Applicant was revising its proposal to eliminate the HVDC circuit between the U.S./Canada border and Bridgeport, Connecticut, and change the POI in New York City from the ConEd Sherman Creek substation in Manhattan to a substation in Astoria, Queens, New York, owned by the New York Power Authority (NYPA). The Applicant also amended its Presidential permit application to DOE on August 5, 2010, to reflect these project revisions.

On August 12, 2010, the Secretary of the NYSPSC determined that the submitted documents, as supplemented, were filed or otherwise in compliance with the filing requirements of Article VII as of August 11, 2010, and that the formal review of the project would be initiated. Procedural conferences were held in this proceeding before the NYSPSC Administrative Law Judges on September 21, 2010, and January 19, 2011. Public statement hearings were held before Administrative Law Judges on the following dates and at the following locations:

- October 24, 2010, in Yonkers, New York
- October 28, 2010, in Kingston, New York
- November 3, 2010, in Schenectady, New York
- November 4, 2010, in Whitehall, New York
- November 9, 2010, in Plattsburgh, New York.

The Applicant also hosted informal informational sessions for the public on the following dates and locations:

- March 9, 2010, in Albany, New York
- April 13, 2010, in Plattsburgh, New York
- April 20, 2010, in Kingston, New York
- May 4, 2010, in Scotia, New York
- May 12, 2010, in Yonkers, New York.

After exploratory discussions among the 30 active stakeholder parties, a Notice of Impending Settlement Negotiations was filed with the Secretary of the NYSPSC by the Applicant and served to all parties on November 2, 2010.

CZMA Consistency Review. On December 6, 2010, the Applicant submitted its Coastal Consistency Assessment Form to the NYSDOS requesting a concurrence on its finding that the proposed CHPE Project would be consistent with the policies of the New York State Coastal Management Program. On June 8, 2011, NYSDOS issued a Conditional Concurrence with Consistency Certification to the Applicant (see **Appendix F**). In this letter, NYSDOS "conditionally concurred with the consistency certification for the project under the enforceable policies of the New York State Coastal Management Program (CMP)."

[4] The 30 active stakeholder parties are as follows: the Adirondack Park Agency; Adirondack Council; Albany County, New York; Central Hudson Gas & Electric Corporation; CHPEI; City of New York; City of Yonkers; Consolidated Edison Company of New York, Inc.; County of Rockland, New York; County of Westchester, New York; Entergy Nuclear Power Marketing, LLC; Greene County, New York; International Brotherhood of Electrical Workers Local Union No. 97; Independent Power Producers of New York, Inc. (IPPNY); National Grid USA; New York Power Authority (NYPA); New York State Council of Trout Unlimited; New York State Canal Corp./New York State Thruway Authority; New York State Department of Agriculture and Markets; NYSDEC; NYSDOT; New York State Office of Parks, Recreation and Historic Preservation; NYSDPS; Orange and Rockland Utilities, Inc.; Riverkeeper, Inc.; Scenic Hudson, Inc.; Town of Saugerties, New York; Saratoga County, New York; Vermont Electric Power Company, Inc. and Vermont Transco LLC; and the Utility Intervention Unit of the NYSDOS's Consumer Protection Division.

In its concurrence, NYSDOS developed conditions that, if adopted by the Applicant, pursuant to 15 CFR 930.4, would allow the project to be consistent with the CMP. These conditions are summarized in the following:

- The transmission line would be buried at the maximum depth achievable that would allow each pole of the bipole to be buried in a single trench using a jet plow. Given the state of the available information, this is expected to be at least 6 feet (1.8 meters) below the sediment-water interface in a single trench in coastal waters regulated by the New York State CMP, which in the case of the proposed CHPE Project occur in the Hudson, Harlem, and East rivers. Should the bipole occupy any federally maintained (i.e., dredged) navigation channels, it would be located at least 15 feet (5 meters) below the authorized depth within those channels. The cable would be maintained at these depths and the depth of burial would be verified on a periodic basis so it would not become a hazard to navigation or marine resources. (Subsequent to the issuance of the NYSDOS conditional concurrence, the USACE New York District Public Notice for the proposed CHPE Project [NAN-2009-01089-EYA] dated October 2013 [USACE 2013] identified burial depths, including in the federally maintained navigation channel [see **Section 2.4.10.1**]. The NYSPSC Certificate stated that in the event USACE imposes conditions conflicting with the Certificate, such conflicts must be reconciled with the USACE and NYSPSC.)
- All transitions from aquatic and terrestrial configurations within the coastal area would be accomplished by HDD and would be at a depth sufficient so they would not interfere with any current or future water-dependent uses.
- The transmission cable would not occupy any area within the Hudson River north of the southerly boundary of the Inbocht Bay and Duck Cove Significant Coastal Fish and Wildlife Habitat (SCFWH).
- The transmission cable would be in a terrestrial, buried configuration around the Haverstraw Bay SCFWH.
- When work would be conducted in identified SCFWHs, it would be conducted during the timeframes provided in narratives describing the SCFWHs (NYSDOS 2012). Outside of SCFWHs, all in-water work would be conducted in accordance with the recommendations developed during the NYSPSC Article VII process (NYSDOS 2011a).

The Applicant incorporated these changes in the proposed CHPE Project design, and on July 7, 2011, submitted an amended Presidential permit application to DOE identifying that the project would be modified in accordance with these conditions (CHPEI 2011, TDI 2012a). The conditions were also incorporated into NYSPSC's April 2013 Order Granting a Certificate of Environmental Compatibility and Public Need to the Applicant associated with construction and operation of the proposed CHPE Project (NYSPSC 2013).

Following submission of the amended Presidential permit application, public and intervener input into the NYSPSC process continued to occur. As a result of these discussions, the Applicant also proposed to construct the HVDC converter station adjacent to the Astoria Annex Substation in Queens and to construct an approximately 3-mile (5-km), 345-kV HVAC interconnection circuit between the Astoria Annex Substation and the ConEd 345-kV Rainey substation, also in Queens.

2.3.2 Identification of the Proposed CHPE Project Joint Proposal

As mentioned in **Section 2.3.1**, in November 2010, a Notice of Impending Settlement Negotiations was filed in the state process. Between November 2010 and February 2012, more than 50 settlement conferences were held. These settlement negotiations culminated with the filing of a "Joint Proposal of

Settlement" (Joint Proposal) with the NYSPSC on February 24, 2012. The following governmental and nongovernmental organizations are signatory parties to the Joint Proposal:

- The Applicant, CHPEI
- NYSDPS
- NYSDEC
- NYSDOS
- New York State Department of Transportation (NYSDOT)
- New York State Department of Agriculture and Markets
- Adirondack Park Agency (APA)
- Riverkeeper, Inc.
- Scenic Hudson, Inc.
- City of Yonkers, New York
- City of New York, New York
- New York State Council of Trout Unlimited
- New York State Office of Parks, Recreation, and Historic Preservation
- Palisades Interstate Park Commission.

The Joint Proposal set forth a proposed route for the proposed CHPE Project and impact reduction measures, including the establishment of a $117 million trust fund for environmental management purposes, as detailed in Joint Proposal Term 144, to be used exclusively for in-water mitigation studies and projects that have a direct nexus to the construction and operation of the proposed CHPE Project.

As expressed in the Joint Proposal, the signatory parties entered into the Joint Proposal on the understanding that it constitutes a negotiated resolution of the issues in the proceeding. The support of the signatory parties for the Joint Proposal is expressly conditioned upon acceptance or approval by the NYSPSC of all provisions thereof, without material change or condition (CHPEI 2012b). On February 28, 2012, TDI, on behalf of the Applicant, submitted the Joint Proposal as an amendment to the Presidential permit application. The CHPE Project as currently proposed by the Applicant and evaluated herein is the transmission line route and system components reflected in the Joint Proposal and subsequent modifications as discussed below. The CHPE Project is described in the following paragraphs and is referred herein as the proposed CHPE Project.

The proposed CHPE Project (the Applicant's Preferred Alternative) is essentially identical to the August 2010 proposal for major portions of the transmission line route, with the exception of a few alignment changes resulting from and included in the Joint Proposal. The previously proposed CHPE Project alignments from the August 2010 proposal are identified in **Section 2.5**.

Since the Joint Proposal was issued in February 2012, three subsequent modifications have been made to the proposed CHPE Project, all of which occur on the grounds of the ConEd Charles Poletti Power Plant complex in Astoria, New York, and are reflected in subsequent Joint Proposal exhibits submitted by the Applicant and are as follows.

- To avoid routing the transmission line through the site of a liquefied natural gas (LNG) storage facility on the Charles Poletti Power Plant complex at proposed CHPE Project milepost (MP) 332, the transmission line route would follow the East River shoreline to the east and south along Luyster Creek around the perimeter of the LNG facility. The route would remain entirely within the power plant complex (CHPEI 2012tt).
- The proposed site for the CHPE Project HVDC Converter Station along Luyster Creek in the Charles Poletti Power Plant complex (at MP 333) was revised as the Applicant and ConEd

reached consensus on its footprint. The acreage of the site was reduced from 5.2 acres (2.1 hectares) to 4.5 acres (1.8 hectares) (CHPEI 2012uu). See **Section 2.4.6** for more information about the converter station.

- The Applicant has agreed to compensate ConEd for installation of electrical system upgrades from the Astoria Annex Substation to the Astoria East Substation rather than use operating procedures to ensure that sufficient power can flow through the system into the grid (see **Section 2.4.7**) (CHPEI 2012k).

2.3.3 Issuance of the Certificate of Environmental Compatibility and Public Need for the Proposed CHPE Project

On December 27, 2012, the Administrative Law Judges issued a recommendation to the NYSPSC that a Certificate of Environmental Compatibility and Public Need be issued to the Applicant for the proposed CHPE Project (NYSPSC 2012). On January 17, 2013, the NYSDPS Office of Energy Efficiency and the Environment issued a CWA Section 401 State Water Quality Certificate to the Applicant for the proposed CHPE Project (NYSDPS 2013). The NYSPSC then issued an Order granting the Certificate of Environmental Compatibility and Public Need (Certificate) (see **Appendix C**) for the proposed CHPE Project on April 18, 2013 (NYSPSC 2013). In its Certificate, the NYSPSC stated "The [proposed CHPE] Project would satisfy a need by providing additional transmission capacity into the New York City load pocket and an additional source of supply – hydroelectric power – that is both renewable and relatively stable in price, enhancing the fuel diversity in the City. Moreover, by allowing a new entrant into the New York City market, approval of the proposed CHPE Project would advance NYSPSC's policy favoring competition. Finally, the proposed CHPE Project would advance State policies by enabling access to a source of clean energy supply." The Certificate includes 165 attached conditions, some of which require measures to reduce, avoid, or measure environmental impacts.

2.4 Proposed CHPE Project Location, Design, and Construction Methods

The following subsections describe the route segments analyzed in this EIS and specific engineering details of the transmission system: the aquatic DC transmission cables; HDD methods; terrestrial DC transmission cables; cooling stations to be used in certain locations along the transmission line; the proposed HVDC converter station and substation interconnection in Astoria, New York; and, finally, the proposed Astoria Annex to Rainey substation HVAC interconnection as approved by NYSPSC under the Certificate.

The following subsections discuss how the Applicant proposes to install and operate the transmission line and aboveground facilities of the proposed CHPE Project based on information available when this EIS was prepared (CHPEI 2012vv).

2.4.1 Description of the Route Segments

For the purposes of understanding the various environmental settings associated with the proposed CHPE Project, and to facilitate the analysis in this EIS, the transmission line route was divided into four geographically logical segments:

- Lake Champlain Segment
- Overland Segment
- Hudson River Segment
- New York City Metropolitan Area Segment.

The four segments are shown on **Figures 2-1** through **2-4**, respectively, and supporting detailed maps of the full project route are provided in **Appendix A**.[5] From the U.S./Canada border, the HVDC transmission line would be routed through the Lake Champlain lake bed for approximately 101 miles (163 km), entirely within the jurisdictional waters of New York State from near Champlain, New York, to Dresden, New York. This portion of the route composes the Lake Champlain Segment (see **Figure 2-1**).

The Overland Segment begins at the southern end of Lake Champlain in the Town of Dresden, where the HVDC transmission line would exit the water at MP 101 and be installed underground in NYSDOT ROW for approximately 11 miles (17 km) along New York State Route 22, crossing under South Bay in Lake Champlain via HDD at MP 109, to MP 112 in the Town of Whitehall, New York (see **Figure 2-2**). Beginning at MP 112 in Whitehall, the transmission line would be buried within an existing railroad ROW owned by the Canadian Pacific (CP) Railway for approximately 64 miles (103 km) through the municipalities of Fort Ann, Hartford, Kingsbury, Fort Edward, Moreau, Northumberland, Wilton, Greenfield, Saratoga Springs, Milton, Ballston, Clifton Park, Glenville, Schenectady, and Rotterdam, New York. In Schenectady, the transmission line would be routed underground off the railroad ROW for more than 1 mile (1.6 km) through city streets between MPs 173 and 174 to avoid engineering constraints along the railroad ROW. After returning to the CP railroad ROW in Schenectady, the transmission line would then transfer to the CSX Transportation (CSX) railroad ROW at MP 177.0 in the town of Rotterdam and continue south underground for approximately 51 miles (81 km) through the municipalities of Guilderland, New Scotland, Bethlehem, Coeymans, New Baltimore, Coxsackie, Athens, and Catskill. The transmission line would go off the railroad ROW where it would follow Alpha Road in Catskill and connect to the Hudson River at MP 228, south of the Inbocht Bay and Duck Cove SCFWH.

The Hudson River Segment begins at MP 228 where the HVDC transmission line would enter the Hudson River at the Town of Catskill, New York (see **Figure 2-3**). Upon entering the Hudson River, the transmission line would be buried in the river bottom for approximately 67 miles (108 km) until exiting the water near the Town of Stony Point, New York, north of the Haverstraw Bay SCFWH in the Hudson River. The transmission line route would avoid 15 "Exclusion Areas" containing high-quality wildlife habitats in the Hudson River between Catskill and Stony Point, as identified by NYSDEC during the development of the Joint Proposal (CHPEI 2012jj). The transmission line would bypass the Haverstraw Bay SCFWH by following the CSX railroad ROW through the communities of Stony Point and Haverstraw, and the U.S. Route 9W ROW in Clarkstown between MPs 295 and 303. The transmission line would be buried through this entire stretch before reentering the Hudson River. HDD would be used to install the cables at the land/water interfaces, under roads and wetland areas, and under Stony Point State Historical Park, Hook Mountain State Park, and Rockland Lake State Park. The transmission line would reenter the Hudson River at MP 303 for approximately 21 miles (34 km) until it reaches the end of the Hudson River Segment at Spuyten Duyvil Creek (the area where the Harlem River shipping channel connects to the Hudson River) and the Harlem River in New York City at MP 324.

The New York City Metropolitan Area Segment begins at Spuyten Duyvil at MP 324, where the HVDC transmission line would enter the Harlem River and continue south in the river for a distance of approximately 6 miles (10 km) to a point north of the Willis Avenue Bridge in the borough of the Bronx at MP 330 (see **Figure 2-4**). The transmission line would exit the river and proceed east through the NYSDOT railroad corridor and rail yards along the northern side of the Bronx Kill to the East River.

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5 Joint Proposal Section III.A ("Facility Description") was intended to provide only a general narrative overview of the transmission line route. The distances identified in this EIS are derived from route alignments and mileposts shown in the maps provided in Appendix B of the Joint Proposal, are used as the source data for purposes of the NEPA analysis, and may deviate slightly from the Joint Proposal Facility Description.

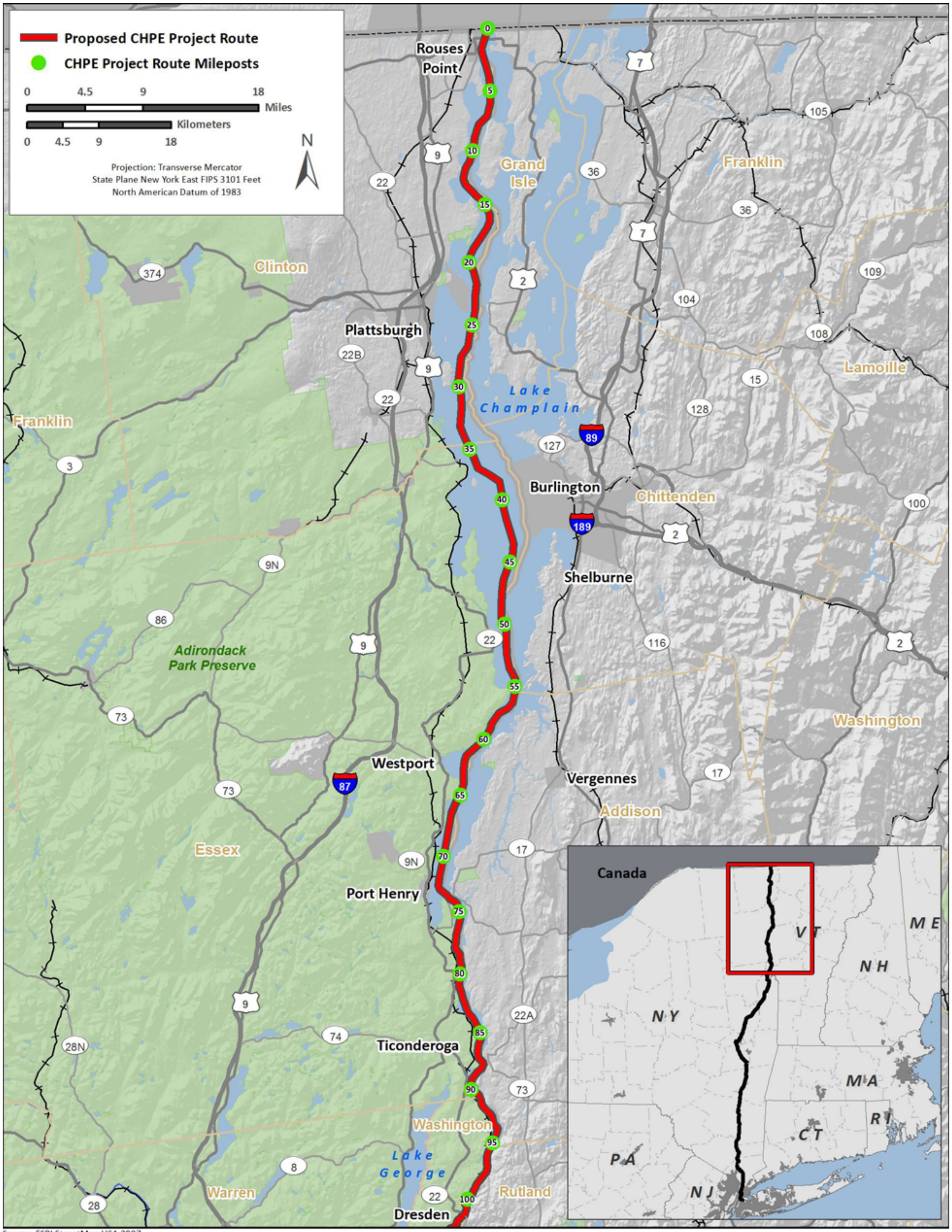


Figure 2-1. Lake Champlain Segment

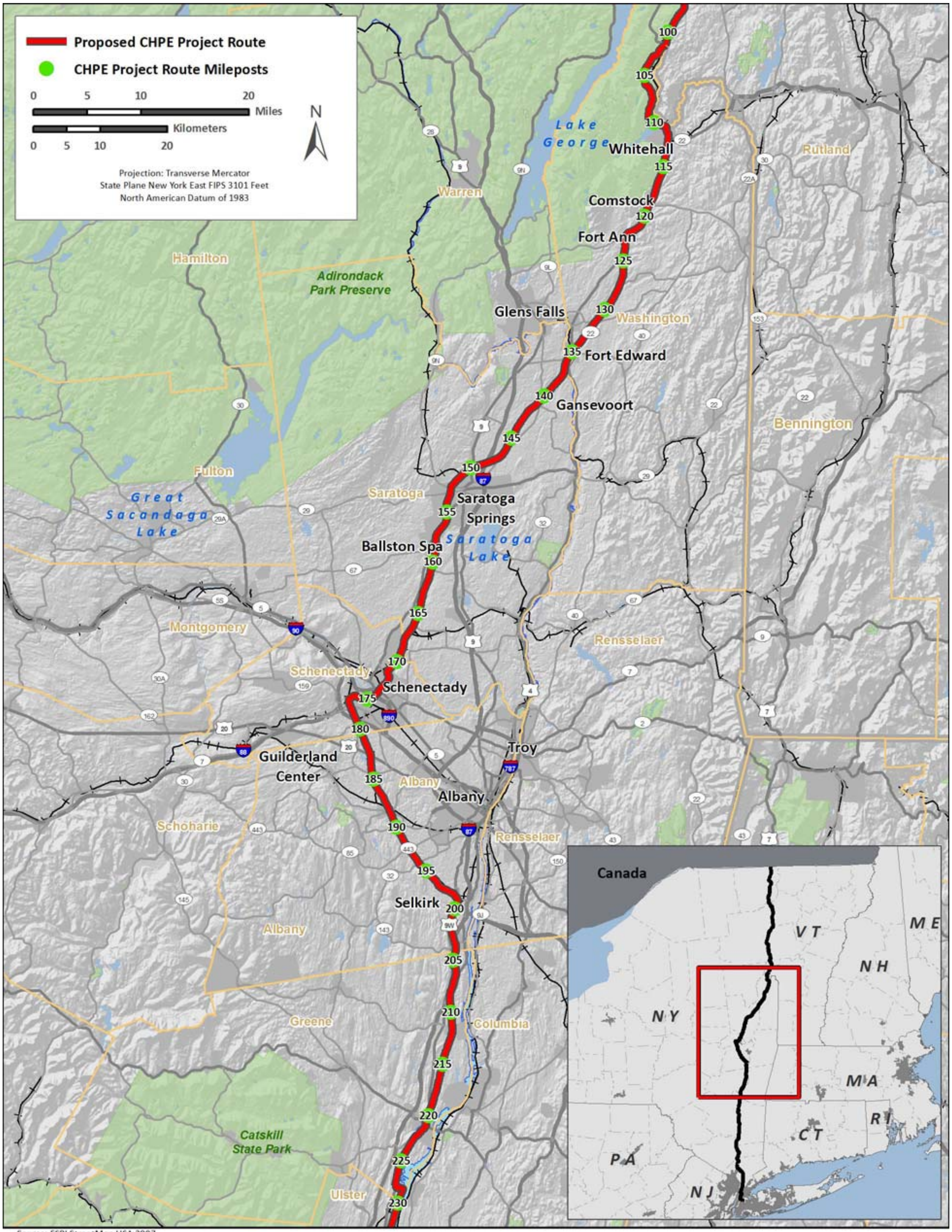


Figure 2-2. Overland Segment

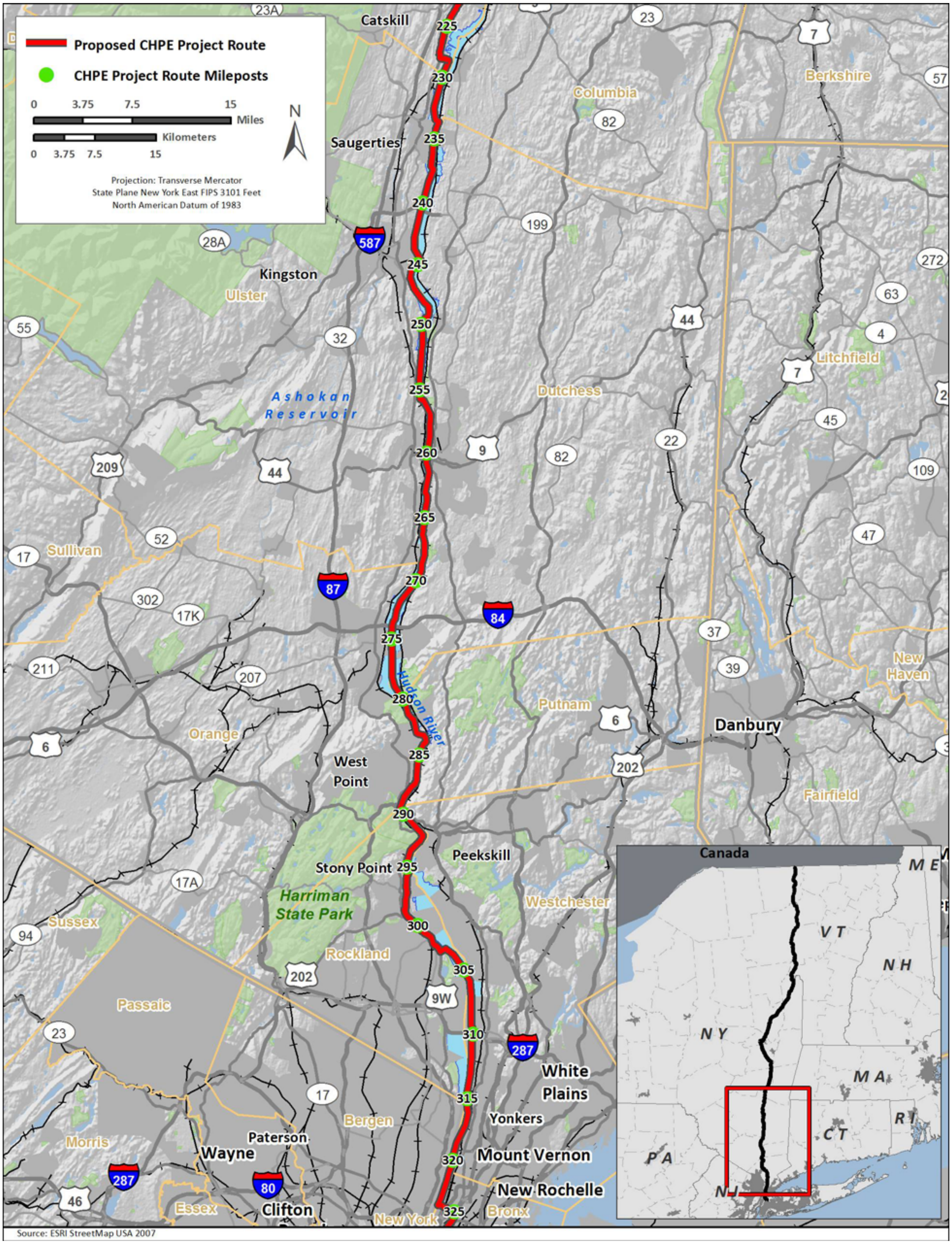


Figure 2-3. Hudson River Segment

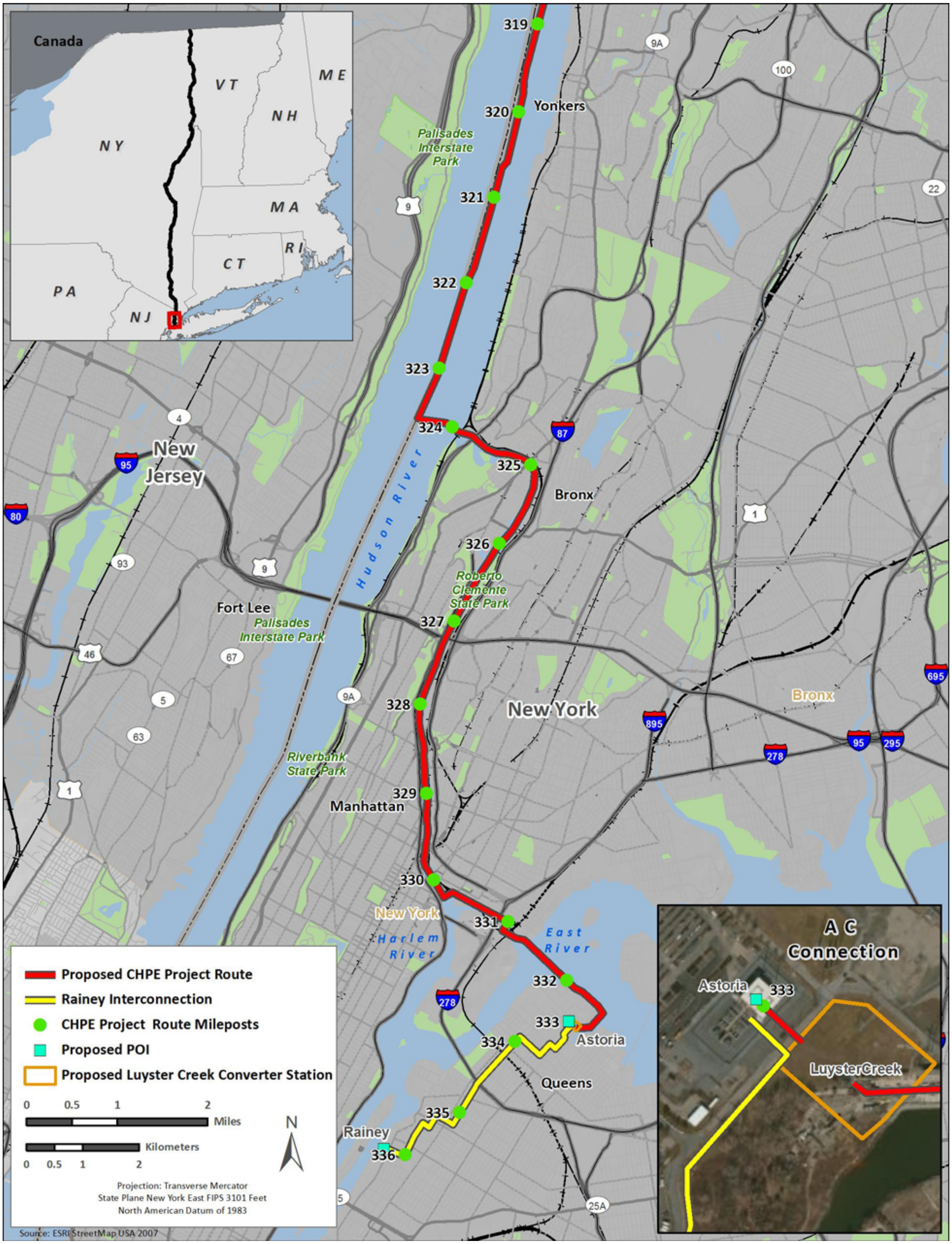


Figure 2-4. New York City Metropolitan Area Segment

The transmission line would be buried within the CSX ROW for approximately 1 mile (1.6 km), crossing beneath the Robert F. Kennedy Bridge and the Hell Gate railroad bridge. The transmission line would then cross under the East River at MP 331 using HDD and proceed to the southeast to land at the site of the ConEd Charles Poletti Power Plant complex in Astoria, Queens, New York, at MP 332. Once onshore, the HVDC transmission cables would wrap around the eastern portion of the power plant complex for approximately 1 mile (1.6 km) and would terminate in a proposed HVDC converter station occupying an approximately 4.5-acre (1.8-hectare) site along Luyster Creek (also referred to as Steinway Creek) on land adjacent to the Astoria Annex 345-kV electrical substation. The Luyster Creek HVDC Converter Station would convert the DC electrical power to AC, and underground double-circuit 345-kV AC cables would connect the converter station with the adjacent Annex substation, which was recently constructed by NYPA.

The Applicant has agreed to construct the facilities necessary to allow at least 1,550 MW of electric energy to be delivered from the Astoria Annex Substation into ConEd's 345-kV system unless prevented by a transmission system outage, maintenance outage, or if the New York State Bulk Power System (NYSBPS), the power system within the New York Control Area (NYSRC 2007), is in an "emergency" or "emergency state" that prevents the delivery of 1,550 MW of energy out of the Astoria Annex Substation. To achieve this result, the Applicant proposes to construct an approximately 3-mile (5-km) buried 345-kV HVAC cable circuit from the Astoria Annex Substation to ConEd's 345-kV Rainey Substation. The Applicant has also agreed to construct a new ring bus (a substation switching arrangement that might consist of four or more circuit breakers connected in a closed loop) at the converter station to facilitate the interconnection into the Astoria Annex Substation and the extension to the Rainey Substation.

Table 2-1 provides a breakdown of the cable sections associated with the proposed CHPE Project route, including the segment, corridor type (aquatic or terrestrial), reference MPs, and length. Approximately 58 percent of the route's length is aquatic, while 42 percent is terrestrial.

2.4.2 Aquatic Direct Current Transmission Cable

The transmission cables proposed for installation in the Lake Champlain, Hudson River, and New York City Metropolitan Area segments would be cross-linked polyethylene (XLPE) HVDC cables rated at 300 to 320 kV (depending upon the manufacturer). 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. In general, aquatic transmission cables include a polyethylene sheath extruded over a lead-alloy sheath to provide superior mechanical and corrosion protection (see **Figure 2-5**). An armored layer of galvanized steel wires embedded in bitumen provides additional protection for the aquatic transmission cables. The outer layer of the aquatic transmission cable would consist of an asphaltic compound with polypropylene reinforcement. The diameter of each aquatic cable would be approximately 4.9 inches (12.4 centimeters [cm]) and the cable would weigh approximately 29 pounds per foot (lb/ft) (43 kilograms/meter [kg/m]) (TDI 2010).

Aquatic transmission cables are generally sited to maximize the system's operational reliability while minimizing the costs and potential environmental impacts caused during construction, operation, and maintenance. Underwater cable installation activities would be limited to certain times of the year to avoid life-cycle or migratory impacts on aquatic species in the project area in accordance with conditional concurrence of the proposed CHPE Project with the New York State CMP issued by NYSDOS (see **Section 2.3.2** and **Appendix F.1**). In addition, the aquatic transmission cables would be sited to avoid areas that could cause damage to the system or impede future maintenance activities. For the proposed

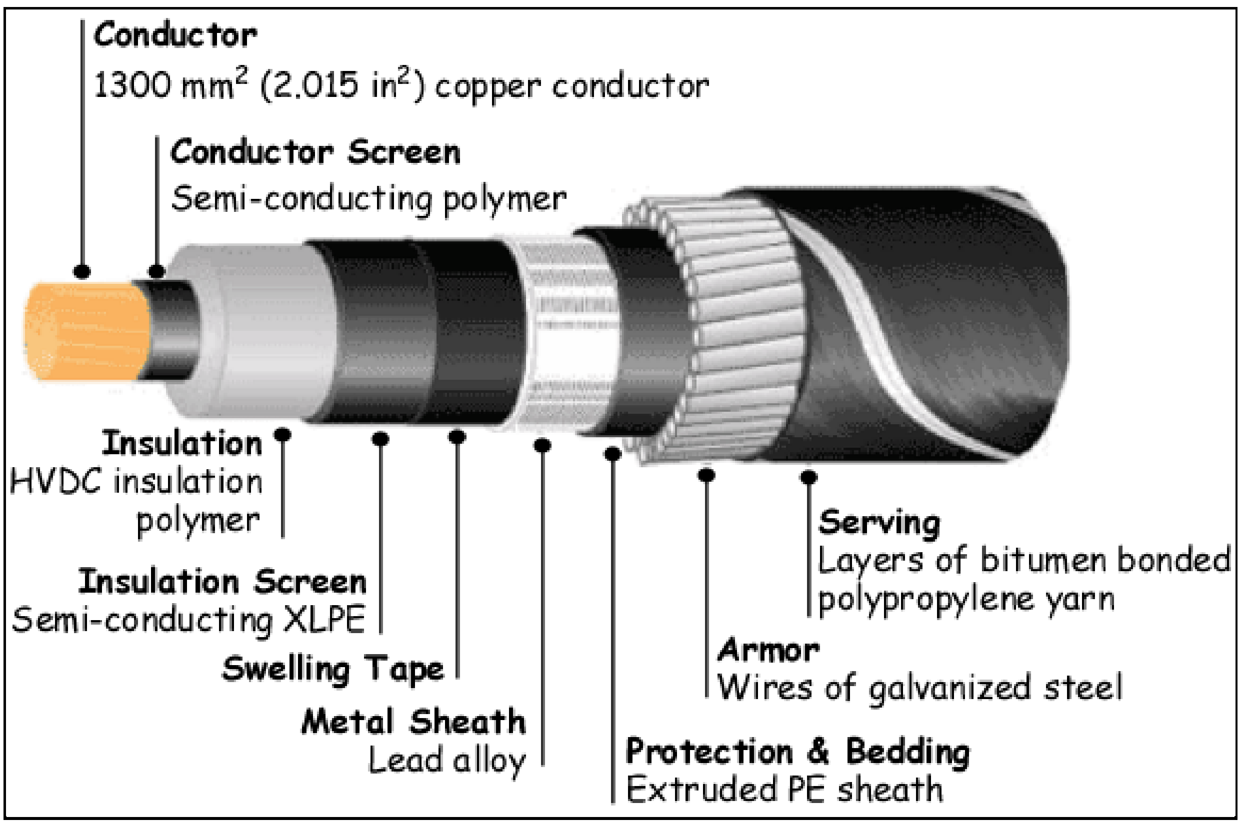
Table 2-1. Summary of the Proposed CHPE Project Transmission Line Route

Cable Section	Segment	Corridor Type	Milepost Start*	Milepost End*	Construction Corridor Width (feet)	Length (miles)*
U.S./Canada Border to Dresden, NY, in Lake Champlain	Lake Champlain	Aquatic	0	101	50	101
Dresden to Whitehall, NY (along NY State Route 22)	Overland	Terrestrial	101	112	25	11
CP Railroad ROW from Whitehall to Schenectady, NY	Overland	Terrestrial	112	173	33	61
City Streets in Schenectady, NY	Overland	Terrestrial	173	174	25	1
CP Railroad ROW from Schenectady to Rotterdam, NY	Overland	Terrestrial	174	177	33	3
CSX Railroad ROW from Schenectady to Catskill, NY	Overland	Terrestrial	177	227	48	50
Alpha Road from CSX Railroad ROW to Hudson River in Catskill	Overland	Terrestrial	227	228	25	1
Hudson River from Catskill to Haverstraw Bay (Stony Point, NY)	Hudson River	Aquatic	228	295	50	67
CSX Railroad and U.S. Route 9W ROW around Haverstraw Bay	Hudson River	Terrestrial	295	303	48	8
Hudson River from Haverstraw Bay to Spuyten Duyvil and Harlem River	Hudson River	Aquatic	303	324	50	21
Harlem River to Bronx	New York City Metropolitan Area	Aquatic	324	330	50	6
Railroad ROW in Bronx to East River	New York City Metropolitan Area	Terrestrial	330	331	33	1

Cable Section	Segment	Corridor Type	Milepost Start*	Milepost End*	Construction Corridor Width (feet)	Length (miles)*
East River to Astoria	New York City Metropolitan Area	Aquatic	331	332	50	1
Luyster Creek Converter Station/Astoria Annex Substation	New York City Metropolitan Area	Terrestrial	332	333	50	1
HVAC Line from Astoria Annex Substation to Rainey Substation along City Streets in Queens, NY	New York City Metropolitan Area	Terrestrial	333	336	10	3
Total Aquatic Length						**196**
Total Terrestrial Length						**140**
Total Length						**336**

Source: CHPEI 2012b

Note: *Mileposts and distances are based on the route maps as shown in Appendix B of the Joint Proposal.



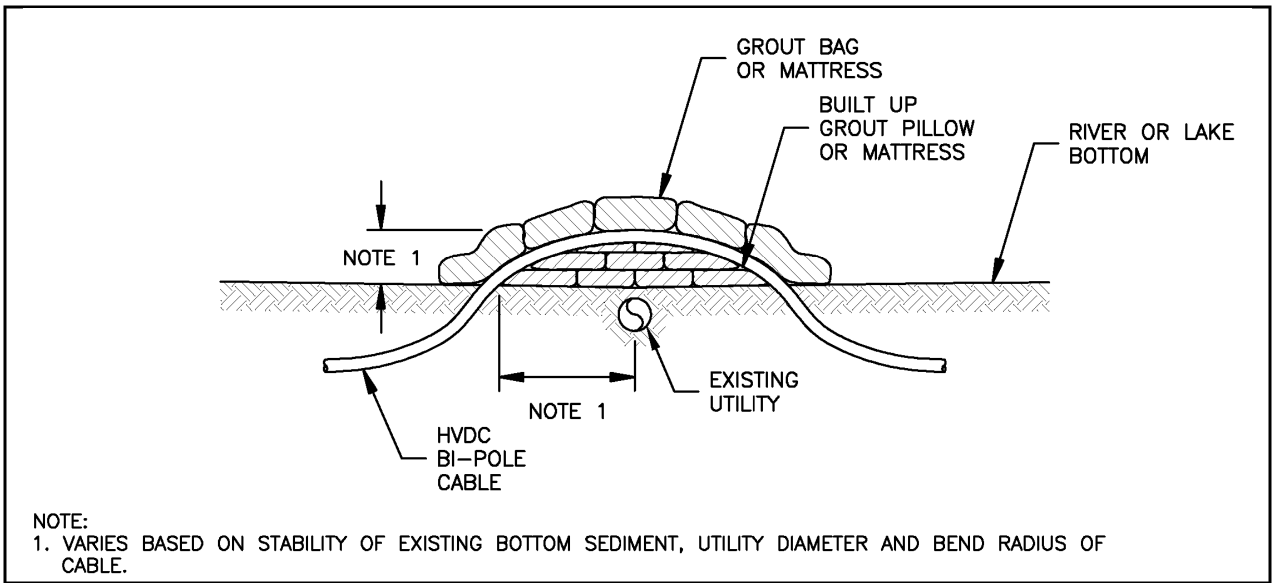
Source: Cross-Sound Cable Company 2012

Figure 2-5. Example Aquatic HVDC Transmission Cable Cross-Section

CHPE Project route, the transmission cables would primarily follow existing waterways from the U.S./Canada border, south to the New York City metropolitan area. To the extent practicable, the transmission cables would be buried beneath the beds of these waterways at a depth of at least 4 to 8 feet (1.2 to 2.4 meters) to prevent disturbance to the cables from unrelated marine operations in the waterways. The depth of burial that can be achieved would depend on available marine construction equipment, soil types and depth to bedrock, existing utilities, and the types of marine activities occurring and their potential threat to cable integrity (TDI 2010).

In general, the burial depths below the sediment-water interface would be 4 feet (1.2 meters) within Lake Champlain, 7 feet (2.1 meters) in the Hudson River, and 8 feet (2.4 meters) in the Harlem River. Transmission cables would be installed along the entire East River route using HDD; therefore, burial depths would not apply.

However, burial depths might vary in response to site-specific factors identified within Lake Champlain and the Hudson and Harlem rivers. These factors could include the presence of existing infrastructure and federally maintained navigation channels, the potential for anchor damage, the identification of archaeological or historic resources, localized geological or topographical obstacles, or other environmental concerns (TDI 2010). For example, in areas where there are soft-bottom conditions, the transmission cables could be buried at a greater depth to provide additional protection against damage. Where the transmission cables cross bedrock or an existing utility such as a pipeline or another cable, they would be laid over the existing utility and protective coverings such as grout pillows or articulated concrete mattresses (i.e., mats) would be installed over the cable crossing (CHPEI 2012f) (see **Figure 2-6**). Physical surveys, including diver surveys of each utility, would be performed prior to cable installation in an attempt to reduce the requirement for concrete mats.



Source: CHPEI 2012d

Figure 2-6. Representative Schematic of Protective Measures for Aquatic Transmission Cables

Articulated concrete mats (see **Figure 2-7**) are typically made of small pre-formed 9- to 12-inch (22.7- to 30-cm)-thick concrete blocks that are interconnected by cables or synthetic ropes in a two-dimensional grid. The concrete mats used for the proposed CHPE Project would be 40 feet (12 meters) long, 8 feet (2.4 meters) wide, and 9 inches (23 cm) deep. An average of three concrete mats would be placed lengthwise end-to-end at each location. Specifically, concrete mats would be installed as protective

Source: IMCA 2011

Figure 2-7. Typical Articulated Concrete Mats

covering over the transmission cables for 0.6 miles (1.0 km) in the Lake Champlain Segment, 1.8 miles (2.9 km) in the Hudson River Segment, and 0.6 miles (1.0 km) in the New York City Metropolitan Area Segment, representing 1.5 percent of the length of the aquatic portion of the entire transmission line route. Coordination with utility owners would occur and standard utility crossing procedures would be employed to prevent damage to pre-existing utilities. Where bedrock is near the surface, protective coverings such as concrete mats would be installed to protect the cables. If necessary, blasting could be used to create a trench in which to bury the cables.

Installation of the transmission line in the Harlem River would require blasting to excavate approximately 460 feet (140 meters) of bedrock from a former rock peninsula at MP 324.5. The minimum burial depth for rock in the Harlem River, which contains a federally maintained navigation channel, is 6 feet below the rock surface (USACE 2013). Geological maps indicate this rock is Fordham Gneiss with unconfined compressive strength that is too hard to remove by cutterhead, ripping, hoe-ramming, or non-explosive methods. Additional information on blasting in the Harlem River is in **Section 2.4.10.1**.

As shown in **Table 2-1**, the transmission line would consist of aquatic HVDC cables from the U.S./Canada border (MP 0) to Dresden, New York (MP 101); from Catskill, New York (MP 228) to Stony Point, New York (MP 295); from Clarkstown, New York (MP 303) to the Bronx, New York (MP 330); and from the Bronx (MP 331) to Queens, New York (MP 332).

2.4.3 Horizontal Directional Drilling

HDD would be used to install the transmission cables in transition areas between aquatic and terrestrial portions of the proposed CHPE Project route, in sensitive areas and under the East River. Sensitive areas include wetlands and streams where deemed necessary, wild blue lupine (*Lupinus perrenis*) habitat, and existing infrastructure along the terrestrial portions of the proposed CHPE Project route; and where necessary to avoid obstacles along the route, such as road or railroad crossings where trenching is not possible. The equipment used and scale of the HDD operation would vary depending on the length and depth of the installation. The largest, most complex HDD operation would occur at the five water-to-land transitions that are planned. This larger-scale HDD technology would be used at the transitions at MPs 101, 228, 295, 303, and 330. This process is described below.

For each proposed HDD location, two separate drill holes would be required, one for each cable. Each cable would be installed within a 10-inch (64-cm)-diameter, or larger, high-density polyethylene (HDPE) tube-shaped duct, or conduit. To maintain appropriate separation between the two cables, a minimum of 6 feet (1.8 meters) would be required between each drill path.

During installation, a drill rig would be placed onshore behind a temporary fluid return pit and a 40-foot (12-meter) drill pipe with a cutting head would be set in place to begin the drilling process. As the initial pilot borehole is drilled, a slurry composed of water and bentonite (i.e., a shrink-swell clay) would then be pumped into the hole to transport the drill cuttings to the surface, to aid in keeping the borehole stable, and to lubricate the drill.

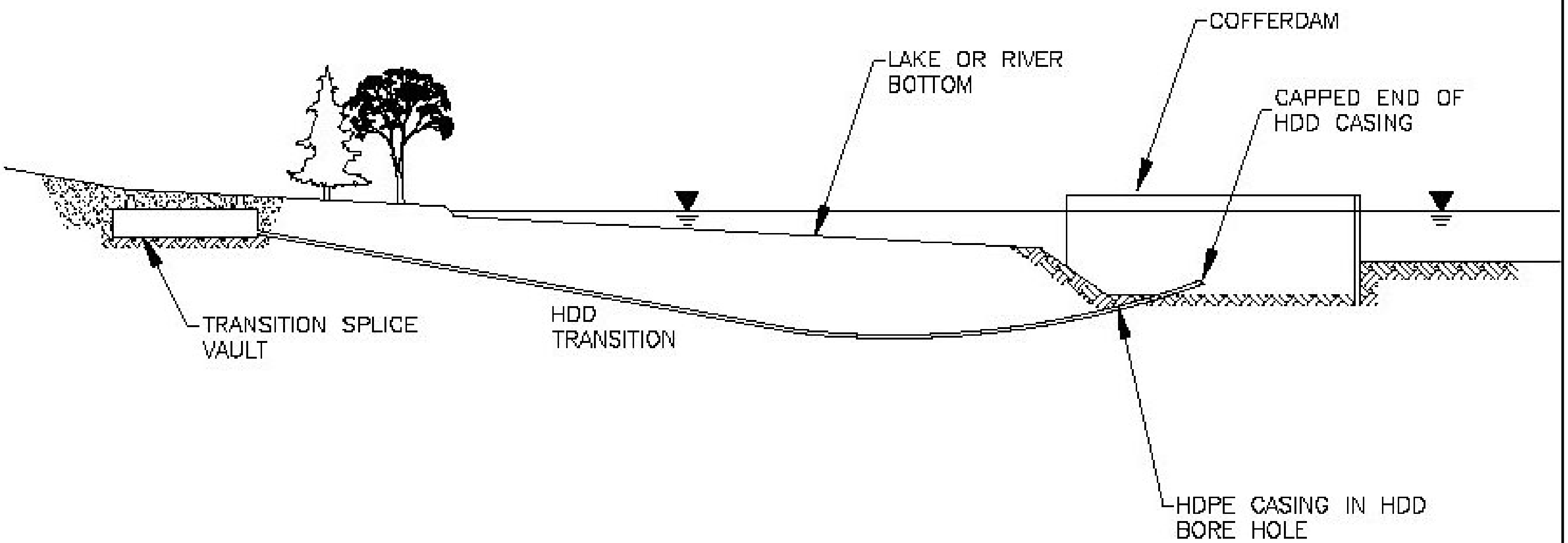
After each 40-foot (12-meter) segment of pipe is installed, an additional length of drill pipe would be added until the final drill length has been achieved (see **Figure 2-8**). As necessary, the borehole would be widened by repeated passes of a widening tool called a reamer. When the desired borehole diameter and drill length have been achieved, a pulling head would be attached to the end of the drill pipe and the drill pipe would then be used to pull back an HDPE conduit pipe into the borehole from the exit end. Separate conduits would be installed for each of the bipole cables. After the HDPE conduits are in place, the transmission cables would be pulled through these pipes and into a transition splice vault, which would remain in place to protect the transmission cable.

At each water-to-land transition, a transition, or splice, vault would be constructed on shore below grade to facilitate the splicing of aquatic transmission cables to terrestrial transmission cables. Transition vaults are segmental precast reinforced concrete assemblies typically measuring 35 feet (10.7 meters) long by 9 feet (2.7 meters) wide and 8 feet (2.4 meters) high. The transition vault would house the transition joints (from aquatic to terrestrial cables) and the aquatic transmission cable anchoring system. After splicing is completed, the transition vaults would be filled with sand or flowable fill and covered with concrete slabs. The locations of transition vaults would be clearly identified to ensure public safety.

The HDD operation would include an HDD drilling rig system, a drilling fluid collection and recirculation system, temporary cofferdam installed at the water exit to maintain exit pit stability following dredging of the pit, and associated support equipment. Excavated soils would be temporarily stored on site during construction, and would be used to restore the site to its previous grade once the drilling process has been completed, or removed and disposed of at an approved location. The Applicant estimates that approximately 100 cubic yards (76 cubic meters) of drill cuttings (used bentonite and excess soil) would be generated for disposal at each of the seven major HDD installations. **Figure 2-9** shows an example of an HDD drill rig operation staging area for landfall locations. HDD staging areas in entirely terrestrial locations (i.e., roadway crossings) would be smaller in size and less complex due to smaller equipment requirements.

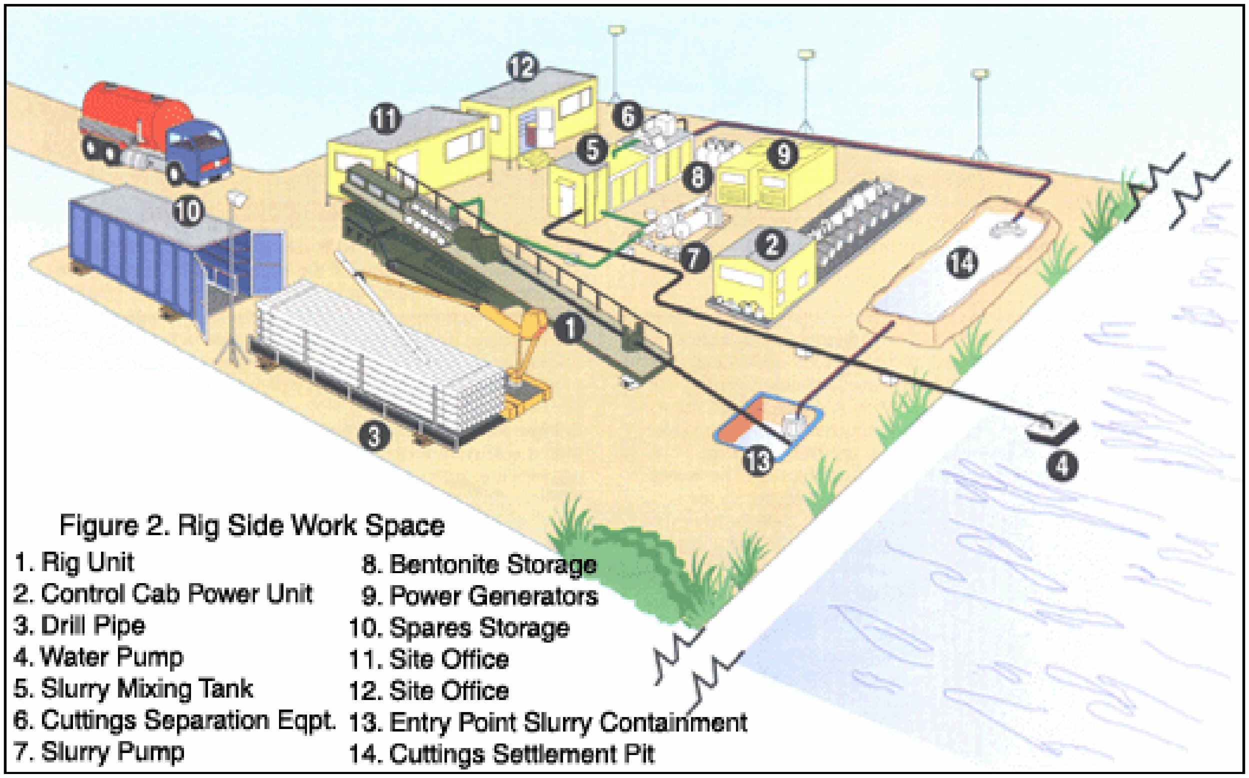
NOTES:

1. COFFERDAM TO BE UTILIZED WHERE NECESSARY TO STABILIZE BOTTOM SEDIMENT AT HDD TERMINUS OTHER ALTERNATIVES PROVIDING EQUIVALENT ENVIRONMENTAL PROTECTION MAY BE EMPLOYED WHERE BOTTOM CONDITIONS DO NOT PERMIT DRIVEN PILES.
2. PILES SHALL BE REMOVED OR CUT BELOW THE MUD LINE. AT COMPLETION OF CABLE INSTALLATION IN COORDINATION WITH THE BMP REQUIREMENTS.
3. COFFERDAM WILL EXTEND ABOVE THE WATERLINE IN SHALLOW WATER. EXPOSED STRUCTURE WILL BE MARKED BY BUOYS AND OTHER NAVIGATION AIDS. A NOTICE TO MARINERS WILL BE ISSUED WHEN APPROPRIATE.
4. COFFERDAMS IN DEEP WATER NOT BE EXTENDED TO THE WATER SURFACE. EACH INSTALLATION WILL BE MARKED BY BUOYS AND OTHER NAVIGATION AIDS. A NOTICE TO MARINERS WILL BE ISSUED WHERE APPROPRIATE.



Source: CHPEI 2012a

Figure 2-8. Example HDD Techniques



Source: Laney Drilling 2012

Figure 2-9. Typical HDD Landfall Drill Rig Operation

For drilling operations extending from land into the water and water onto land, the directional drill would be expected to exit the ground in water at a depth sufficient to avoid potential impacts on or littoral zone or intertidal habitat. A temporary cofferdam would be constructed at the offshore exit hole location. The purpose of the cofferdam would be to reduce turbidity associated with the dredging and HDD operations and to help maintain the exit pit. A cofferdam would be approximately 16 feet (5 meters) by 30 feet (9 meters) or 480 square feet (44 square meters) with a dredged entry/exit pit typically 6 to 8 feet (1.8 to 2.4 meters) deep and would be constructed using steel sheet piles installed with a vibratory hammer.

Sheet pile used to construct cofferdams would be installed in pairs with 8 to 10 pairs of sheets installed per day. Each pair of sheets would provide a wall 4 feet (1.3 meters) wide and approximately 50 feet (15 meters) tall. A single pair of sheets can be installed in 30 to 120 minutes depending on the geotechnical conditions. After the vibratory penetration, each sheet would be "seated" into hard strata as required. Approximately 4 to 6 strikes per pair of sheets would be required to "seat" the pile wall. The Applicant has committed to using soft starts for vibratory installation. Each cofferdam would be constructed within 25 to 30 days. The cofferdam would be rectangular in shape and open at the end facing away from shore to allow for pull back of the conduits and the cables. The depth of the cofferdam would be determined based on existing conditions. The area inside the cofferdam would be excavated to create an exit pit at the waterward end of the borehole. The cofferdam would extend 6 feet (1.8 meters) below the mudline.

Dredging activities associated with the proposed CHPE Project would only be for cofferdam installation. Dredging and cofferdam installation would occur during the construction windows established for the proposed CHPE Project (see **Table 2-2**). Depending on the sediment composition, approximately 107 cubic yards (82 cubic meters) of sediment would be excavated from within a cofferdam. Material

Table 2-2. Underwater Construction Windows

CHPE Project Milepost (MP)	Location	Construction Window	Construction Method
Lake Champlain			
0 to 73	U.S./Canada Border to Crown Point	May 1 to August 31	Jet Plow
73 to 101	Crown Point to Dresden	September 1 to December 31	Shear Plow
Hudson River			
228 to 269	Cementon (Catskill) to New Hamburg	August 1 to October 15 [a]	Jet Plow
269 to 295	New Hamburg to Stony Point	September 15 to November 30	Jet Plow
303 to 324	Clarkstown to Harlem River	July 1 to October 31	Jet Plow
Harlem and East Rivers			
324 to 330	Harlem River	May 31 to November 30 [b]	Jet Plow
331 to 332	East River	May 15 to November 30	HDD

Source: NYSPSC 2013, CHPEI 2014

Notes:

a. The transmission line would be installed between MPs 245 and 269 between September 14 and November 30 to avoid impacts on the Kingston-Poughkeepsie Deepwater SCFWH.

b. Blasting would take place between July 1 and November 30.

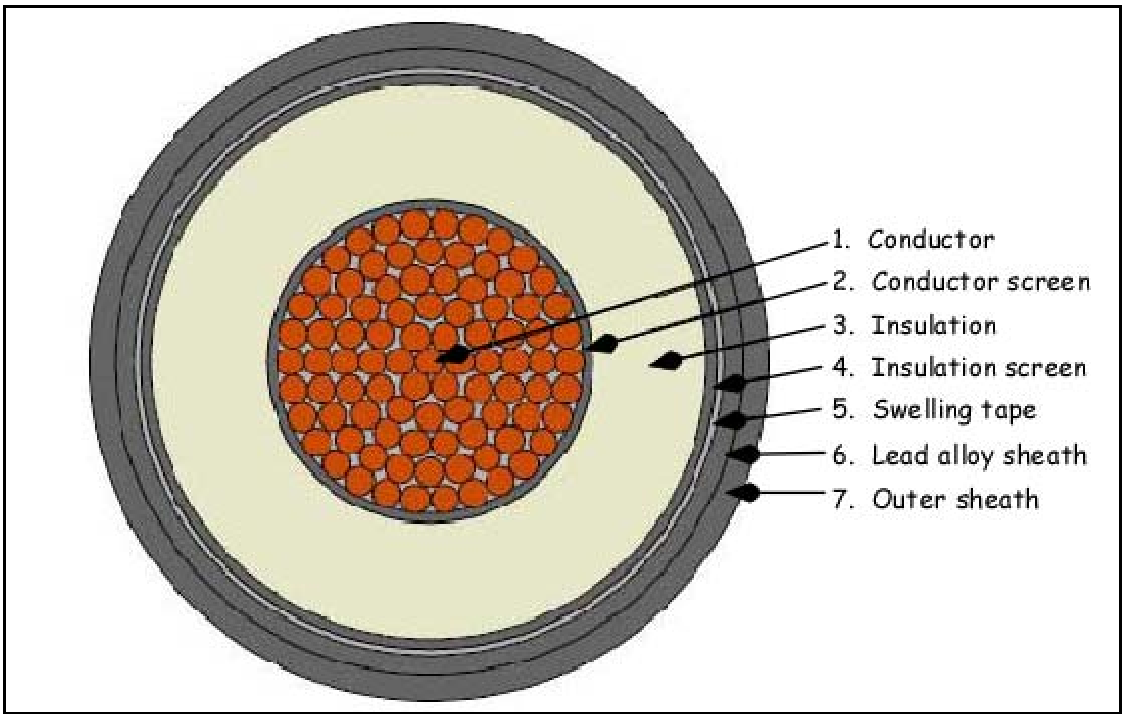
would be dredged using a closed clamshell dredge (also known as an environmental bucket) and removed by barge to an appropriately permitted processing facility. Dredging would be conducted during 8- to 12-hour shifts daily. The dredged material would be placed temporarily on a spud barge (barge with self-leveling anchor legs that are supported by the riverbed) or dredge scow for storage and ultimate disposal at an appropriately permitted facility. The barge would be anchored by two 3-foot (0.9-meter) diameter spuds. Silt curtains would be used as required around the work area; however, it is not anticipated that any silt would escape from within the cofferdam. At the end of cable installation, the cofferdam would be cut at the mudline using divers and underwater cutting or burning equipment such as exothermic rods, the exit pit would be backfilled with clean sand using equipment mounted on a spud barge, and the HDD staging area would be restored and revegetated as appropriate to preconstruction grades and conditions to the extent practicable.

A visual and operational monitoring program would be developed as part of the EM&CP and conducted during HDD operations to detect any losses of drilling fluid. The monitoring program would consist of visual observations in the surface water at the targeted drill exit point and monitoring of the drilling fluid volume and pressure within the borehole. Visual observations of drilling fluid in the water, or excessive loss of volume or pressure in the borehole would trigger response actions by the HDD operator, including halting drilling activities and initiating cleanup of released bentonite. A barge with a pumping system would be positioned at the cofferdam during drilling to collect any drilling fluid released into the cofferdam enclosure. Any collected drilling fluids would be disposed of at a permitted facility. In addition to water-to-land transitions, HDD could also be used to install the transmission cables beneath other environmentally sensitive areas such as wetlands and streams where deemed necessary; existing infrastructure along the terrestrial portions of the proposed CHPE Project route; and in special circumstances to avoid obstacles along the CHPE Project route, such as road or railroad crossings where open trenching would not be possible (TDI 2010). Additionally, HDD would be used to install the transmission line entirely under the East River from the Bronx to Queens. Therefore, the proposed CHPE

Project route includes approximately 200 locations covering approximately 17 total miles (27 km) where HDD would be used, including approximately 0.8 miles (1.3 km) of the transmission line that would traverse under wetlands using HDD (see **Appendix A** for locations of HDD applications). It is expected that at least three different sized HDD rigs would be employed on the project, requiring varying staging area sizes depending on the length of the drill at the particular location, proximity to sensitive areas such as wetlands where deemed necessary, access limits, and other constraints.

2.4.4 Terrestrial Direct Current Transmission Cable

Approximately 42 percent of the proposed CHPE Project route would be composed of underground (terrestrial) portions. In general, the buried transmission line would be routed underground beginning at MP 101.3 to MP 228.4 to cross the divide between Lake Champlain and the Hudson River watersheds, and to bypass PCB dredging activities along the Upper Hudson River. For the underground transmission cables, the outer sheathing insulation would be composed of an ultraviolet-stabilized, extruded polyethylene layer (see **Figure 2-10**). The underground transmission cables would have an outside diameter of 4.5 inches (11.4 cm), and each cable would weigh approximately 20 lb/ft (30 kg/m) (TDI 2010).



Source: CHPEI 2012c

Figure 2-10. Example Terrestrial HVDC Transmission Cable Cross-Section

The underground portion of the proposed CHPE Project route would start at Dresden, New York. For the underground portions of the transmission line route, the two cables within the bipole system would typically be laid side-by-side (approximately 12 to 15 inches [30 to 38 cm] apart) in a trench approximately 4 to 5 feet (1.2 to 1.5 meters) deep to provide for at least 3 feet (0.9 meters) of cover over the cables. Subsequent to laying the cables 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 low thermal resistive backfill material. A marker tape would then be placed 1 to 2 feet (0.3 to 0.6 meters) above the cables.

Beginning at Dresden, the transmission line would be installed for approximately 127 miles (204 km) along existing road ROWs and existing CP and CSX railroad ROWs. A combination of HDD and trenching techniques would be used to install the transmission line underground along this portion of the route. Construction layout and staging and work areas for cable installation within road and railroad ROWs would be confined to the state road ROW or the railroad ROW. A typical staging area for construction equipment in a roadway ROW would be approximately 24 to 38 feet (7 to 12 meters) wide along one side of the roadway. A typical staging area for construction equipment in a railroad ROW would be approximately 33 feet (10 meters) wide along one side of the railroad track for the CP ROW and 48 feet (15 meters) wide along one side of the track for the CSX ROW (TDI 2010). Trenchless technologies would be used where roadways and railroad beds would be crossed by the transmission line. Trenchless technologies could include HDD, horizontal boring, or pipe jacking (driving a casing underground using pneumatic blows).

Where a trenchless technology is used for road or railroad crossings, a temporary starting pit would be excavated on either side of the road or railroad bed to allow for the installation of a carrier pipe or casing. Horizontal boring is similar to HDD as described in the previous paragraphs, but uses an auger-type drill head (i.e., a rotating screw-shaped 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. The specific technology used at each crossing location would be selected based on the distance to be crossed, the type of soil present, and the space available for staging the operation.

Any excavated soils would be temporarily stockpiled adjacent to the worksite or transported off site if onsite storage is not possible. Where soil is stockpiled on site, it would be stabilized with erosion and sedimentation controls. Following completion of the transmission cable installation, the excavated area would be backfilled and regraded, as necessary. The Applicant proposes that once construction is complete, all debris and equipment would be removed from the site and recycled to the maximum extent feasible and the remainder disposed of at an approved facility, and the disturbed area would be returned to its previous condition as much as possible (CHPEI 2012q).

The proposed CHPE Project would be in the existing ROWs of both the CP and CSX railroads from MPs 112 to 228 and MPs 295 to 301. The Applicant has stated that drafts of Occupancy Agreements for easements along the railroad corridor have been exchanged with both CP and CSX and are currently under negotiation. The final agreements would establish the terms of occupancy of the ROWs and refine required offsets of the transmission cables from the track centerline. In a number of instances, the transmission line would deviate from established ROWs (i.e., railroads or roads) to accommodate features such as bridges, roadway crossings, and areas where the existing ROW is too narrow to permit cable installation while meeting the established clearance criteria (CHPEI 2012b). The locations where these minor route alterations would occur are referred to as deviation areas.

2.4.5 Cooling Stations

As described in **Section 2.4.3**, many portions of the transmission cable would be installed using HDD methods. In certain situations where there is a long segment of cable installed by HDD, heat can accumulate in the HDPE conduit, which would reduce the performance of the transmission system. The Applicant has identified 16 sections of underground cabling where the potential for heat accumulation could require that cooling facilities be installed. The cooling stations would be modular in design and installed on a concrete pad, with electrical power provided by a local electrical utility. Sixteen cooling equipment stations might be constructed along the transmission line route and are proposed to be located at approximate MPs 110, 112, 145, 146, 158, 185, 208, 227, 228, 296, two at 298, 299, two at 302, and 331. These cooling stations would consist of an aboveground building measuring approximately 8 feet

(2.4 meters) by 8 feet (2.4 meters) by 16 feet (4.8 meters) (see **Figure 2-11**). Each cooling station would consist of a chiller unit and pumping system within the building and this equipment would circulate chilled water through tubing in a closed-loop system alongside the HVDC cable to cool the cables (see **Figure 2-12**).

The heat emitted from the cables within the buried conduit would then be transferred by the coolant back to the cooling station and then to the outside atmosphere above ground. The Applicant has estimated that approximately 245 gallons (927 liters) of cooling water would typically be required to fill the system to cool an HDD segment of 3,000 feet (915 meters) in length. The final design and cooling capacity of the equipment depends on the length of the HDD segment, burial depth, cable losses, and the specified ambient conditions. It is anticipated that the cooling systems would be operated primarily during peak load conditions (CHPEI 2012b).

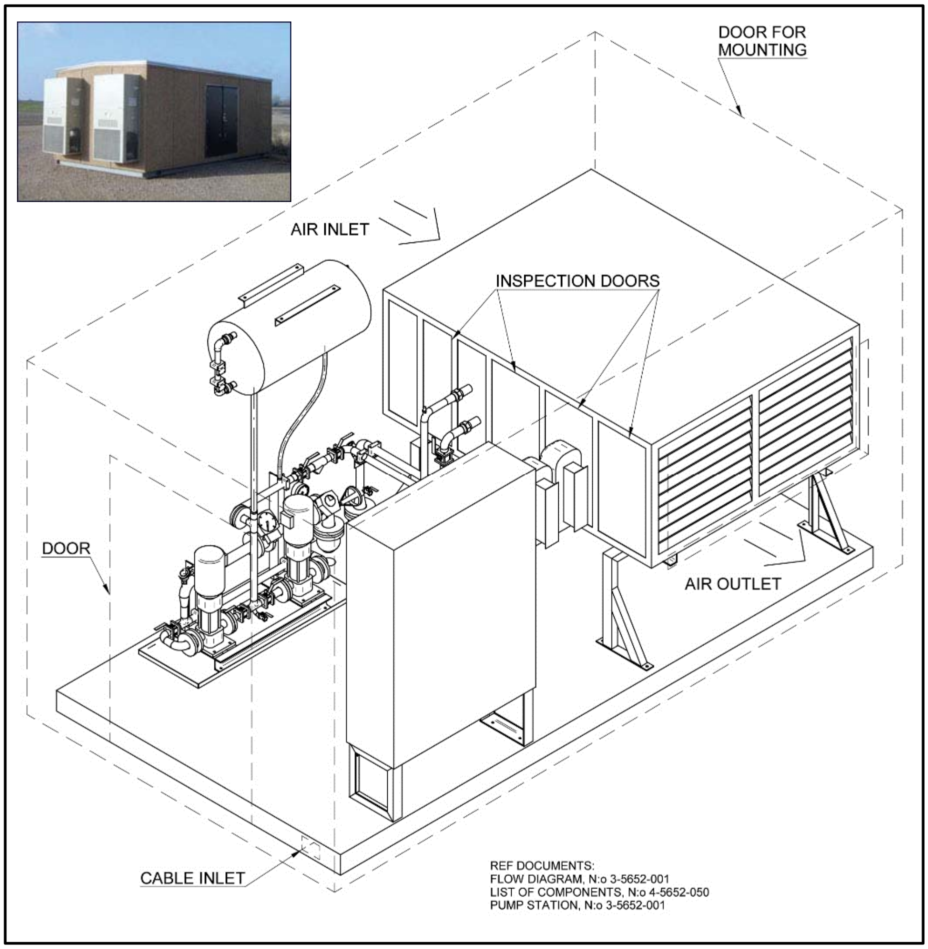
2.4.6 Luyster Creek HVDC Converter Station

The HVDC transmission cables would terminate approximately 333 miles (536 km) south of the U.S./Canada border at a proposed HVDC converter station near Luyster Creek in Astoria, New York. The Luyster Creek HVDC Converter Station would convert the electrical power from DC to AC. An underground HVAC line would connect to the adjacent Astoria Annex Substation and then run approximately 3 miles (5 km) to ConEd's Rainey Substation in Queens as described in **Section 2.4.8**.

The HVDC converter station would be a "compact type" with a total site footprint (i.e., building and associated areas and equipment) of approximately 4.5 acres (1.8 hectares) (see **Figure 2-13**). The main building would be approximately 165 feet by 325 feet (50 meters by 99 meters) with a building footprint of 1.2 acres (0.5 hectares) and a height of approximately 70 feet (21 meters). The building would contain 10 bays to provide access for annual maintenance, and truck access for maintenance would be on the eastern side of the building. The Luyster Creek Converter Station would be designed to blend into the local environment and surroundings. The indoor design of the HVDC converter station would limit the need for exterior switchyards and would reduce audible sound and the risk of flashover (i.e., unintended and undesired electrical discharge or arc). It is anticipated that transformers, cooling equipment, and power line carrier filters would be the major equipment installed outside of the building. The converter station would be powered by electricity taken directly from the proposed CHPE Project transmission line. In the unlikely event this is not possible, electric power from a local utility (i.e., ConEd) would be used. A diesel generator may also be used as emergency backup to provide black start capability (i.e., the ability to start operating and delivering electric power without assistance from the electric system in the event of an outage) and providing emergency power for the converter station. The facility would not require onsite personnel during normal operations (CHPEI 2010a).

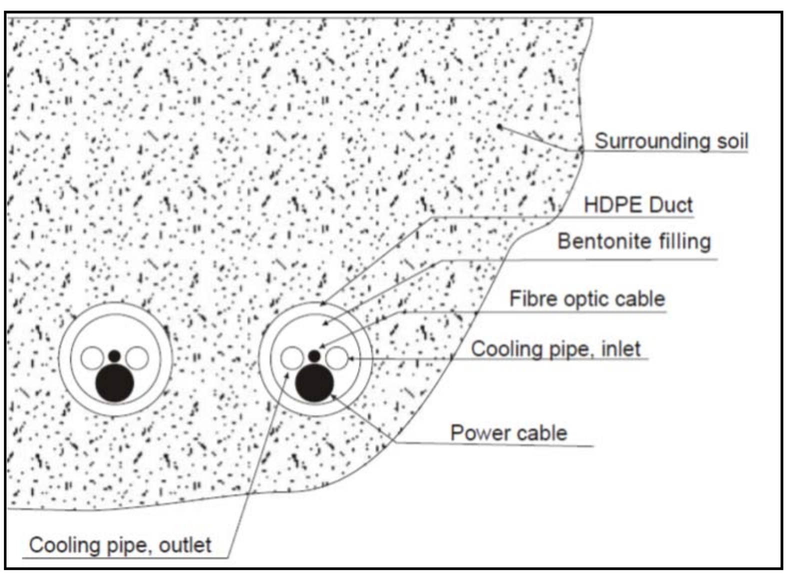
2.4.7 Astoria Annex Substation Interconnection

The Luyster Creek Converter Station would deliver its energy by underground cable to the Astoria 345-kV, SF6 gas-insulated substation that was recently constructed in Astoria by NYPA to support a new 650-MW combined-cycle power plant, the Astoria Energy II Plant (AEII Plant). The Astoria Annex Substation is adjacent to the Charles Poletti Power Plant complex on 20th Avenue, Astoria, Queens County, New York, on part of an approximately 47-acre (19-hectare) parcel owned by NYPA. The entire project area is zoned for heavy industrial use and the NYPA property is part of a 291-acre (117-hectare) parcel formerly shared with ConEd. The property has been used since 1905 for the generation of electricity. The power plant complex includes the 835-MW Poletti Power Project, which began commercial operation in 1977 burning fuel oil or natural gas, and the 650-MW combined-cycle AEII



Source: CHPEI 2012b

Figure 2-11. Representative Schematic of Cooling Unit for Underground Cable



Source: CHPEI 2013a

Figure 2-12. Representative Schematic of Cooling Pipes inside an HDPE Conduit

Source: Virtual Earth Imagery

Figure 2-13. Proposed Luyster Creek Converter Station Site

Plant, which began commercial operations at this location in December 2005. The Poletti Power Project and its associated 345-kV substation have been retired from service and replaced by the AEII Plant and the Astoria Annex Substation.

The 345-kV AC transmission cables would connect into the Astoria Annex Substation owned by NYPA to distribute the electricity from the proposed CHPE Project transmission system into ConEd's electrical grid for the New York City metropolitan area. The Astoria Annex Substation presently interconnects with the ConEd system through two cables that connect to the ConEd East 13th Street substation. In addition, in May 2012, ConEd completed construction of an additional interconnection ("Feeder 34091") between the Astoria Annex Substation and its Astoria East 138-kV Substation, also located on the Charles Poletti Power Plant complex. However, with the installation of this new ConEd line between the Astoria East and Astoria Annex substations and additional requirements discussed as follows, the Astoria Annex Substation currently cannot accommodate the proposed CHPE Project interconnection without an expansion of the facility (CHPEI 2012k).

The Applicant has proposed to modify the electrical configuration of the Astoria Annex Substation by adding a four-breaker gas-insulated switch ring bus to connect both the cable from the Luyster Creek Converter Station and the Astoria-Rainey Cable (see **Section 2.4.8** below) to the one remaining empty bus at the Astoria Annex Substation. This new ring bus could be constructed in a new building approximately 72 feet (22 meters) long, 58 feet (18 meters) wide, and 40 feet (12 meters) high. The new ring bus would have a footprint of 4,176 square feet (388 square meters) and would be located on the same parcel of land as the Luyster Creek Converter Station. The new ring bus could be connected to both the converter station and the Astoria Annex Substation by gas-insulated switch cables in underground pipes (CHPEI 2012j). However, no obstacles have been identified that would prevent the expansion of the existing ring bus at the Astoria Annex Substation to eight breaker positions. Therefore, it is unlikely that it would be necessary to build a new building to house the ring bus.

The Applicant has also agreed to compensate ConEd for upgrading their 138-kV section of Feeder Cable 34091 to ensure that energy deliverability to the ConEd system would be sufficient to permit at least 1,550 MW of electricity to flow from the Astoria Annex Substation into ConEd's transmission system grid. The upgrades would consist of either adding another 138-kV cable circuit between the Astoria Annex and Astoria East substations or replacing the conductors in the substations themselves (CHPEI 2012k).

CHPE Project construction activities at this site would include construction of the Luyster Creek Converter Station and the ring bus, an HDD operation to install the HDPE conduit to bring the cable from the East River onto land, trench approximately 1 mile (1.6 km) to bring the cable across the site to the substation, the physical interconnection from the ring bus into the Astoria Annex Substation, and a portion of the HVAC interconnection between the Astoria Annex and Rainey substations.

2.4.8 Astoria to Rainey Interconnection

The Applicant, in consultation with NYPA and ConEd, has determined that a 345-kV HVAC cable circuit would need to be constructed from the Astoria Annex Substation to ConEd's Rainey Substation in Queens to reliably deliver power into ConEd's 345-kV system. The Applicant has committed to constructing this interconnection, which would consist of HVAC cables buried beneath city streets for approximately 3 miles (5 km). The XLPE HVAC cables would be buried in a trench to a depth of more than 4 feet (1.2 meters) with a separation distance of 9 inches (23 cm) between the cables in the trench. The route of the HVAC cables would run from 31st Street on the Annex Substation to 20th Avenue, then along 20th Avenue to 29th Street, and along 29th Street to 21st Avenue. The cables would then follow 21st Avenue to 23rd Street, running along 23rd Street for approximately 1.3 miles (2.1 km) to 30th Drive, from 30th Drive to 14th Street, and then from 14th Street to 31st Drive, and 31st Drive to 12th Street, and 12th Street to 35th Avenue to the Rainey Substation (see **Figure 2-4**).

2.4.9 Additional Engineering Details

Heat. Ambient water temperatures in the Hudson, Harlem, and East rivers range from 32 degrees Fahrenheit (°F) (0 degrees Celsius [°C]) in January to a maximum of 81 °F (27 °C) in July (Historic Hudson River 2004, Riverkeeper 2013, Blumberg and Pritchard 1997). XLPE transmission cables operate at about 176 to 194 degrees °F (80 to 90 degrees °C) with an emergency operating temperature of about 266 °F (130 °C). The proposed CHPE Project's HVDC cables would be designed to operate at normal temperature of only 158 °F (70 °C). Under limited durations (i.e., maximum of 2 hours) of emergency overload conditions, the temperature would not exceed 176 °F (80 °C). At these temperatures, heat must be carried away from the conductors for them to operate efficiently. The air performs this function for overhead lines, and soils in and around a trench perform this for underground cables. All of the heat generated from buried cables must be dissipated through the soil. Different soils have different abilities to transfer heat; saturated soils conduct heat more easily than, for instance, dry soils. A soil thermal survey, which measures the ability of various soil types to dissipate energy, could be necessary prior to initiating construction activities to determine the soil's ability to transmit heat away from the cables. The selection of backfill type can make a difference on the cable capacity rating. Where required, a low thermal resistive backfill material would be used instead of native soil in the trench around the cables to ensure sufficient standard heat transfer to the surrounding soils and groundwater.

Electric and Magnetic Fields. Operation of the proposed CHPE Project transmission line would produce electric and magnetic fields. Transmission lines, like all electric devices, produce electric and magnetic fields, or EMF. Voltage, the force that drives the current, is the source of the electric field. Current, the flow of electric charge in a wire, produces the magnetic field. The strength of the EMF depends on the design of the electrical line and the distance from it. EMF is found around any electrical wiring, including household wiring, electrical appliances, and equipment.

Electric fields are measured in volts per meter (V/m) or kilovolts per meter (kV/m). Throughout a home, the average electric field strength from wiring and appliances is typically less than 0.01 kV/m. Electric field levels in public buildings such as shops, offices, and malls are comparable with residential levels. Outdoor electric fields in publicly accessible places can vary widely from less than 0.01 kV/m to 12 kV/m. Electric field strength is reduced by shielding or by intervening objects such as structures and vegetation. The proposed CHPE Project transmission line would be shielded within a lead-alloy sheath and buried, which would effectively eliminate any exposure to the electric field (Cross-Sound Cable Company 2012, WHO 2012).

Magnetic fields are measured in units of gauss (G) or milligauss (mG). The average magnetic field strength in most homes (away from electrical appliances and wiring) is typically less than 2 mG. Appliances carrying high current or with high torque motors, such as microwave ovens, vacuum cleaners, or electric shavers, can generate fields of tens or hundreds of mG directly around them. Office workers are exposed to similar fluctuating magnetic fields, while equipment or machine workers or those working for electric utilities are generally exposed to slightly higher level fields. Outdoor magnetic fields in publicly accessible places can range from less than a few mG to 300 mG or more, depending on proximity to power lines and the voltage of the power line.

Like electric fields, magnetic fields fall off with distance from the source. Unlike electric fields, however, intervening objects, such as structures or by being buried, do not reduce magnetic field strength. Consequently, while appliances can produce the highest localized magnetic fields, power lines serving neighborhoods and distribution lines and transformers serving individual homes or businesses are a common source of longer-term magnetic field exposure (BPA 2010).

Electromagnetic Interference. The proposed HVDC technology and transmission cable would be designed to eliminate any potential electromagnetic interference (EMI) that could affect television or radio service along the transmission line corridor (TDI 2010). The Luyster Creek Converter Station would be designed to meet the requirements of local radio, television, and telephone EMI limits. Specifically, the Applicant has stated that any potential radio interference from the HVDC converter station would comply with the limits stated in British Standard EN50121-5 (2000), *Railway Applications—Electromagnetic compatibility—Emission and immunity of fixed power supply installations and apparatus*, in the frequency range of 500 kiloHertz (kHz) – 30 megahertz (MHz). They have also stated that the facility would comply with the limits stated in CISPR 11 (*Industrial, Scientific, and Medical (ISM) Radio-Frequency Equipment—Electromagnetic Disturbance Characteristics—Limits and Methods of Measurement*), Group 1 and Class A, in the frequency range of 30 MHz–1 gigahertz (GHz). The corona noise level (caused by the local sound-pressure level changes due to the individual corona discharges) from the outdoor yard at the Luyster Creek HVDC Converter Station would not exceed 100 microvolts per meter (μV/m) in the frequency range of 500 kHz to 30 MHz within a 1,475-foot (450-meter) perimeter, as measured from any energized component in the converter station or adjacent AC switching station.

Additional details regarding the features required to minimize EMI at the Luyster Creek HVDC Converter Station would be developed during the detailed design phase of the proposed CHPE Project.

2.4.10 Construction and Schedule

The Applicant anticipates that the initial permitting phase of the proposed CHPE Project would continue through mid 2014, with major construction commencing later in 2014. Installation of the transmission cables is proposed to be completed between 2014 and 2017. The Applicant anticipates that the commercial operation date for the proposed CHPE Project would be 2017 (TDI 2010, CHPEI 2012ww).

2.4.10.1 Aquatic Transmission Cable Installation

To the extent practical, the aquatic transmission cables would be buried beneath the beds of existing waterways (see **Figures 2-1** through **2-4** and **Appendix A** for maps of the waterways) at depths ranging between 4 and 8 feet (1.2 and 2.4 meters) beneath the bed surface. To prevent disturbance to the transmission cables from unrelated marine operations in the waterways, the cables would be buried beneath the bed of Lake Champlain at a depth of at least 8 feet (2.4 meters) in the sediment and at least 4 feet (1.2 meters) in rock within the federally maintained (i.e., dredged) navigation channel, and at least 4 feet (1.2 meters) in the lakebed outside of the federally maintained navigation channel. Cables installed in the Hudson River sediment bed would be buried to a minimum depth of 7 feet (2.1 meters). Cable installation in the Harlem River would be entirely within the federally maintained navigation channel at minimum depths of 8 feet (2.4 meters) in the sediment and 6 feet (1.8 meters) in rock. Transmission cables would be installed along the entire East River route using HDD; therefore, trench burial depths would not apply.

Burial depths could vary in response to site-specific factors (e.g., presence of existing infrastructure or archaeological resources, environmental concerns, localized geological or topographical obstacles) identified along the proposed CHPE Project route. Where the transmission cables would cross areas that contain surficial bedrock or existing infrastructure (e.g., other cables, pipelines), the transmission cables would generally be laid atop the existing bedrock or infrastructure and protected by material placed over the transmission cables. Protective material could include concrete (e.g., rip-rap, grout mattresses), protective cable ducts, or other low-impact protective armoring (TDI 2010). Aquatic transmission cables would cross under a cable ferry crossing in Lake Champlain. The Ticonderoga–Larrabee Point Ferry, which would be crossed the proposed CHPE Project route near MP 86, uses two parallel, steel guidance cables that are lifted by steel sheaves to pull the ferry along the cables. The guidance cables rest along the bottom of the lake when they are not in use and typically are replaced every 4 years. The guidance cables would be temporarily removed from the lakebed prior to the installation of the transmission cables, which may put the ferry temporarily out of service. After installation and burial of the transmission cables, the guidance cables would be replaced over the top of the transmission cables. Installation of the cables would be coordinated with the ferry operator to minimize impacts on ferry operations.

The NYSPSC Certificate issued for the proposed CHPE Project established construction work schedule windows identifying times of the year when work associated with the underwater portion of the transmission line may take place. These work windows were subsequently supplemented through consultation with NMFS. These established work windows and time of year restrictions (**Table 2-2**) were developed in part to avoid impacts on overwintering, spawning migrations, spawning activity, and larval stages of ESA-listed fish species. Spawning seasons for ESA-listed fish species in the Hudson River Segment are April through May for shortnose sturgeon and May through June for Atlantic sturgeon. The NYSDOS has conditionally concurred with these construction windows as part of its CMP consistency certification for the proposed CHPE Project. Restriction of construction activities to specific windows of time would protect ESA-listed fish species during spawning migrations, which are vital and sensitive stages of their lifecycle.

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

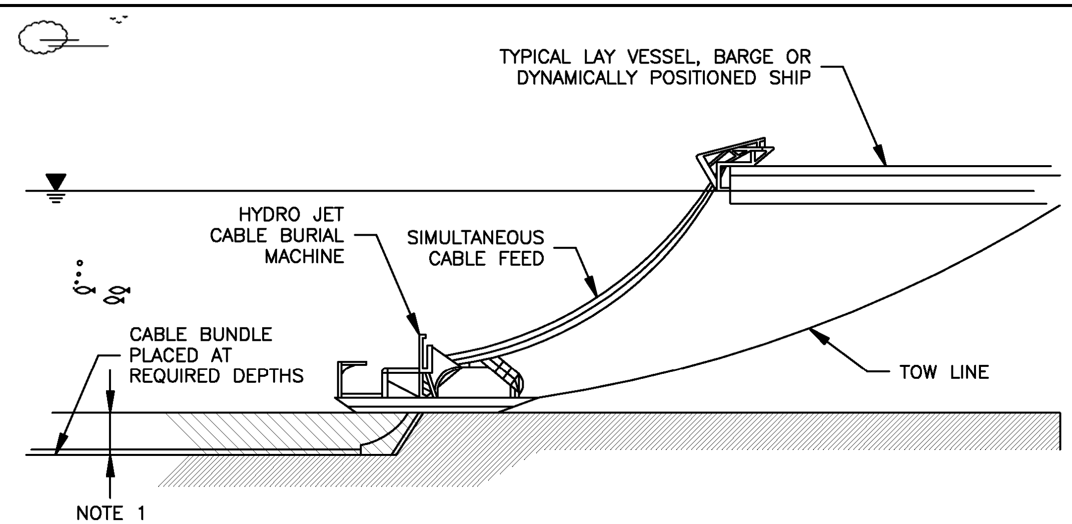
- Route-clearing operation
- Cable installation
- Post-installation survey.

The first step in the installation of the aquatic transmission cables would involve conducting a pre-installation route clearing operation (i.e., debris removal) in the year preceding transmission line installation. Debris removal in Lake Champlain and the Hudson and Harlem rivers would occur during the approved construction windows (see **Table 2-2**). Debris removal would occur from September 15 through October 30 in the Hudson River within the appropriate construction windows and would be accomplished in 20 calendar days during 12-hour shifts.

Route clearing could require one to three stages based on the site conditions. All stages of route clearing would use a tug and barge equipped with cutter wheel equipment, or with a smaller tug if possible. Support vessels would include a crane barge to remove larger debris as required or a debris barge to transport recovered riverbed debris. The initial stage of route clearing is designed to find and remove debris lying on and just below the river floor. This stage is performed with large grapnel equipment. In areas of extensive debris or suspect areas, a second stage clearing would be performed with a de-trenching grapnel. This grapnel provides penetration of up to 3 feet (0.9 meters) into the riverbed. After completion of the grapnel runs, a third stage of clearing (i.e., plow pre-rip) would be required if the site conditions indicate the potential for sub-surface debris. The plow pre-rip is designed to clear and prove the entire route to the full burial depth, and would be performed in the Hudson and Harlem rivers using a jet plow but without the cables loaded. Transit routes for the route-clearing equipment would vary based on the location of marine-based yards along the route, but the yards would generally be no more than 50 miles (81 km) from the equipment's location. Temporary marine yards would be set up and moved as the route-clearing operation progresses.

Once cleared of debris, the next step would be the simultaneous installation of both transmission cables by either a jet plow or a shear plow. The Applicant would employ a fleet of approximately four vessels, including the cable-laying vessel, survey boat, crew boat, and tugboat or tow boat, which would be used to coordinate laying of cable. The plowing process would be conducted using a dynamically positioned cable barge and towed plow device that simultaneously lays and embeds the aquatic transmission cables in a trench. A barge would propel itself along the route with its forward winches, with other moorings holding 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 barge 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 because it has no propulsion system. For burial, the barge tows the plow at a safe distance as the laying and burial operation proceeds (see **Figure 2-14**). The transmission cables composing the bipole would be deployed from the barge to a funnel device on the plow. The plow is lowered to the lake or river floor, and the plow blade cuts into the lake or riverbed while it is towed along the pre-cleared route to carry out a simultaneous lay-and-burial operation. The plow would then bury both cables of the bipole in the same trench.



NOTES:
1. BURIAL DEPTH SHALL BE 15 FT. MIN. WITHIN MAINTAINED NAVIGATION CHANNELS AND NOT LESS THAN 4 FT. ELSEWHERE.
2. CABLE LAY MACHINE IS TYPICAL OF EQUIPMENT THAT MAY BE EMPLOYED. ACTUAL EQUIPMENT WILL BE DETERMINED BY THE EPC CONTRACTOR.
3. CABLE LAY MACHINE MAY BE OPERATED WITH OR WITHOUT HYDROJET OPERATION DEPENDING ON BOTTOM SEDIMENT CONDITIONS.

Figure 2-14. Typical Aquatic Transmission Cable Installation Process

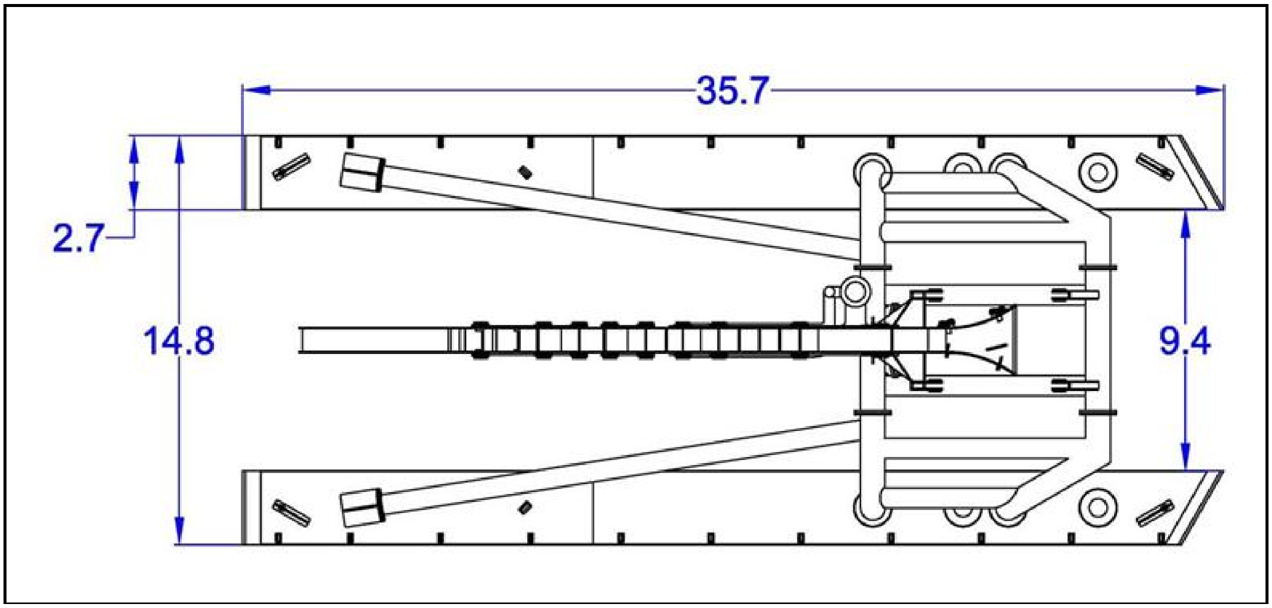
It is anticipated that the majority of the aquatic cable route would be installed and buried using water-jetting techniques (see **Figure 2-15**), which would result in short-term, localized sediment suspension and transport. The water-jetting process uses jets of pressurized water to fluidize the sediments. The jet plow is fitted with hydraulic pressure nozzles that create a downward and backward flow within the trench, allowing the transmission cables to settle into the trench under its own weight before the sediments settle back into the trench. Jet plows generally are used to install cables to a depth of between 3 to 10 feet (0.9 to 3 meters), although plows are available that can install cables to a depth of up to 16 feet (5 meters). Where used along the proposed CHPE Project route, the jet plow would create a 2-foot (0.6-meter)-wide by 4- to 8-foot (1.2- to 2.4-meter)-deep trench. Depending on the sediment particle-size composition, the majority (approximately 70 to 80 percent) of the disturbed sediment would be expected to remain within the limits of the trench under limited water movement conditions, with 20 to 30 percent of suspended sediment traveling outside the footprint of the area directly impacted by the plow. With higher currents, more sediment can be transported outside the trench area (HTP 2008, MMS 2009, CHPEI 2012i).

Source: CHPEI 2012d

Figure 2-15. Example of Water Jet Trenching Device

Anchorage of vessels during installation of the aquatic transmission line would be used in the event that bottom conditions are encountered that either stop forward progress at reasonable tow tension or result in excessive rolling or pitching of the jet plow. In such cases, the barge would be stopped, anchors deployed to hold the barge in position, and obstructions investigated and remedied. Anchors would also be used during idle periods due to weather conditions. Open water anchorages are not envisioned as a common event. Specific areas where anchorage would be anticipated include construction and removal of temporary cofferdams and cable landings at water-to-land transitions, marine splicing locations (although this could also be accomplished using dynamic positioning), and possibly along the 460-foot (140-meter) length of bedrock trenching in the Harlem River (at MP 324.5). The collective length of all work areas where anchors might be deployed is projected to be less than 1 percent of the approximately 197-mile (317-km) aquatic portion of the proposed CHPE Project installation route. Barges would include four 10,000-pound (4,536-kilogram) stockless "navy" anchors measuring approximately 10.3 feet (3.1 meters) long by 6.7 feet (2.0 meters) wide with an approximate footprint of 3 square feet [0.3 square meters]). Installation barges would also include two 3-foot (0.9-meter)-diameter spuds for use in shallow water. The anchors would have a total impact area of approximately 15 square feet (1.4 square meters) per deployment. Midline buoys would be used to prevent anchor chain sweeps.

Both water jetting and mechanical plowing would displace lake or river floor sediment within a narrow trench, which would permit the transmission cables to sink under their own weight. The displaced sediment would settle out, and the trench would refill 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 range from 12 to 16 feet (4 to 5 meters) in width (see **Figure 2-16**).



Source: Caldwell Marine International 2010
Note: Dimensions are shown in feet.

Figure 2-16. Typical Cable Plow Dimensions

For portions of the transmission line route where the sediment stiffness is low, a shear plow would be used. For the shear plowing technique, the plow is tethered to a surface support vessel, which tows the plow along the lake or riverbed. A trench, approximately 0.8 feet (0.2 meters) wide and 4 to 8 feet (1.2 to 2.4 meters) deep, is made for the cables by the plowshare and the cables settle into the trench. In water deeper than 150 feet (46 meters), such as in portions of Lake Champlain, the transmission cables would be buried using a jet plow or laid on the surface of the lake bottom and retro-buried using a jetting cable burial remotely operated vehicle (ROV). Condition 161 of the NYSPSC Certificate issued for the proposed CHPE Project requires that the Applicant conduct an immediate post-installation survey to document the location and depth of burial associated with the cables. Where it has been determined that the installation operation did not result in adequate backfill over the transmission cables, a backfill plow can be used, which employs horizontal blades that capture the sediment pushed off to the sides during plowing and pulls it back into the trench and over the cables. Usually, the trench completely refills over time periods that range from 6 months to 5 years depending on the soil type and water currents (ISE 2003), as bottom sediment naturally backfills the trench over the cable through wave action or bed load transport of sediments. Certificate Condition 161 also requires the Applicant to conduct underwater depth-of-burial surveys every 5 years.

The burial depth for the area of rock excavation in the Harlem River is stated in the USACE Public Notice as being 6 feet below the bottom of the waterbody (USACE 2013). The proposed transmission line would cross exposed bedrock for approximately 460 feet (140 meters). Geologic maps indicate this rock is Fordham Gneiss with unconfined compressive strength that is too hard to remove by cutterhead, ripping, hoe-ramming, or non-explosive methods. Blasting trials would be conducted using a pre-packaged chemical demolition agent (e.g., Green Break or RocKracker) that would be inserted into holes drilled into rock. These packaged demolition agents would be loaded into boreholes and, when ignited, would generate an expansive force to fracture the rock. The rock fragments would then be removed by long-reach hydraulic excavating buckets and deposited onto a barge. If the trials are successful, a vertical pattern of holes would be drilled into the rock to form a trench. The broken rock would be dredged sequentially from each end of the trench progressing towards the middle with the rock fragments placed onto a barge. Turbidity would be generated as a result of operations. However, impacts are expected to be minimal because of the crystalline nature of the rock and because silt curtains would be used to surround the operations to avoid the spread of a turbidity plume.

In the event that trials with the pre-packaged chemical demolition agent are unsuccessful because of the rock's hardness or other reasons, it would be necessary to use water gel dynamites to fracture the rock so it can be dredged. The dynamite would produce a shock wave upon detonation. The force of the shock wave could be decreased by stemming the top of the blast holes with pea gravel, which might require an increase in the number of boreholes needed to be drilled to get the powder factor (i.e., pounds of dynamite per cubic yard of rock) required to break the rock. Each blast hole would be detonated in a controlled sequence to move the rock towards the open end of the trench, and to minimize vibrations that would travel towards the shoreline. Explosives would be detonated during each delay (typically 8 milliseconds apart). Blasting would occur within the proposed CHPE Project construction window for the Harlem River (see **Table 2-2**).

The blasting program in the Harlem River is estimated to last 10 weeks, requiring approximately 300 drill holes with each drill taking 30 to 60 minutes to complete. Nominal noise, vibration, and turbidity is expected from the drilling process, which would employ small diameter drill holes (approximately 1.5 inches [3.8 cm]) that generate a small amount of suspended sediment. The sediment would be contained by means of floating silt curtains as appropriate. Air compressors mounted on the barge would generate additional construction noise. Drilling is anticipated to be conducted from a barge on spuds. Prior to blasting, the barge would be moved off the drilled holes with clearance of the vicinity as required by the fire marshal and the harbormaster.

The blast events are anticipated to have a duration of only a few seconds, but they would be preceded and followed by warnings and clearings of the area for inspections, all of which could last approximately 2 hours. The exact production schedules would be developed by the blasting construction contractor. Preliminary construction sequencing studies indicate that 15 to 20 separate blasts could be required. Peak ground vibrations are predicted to range from 0.25 inches (0.64 cm) per second at a distance of 200 feet (61 meters) from the trench, 1 inch (2.5 cm) per second at a distance of 75 feet (23 meters), 2 inches (5 cm) per second at 50 feet (15 meters), and 4 inches (10 cm) per second at 30 feet (9 meters). Peak water pressures are predicted to be 10 psi at 200 feet (61 meters), 30 psi at 75 feet (23 meters), 50 psi at 50 feet (15 meters), and 85 psi at 30 feet (9 meters) from the trench.

Following clearance by the blaster, mucking of blasted trench materials would be completed with long-reach backhoes to lift muck out of the trench and, if the fragmentation is good, putting it to the side. Large rocks would require removal to shore and disposal. An estimated 1,200 tons of rock material would be anticipated to be removed from the trench and temporarily stored on the river bottom adjacent to the trench. The cables would be laid over a sand backfill in the trench and covered with sand layer. The remainder of the trench would be backfilled with the blasted aggregate materials.

The transmission line would be installed within the limits of the federally maintained navigation channels in the southern end of Lake Champlain (approximate MP 98 to MP 101), in the Harlem River (approximate MPs 324 to 330), and the East River (approximate MP 331). The transmission line would traverse a total of approximately 9.0 miles (14.5 km) of navigation channels, although HDD would be used to install the transmission cables under the entire East River route (see **Appendix A**). Although conventional trenching is not currently proposed outside water-to-land transition points where cofferdams would be installed, it could be used to reach specific cable burial depths required by regulatory agencies at locations where the transmission cables would be sited within, or would cross, maintained navigation channels and plows would be unable to achieve the required burial depth. In these situations, either a clamshell dredge or barge-mounted excavator would be used to pre-dredge a trench into which the cable would be laid. The trench would typically be over excavated by approximately 20 percent to allow for slumping, or movement of loosely consolidated sediment down a slope, of trench sidewalls prior to cable installation. Because the trench spoil cannot be sidecast for re-use as backfill, it would be brought to the surface and placed on barges for disposal at an approved location. This work would most likely occur from spud or jack-up barges, although anchor-moored barges could also be employed, depending on equipment availability and site conditions. The barge would have a crane, typically outfitted with a 6- to 9-cubic-yard (4.6- to 6.9-cubic-meter) clamshell bucket. Alternatively, the barge could have a track hoe excavator working off the deck of the barge, possibly with an extended boom for areas of deeper water. Once a segment of trench is excavated, cable would be laid, and the clamshell dredge or excavator would place clean backfill back into the trench.

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 crossings (e.g., other electric cables, natural gas pipelines). In these instances, the transmission cables would be buried as deep as possible or simply laid atop the lake or river bottom and covered with sloping stone rip-rap or articulated concrete mats for protection.

The ROW required for operation of the aquatic transmission cables is dependent on the water depth, but would be expected to be approximately 30 feet (9.1 meters) in width in most underwater areas. For the majority of the underwater portions of the CHPE Project route, the two cables that compose the bipole would be installed approximately 1 foot (0.3 meters) or less apart in the same trench. The area of Lake Champlain between MP 42 and MP 67, which is approximately 25 miles (40 km) in length, is more than 100 feet (30 meters) deep with water depths in some areas approaching 400 feet (122 meters). In this area, the cables would be laid on the bottom and retro-buried using an ROV. All proposed aquatic transmission cables would be bundled together and simultaneously laid and buried within the same trench (USACE 2013).

For the installation of the transmission line in Lake Champlain, a vessel designed to transit the New York State canal system would be required. This would limit the size of a barge that would be used to install the transmission cables. The Applicant anticipates that the transmission cables would be transported in baskets to the Port of Albany where the baskets would be loaded onto the laying vessel or onto a supply barge. A practical limit for baskets and cables is in the range of 300 to 500 metric tons. The height of the vessel with the basket must comply with maximum 15 feet (4.6 meters) vertical clearance of bridges along the Champlain Canal. Assuming a vessel deck of 4 feet (1.2 meters) above the water surface and a carousel height of 4 feet (1.2 meters), the height of the basket cannot be greater than 7 feet (2.1 meters). Additionally, the typical draft of an installation barge is 12 feet (3.7 meters); however, purpose-built tugs and barges would be used to transit to Lake Champlain on the New York State canal system where the controlling depth is 9.5 feet (2.9 meters).

Given the limitations on barge size and the amount of transmission cable that could be carried on board, the Applicant estimates that the cable-laying vessel would be able to carry approximately 6 miles (10 km) of cables. This would result in approximately 17 splices in the 101-mile (163-km)-long Lake Champlain Segment of the proposed CHPE Project. With the same assumption, there would be approximately 16 splices in the Hudson and Harlem rivers, where the proposed CHPE Project route length would total approximately 95 miles (153 km).

The aquatic transmission cables would likely be manufactured in and shipped on ocean-going vessels from Europe to be installed by one or more United States-registered vessels. The aquatic cables would have to be loaded to a smaller cable-laying vessel (i.e., barge) that would be capable of operating in the Champlain Canal in order for the cables to be installed in Lake Champlain. The Port of Albany has been identified by the Applicant as having adequate berthing and heavy lift facilities to complete this task (TDI 2010).

2.4.10.2 Terrestrial Direct Current Transmission Cable Installation

The general sequence for installing the terrestrial DC transmission cables along the road and railroad ROWs would be conducted in steps as follows (CHPEI 2010c):

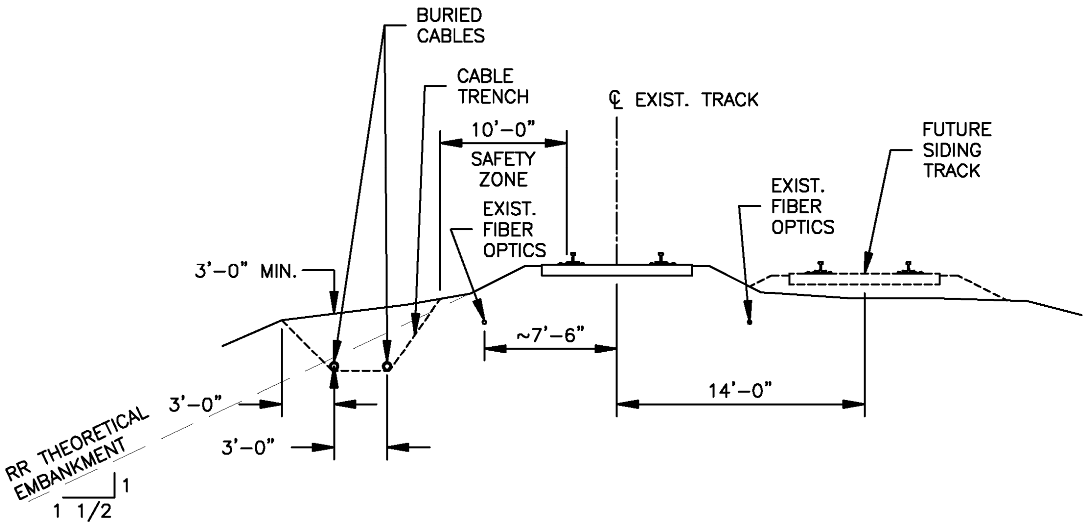
- Initial clearing operations (where necessary) and storm water- and erosion-control installation
- Trench excavation
- Cable installation
- Backfilling
- Restoration and revegetation.

It is anticipated that the majority of the supplies and equipment required for terrestrial transmission cable installation would be transported to the underground portions of the proposed CHPE Project route via roadways or the railroad whose ROW is being used. However, for construction in railroad ROWs, it is anticipated that local roadways would also be used by construction workers to get to and from contractor yards or the railroad ROW, to deliver supplies directly to the site, or to transport equipment (e.g., dewatering pumps, generators, excavators) directly to the site (CHPEI 2010c). To the extent possible, the installation of the terrestrial transmission cables along the railroad ROWs would be from rail-mounted equipment, and the construction equipment and materials would be transported by rail.

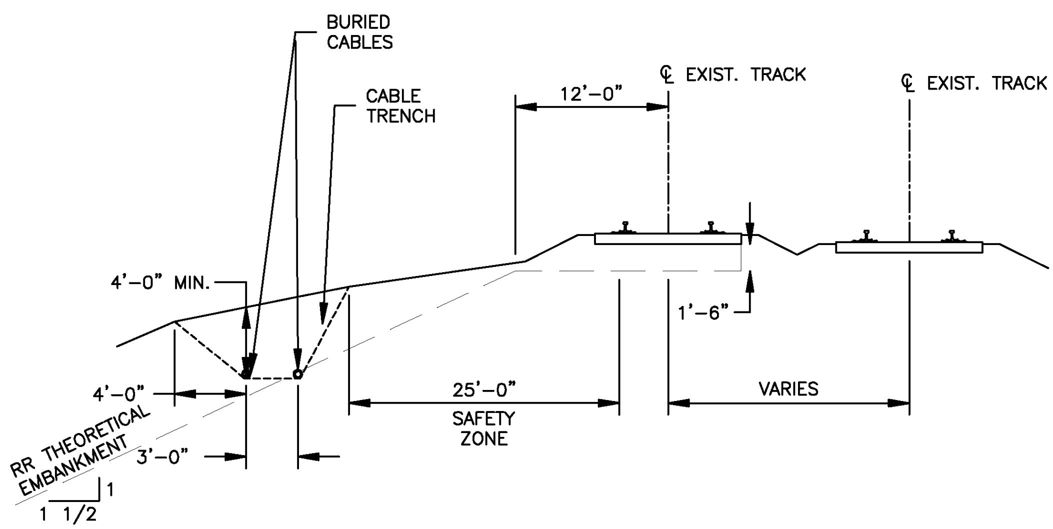
The underground transmission cables would require a number of joints and a flat pad would be installed under each joint for splicing activities. The number of joints would be determined either by the maximum length of cable that could be transported or by the maximum length of cable that could be pulled. The jointing would be performed in a jointing pit or splice vault, with typical segment lengths ranging from 0.1 to 0.5 miles (0.2 to 0.8 km) (CHPEI 2010a). These splice vaults would be similar to the transition vaults that would be used to splice aquatic transmission cables to terrestrial transmission cables at the transitions from water to land (see **Section 2.4.3**). The splice vaults would be backfilled after the splices are completed. While splice vaults are not intended for future access, if emergency repair required replacing a section of cable, use of splice vaults would be considered on a case-by-case basis. The portion of the transmission line within the road and railroad ROWs could therefore require more than 400 splices as part of the installation process.

Along the road and railroad 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, or rail-mounted equipment where possible (CHPEI 2010a). The typical trench would be up to 9 feet (2.7 meters) wide at the top and approximately 3 feet (0.9 meters) deep to allow for proper depth and a 1-foot (0.3-meter) separation required between the two transmission cables to allow for heat dissipation. In the railroad ROWs, a minimum offset distance would be required from the two transmission cables to the railroad track, with each railroad having their own minimum separation requirements for collocation of utilities in its ROW. For the CP Railway ROW, a minimum distance of 10 feet (3 meters) from the centerline of the outermost railroad track to the edge of the cable trench would be required by the railroad. For the CSX Railroad ROW, a minimum distance of 25 feet (8 meters) from the centerline of the outermost track to the edge of the cable trench would be required (see **Figure 2-17**) (CHPEI 2010c). Along road ROWs, the transmission cables would be installed in the shoulder of the road or, where that is not possible due to constraints, under the road.

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. The operation of the transmission cables would result in the generation of heat, which would reduce the electrical conductivity of the cables; therefore, prior to laying the cables, the trenches would be backfilled with low thermal



Ballasted Track Cross-Section, Single Track on CP ROW



Ballasted Track Cross-Section, Double Track on CSX ROW

Source: CHPEI 2010c

Figure 2-17. Cross-Sections of Railroad ROWs with Buried Cables

resistivity material such as sand to prevent heat from one cable affecting a nearby cable. There would be a protective concrete cover consisting of a layer of weak concrete directly above the low thermal resistive backfill material. The whole assembly would have a marker tape placed 1 to 2 feet (0.3 to 0.6 meters) above the cables. The top of the soil covering the trench might be slightly crowned to compensate for settling (CHPEI 2010c).

For crossings of waterbodies such as Catskill Creek and numerous small streams, the following five dry-ditch crossing methods would be used for installation of the transmission line:

- *Attachment to a Bridge*. Where available and feasible, the transmission line would be affixed directly to an existing railroad bridge as it spans the waterbody.
- *Flume Crossing Method.* This method involves installing a flume pipe to carry the stream water around the work area, allowing the trenching to be done in a dry condition, and limiting the amount of sediment that might enter the waterbody.
- *Dam and Pump Crossing Method.* For this method, the stream is dammed upstream of the work area and a pump and hose are used to transport the stream flow to bypass the trenching area to a point downstream where it would be discharged back to the streambed. This method also allows the trenching to occur in a dry condition.
- *HDD*. Under this method, cable conduits would be installed under the streambed using HDD and avoiding any disturbance to the streambed, and the cables would then be pulled through the conduits.
- *Open Cut.* The open cut method of construction involves digging an open trench across the streambed, laying the cable, and backfilling the trenched area without diverting the stream around the work area.

The waterbody crossing methods would be determined based on the NYSDPS stream width classification, NYSDEC stream type classification, and conditions present during the time of construction in accordance with NYSDPS's *Environmental Management and Construction Standards and Practices for Underground Transmission and Distribution Facilities in New York State* (NYSDPS 2003). The categories for water bodies are defined by NYSDPS as follows.

- Minor Waterbodies – less than or equal to 10 feet (3 meters) wide at the crossing location as measured from water's edge to water's edge.
- Intermediate Waterbodies – greater than 10 feet (3 meters) wide, but less than or equal to 100 feet (30 meters) wide at the crossing location as measured from water's edge to water's edge.
- Major Waterbodies – crossings of more than 100 feet (30 meters) wide as measured from water's edge to water's edge.

Intermittent streams that are dry at the time of crossing would only be crossed by open cut with prior approval from NYSDPS and NYSDEC.

In wetland areas, the cables would generally be installed by trenching. The typical sequence of activities would include vegetation clearing, installation of erosion controls, trenching, cable installation, backfilling, and ground surface restoration. Equipment mats or low-ground-pressure tracked vehicles would be used to minimize compaction and rutting impacts on wetland soils. To expedite revegetation of wetlands, the top 1 foot (0.3 meters) 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 down into the trench. If the trenching, stockpiling, cable installation, and backfilling are conducted from the railroad, soil compaction would be reduced, as heavy equipment operation on the ground surface along the cable trenches would be minimized. HDD would be used to install the cable under certain wetlands. A clean-up crew would complete the restoration and revegetation of the construction corridors and other temporary construction workspace. In conjunction with backfilling operations, any woody material and construction debris would be removed from the construction corridor. The temporary construction area would be seeded with a fast growing annual seed mixture to quickly stabilize the wetland area while the rhizomes, rootstock, and seeds in the wetland soils allow the native vegetation to re-establish over the course of the growing season (CHPEI 2010c).

The permanent ROW required for maintenance and operation of the transmission line along the terrestrial portions of the proposed CHPE Project route would be approximately 20 feet (6 meters) wide for both railroad and roadway ROWs. The permanent ROW would provide protection of the transmission cables against third party damage and would facilitate any required maintenance or repair (TDI 2010). On land, the transmission cables would generally be separated by a distance of approximately 1 foot (0.3 meters) (CHPEI 2010a).

2.4.11 Staging Areas

Aquatic Transmission Cable Support Facilities. For the portions of the proposed CHPE Project route where aquatic transmission cables would be installed, it is anticipated that minimal land-based support would be required. Transport of the aquatic transmission cables would occur via the cable-laying vessel, supported by resupply barges operated from a temporary storage area on land. This land-based support facility is envisioned to be no greater than 200 by 300 feet (61 by 91 meters), and would be at an existing port with heavy lift facilities, such as the Port of Albany or the Port of New York & New Jersey (CHPEI 2010a). The proposed CHPE Project would not require the construction of new facilities at these ports.

Terrestrial Transmission Cable Support Facilities. For the terrestrial portions of the proposed CHPE Project route where underground transmission cables would be installed, additional nearby temporary aboveground support facilities would be established. Support facilities could include contractor yards, storage areas, access roads, and additional workspace. Additional workspace might be required at HDD locations, cable jointing locations, and areas with steep slopes. The support facilities would be sited within the existing road and railroad ROWs (CHPEI 2010a).

2.4.12 Measures to Minimize Environmental Impacts

As part of its application development process, the Applicant detailed a number of industry-accepted BMPs that it would undertake to avoid or reduce environmental impacts during construction and operation of the proposed CHPE Project. The Applicant would develop a final Environmental Management and Construction Plan (EM&CP), which documents environmental and construction management procedures and plans to be implemented during the proposed CHPE Project construction activities and during facility operation. A draft EM&CP was included as part of the NYSPSC Certificate for the proposed CHPE Project. In addition, the Applicant has proposed to employ a number of specific measures to minimize environmental impacts as part of its filings with the NYSPSC and the USACE. These impact reduction measures, collectively referred to as BMPs, have been proposed by the Applicant for use during construction and operations to protect environmental, agricultural, cultural, and other potentially sensitive resources along the proposed CHPE Project route. These BMPs have been incorporated into the Certificate and will be incorporated into the final EM&CP (NYSPSC 2013). The Applicant-proposed measures have been taken into account in the environmental analyses conducted for this EIS. These measures include development of a Spill Prevention, Control, and Countermeasures (SPCC) Plan or its equivalent filed as part of the EM&CP and implemented during construction; time of year work restrictions; water quality monitoring; biological studies; work site restoration; and inspection and reporting. A listing of specific BMPs proposed by the Applicant as part of the proposed CHPE Project and considered in the EIS evaluation is provided in **Appendix G**. The Certificate, provided in **Appendix C**, includes several appendices (not included in **Appendix C**) such as the main text of the Joint Proposal, the Applicant's draft EM&CP, and a document describing all project BMPs in detail. The Certificate includes 165 attached conditions, some of which require measures to reduce, avoid, or measure environmental impacts, and are discussed in appropriate resource areas in **Chapter 5** of this EIS.

A final EM&CP would be developed in consultation with NYSDPS and NYSDEC as the project design is advanced prior to construction.

2.4.13 Operations and Maintenance

The proposed CHPE Project has an expected life span of 40 years or more (CHPEI 2012b). During this period, it is expected that the transmission system would maintain an energy availability factor of 95 percent, meaning that the transmission system would be delivering electricity 95 percent of the time, with the remaining 5 percent allocated for scheduled and unscheduled maintenance.

During operation of the transmission cables, heat would be generated, and this heat would be released into the surrounding soils or sediment. The highest temperatures would be found in close proximity to the cable (i.e., within 1 foot [0.3 meters]), with temperatures dissipating with distance. As part of installing the cables in trenches in the terrestrial portions of the proposed CHPE Project route, the trenches may be backfilled with low thermal resistivity material to dissipate heat during operation. For underwater portions, heat would flow from the cable into the surrounding saturated sediment.

The HVDC and HVAC transmission cables would be designed to be relatively maintenance-free and operate within the specified working conditions. However, selected portions or aspects of the transmission system would be inspected to ensure equipment integrity is maintained (CHPEI 2010a).

Transmission Cable Inspection. Following transmission cable installation, regular inspections of visible parts of the transmission cables, landfall areas, and nearshore protection elements would be conducted to ensure cable integrity. All of the aquatic transmission cables would be accessible either by divers or ROVs, and, therefore, inspections would be performed in accordance with manufacturer's specifications to ensure equipment integrity and protection (e.g., appropriate burial depths, concrete mats, rip-rap) were maintained. The aquatic portion of the transmission system would be surveyed at least once every 5 years, and inspections would focus on verifying the depth of cable burial, condition of infrastructure protection measures, and identifying areas where protection of the transmission system or the environment could be compromised. The upland cable would be inspected every 3 years to ensure that adequate cover exists.

In addition, spot checks of the transmission cable protection materials would be performed during or after the first year of operation. These spot checks would occur more frequently at locations where strong currents would be expected or in other areas where abnormalities were identified (e.g., extreme storm conditions or ice crush outages) (CHPEI 2010a).

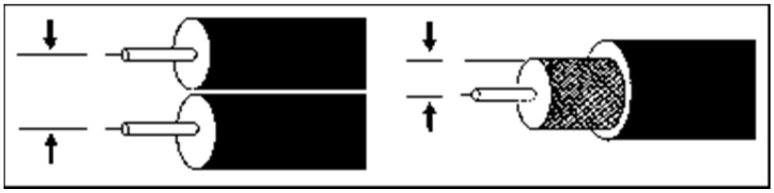
Following completion of the terrestrial facilities, on-the-ground inspectors would survey the terrestrial ROW once a year for:

- Vegetation on the ROW that might be capable of disrupting (i.e., damaging) the cables below
- Line exposures at areas with steep slopes and stream banks
- Locations requiring transmission system marker replacement
- Unauthorized encroachments
- Permanent storm water features requiring maintenance
- Vandalism.

Subsequent to the proposed commercial operation date of 2017, a scan of the installed transmission cables (see **Figure 2-18**) could be conducted using a Time Domain Reflectometer (pulse echo meter) or Optical Time Domain Reflectometer or other similar device. These scans would identify possible anomalies that could lead to failure and would provide an accurate report of the location of the transmission system, as might be required by regulatory agencies (i.e., USACE, NYSPSC, New York State Office of General Services, and USCG) (CHPEI 2010a).

Typical Cable Inspection Method

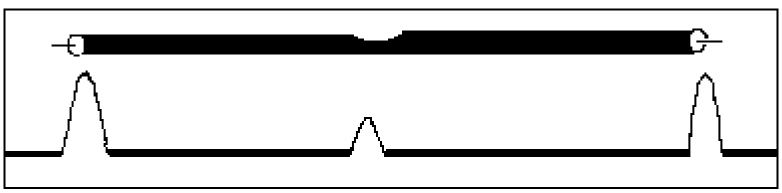
When two metallic conductors are placed close together, they form a cable impedance. The insulating material that keeps the conductors separated is the cable dielectric. The impedance of the cable is determined by the spacing of the conductors from each other and the type of dielectric used.



If the conductors are manufactured with exact spacing and the dielectric is exactly constant, then the impedance will be constant. If the conductors are randomly spaced or the dielectric changes along the cable, then the impedance will also vary along the cable.

A Time Domain Reflector (TDR) looks for a change in impedance, which can be caused by a variety of circumstances, including cable damage, water ingress, change in cable type, improper installation, and even manufacturing flaws.

A TDR sends electrical pulses down the cable and samples the reflected energy. Any impedance change will cause some energy to reflect back toward the TDR and will be displayed. How much the impedance change determines the amplitude of the reflection.



Source: Granite Island Group 2010

Figure 2-18. Cable Inspection Scan

Although no components of the transmission system would require regular replacement, regular inspections, in accordance with the manufacturer's specifications, would be performed during scheduled outages to ensure equipment integrity is maintained. For example, insulators would be inspected and cleaned if there were excess deposits of industrial contaminants and soot. Additionally, metal parts (i.e., nuts, bolts, cable cleats, and grounding scraps) would be inspected for corrosion and tightness and cooling water levels in the cooling stations maintained (CHPEI 2010a).

ROW Maintenance. During operation of the proposed CHPE Project, vegetation clearing in the transmission line ROW would be performed on an as-needed basis. Vegetation management would include mowing, selective cutting to prevent the establishment of large trees (i.e., greater than 20 feet [6 meters] tall) directly over the transmission line, and vegetation clearing on an as-needed basis to conduct repairs. Vegetation along the transmission line ROW would primarily be managed by mechanical means including such mechanisms as brush hogging, mowing, or hand cutting. Any vegetation management activities currently conducted by the railroads and highway operators within railroad and roadway ROWs would continue following the construction and operation of the transmission cable. A Vegetation Management Plan for the operational period of the transmission system would be developed and supplied as part of the EM&CP. The goal of the Vegetation Management Plan would be to establish stable low-growing vegetation with shallow root systems that would not interfere with the cables.

Transmission Cable Repairs. While not anticipated, it is possible that over the expected 40-year lifespan of the proposed CHPE Project, the transmission cables could be damaged, either by human activity or natural processes. The proposed cable installation design and techniques identified by the Applicant would minimize the potential for mechanical damage to the cable system and ensure operational safety and reliability of the cables. If a cable were to be damaged, a protection system in place would detect the fault and the HVDC Converter Station switching system would de-energize the transmission system in approximately 5 milliseconds.

Direct burial of the aquatic transmission cables to a depth between 4 to 8 feet (1.2 to 2.4 meters) below the lake bottom or riverbed provides a margin of safety and reliability against cable damage by vessels or anchors. The transmission cables themselves would have protective steel armoring wires to protect against damage. At the landfall locations, the aquatic transmission cables would be encased within an HDPE conduit to provide protection against mechanical damage. The steel-wire armored cables would be hermetically sealed to prevent the ingress of water and contain no circulating fluids or reservoirs.

Underground terrestrial transmission cables would be buried to an approximate depth of 3 to 4 feet (0.9 to 1.2 meters) below ground surface with a pre-cast concrete cap placed on top of the trench above the cables where they are installed by trenching. At utility and roadway crossings where the cables are installed by HDD, the HVDC transmission cables would be protected by a steel sleeve. The HVDC converter station would be designed, manufactured, installed, and tested by a reputable equipment vendor with international HVDC transmission experience.

Before operation of the proposed CHPE Project begins, an Emergency Repair and Response Plan (ERRP) would be prepared to identify procedures and contractors necessary to perform maintenance and emergency repairs.

The ERRP would detail the activities, methods, and equipment involved in repair and maintenance work for the transmission system. Although the scope of work for each situation would be adjusted to fit the conditions of the problem, the typical procedure for repair of a failure within the aquatic and terrestrial portions of the proposed CHPE Project route is described as follows:

- *Aquatic Transmission Cable Repair*. In the event of aquatic cable repair, the location of the problem would be identified and crews of qualified repair personnel would be dispatched to the work location. Depending on the location of the problem, a variety of equipment would be used to perform the necessary work. As part of the ERRP, appropriate vessels and qualified personnel would be pre-selected to minimize the response time. Once the failure location was identified, a portion of the transmission cable, equal to approximately 2.5 times the water depth, would be raised to the surface in preparation for cable replacement. The damaged portion of the cable would be cut and a new cable section would be spliced in place by specialized jointing personnel. Once repairs were completed, the transmission cable would be reburied using an ROV jetting device (CHPEI 2010a).
- *Terrestrial Transmission Cable Repair*. In the event of terrestrial transmission cable repair, pre-selected local contractors identified during the development of the ERRP would excavate around the location of the problem and along the transmission cable for the extent of cable to be repaired or replaced. Once the portion of the transmission cable was excavated, specialized

jointing personnel would remove the damaged cable and install new cable. Once complete, the transmission cable trench would be backfilled and the work area restored using the same methods as described for the original installation (CHPEI 2010a).

2.4.14 Transmission Service

The maximum electrical power delivery capability for the proposed CHPE Project under normal conditions would be 1,000 MW. The ultimate maximum capacity would be determined during final design of the proposed CHPE Project. In general, the power transfer capability would be limited by the maximum thermal capacity of the proposed CHPE Project. The estimated short-time (i.e., 2-hour) emergency overload capability would be approximately 1,150 MW for the transmission system (TDI 2010).

The NYISO would be the controlling authority for the proposed CHPE Project. However, as with all interconnected transmission systems, the operator of the system where the energy would originate, Hydro-Québec, would coordinate with the NYISO.

2.4.15 Decommissioning

The Applicant proposes to de-energize and abandon the proposed CHPE Project transmission line in place following expiration of its useful life. This proposed approach or any changes to the plan for the decommissioning would be subject to applicable Federal and state regulations in place at that time.

2.5 Alternatives Considered but Eliminated from Further Detailed Analysis

Several technology, alignment, and construction alternatives were considered but eliminated from further detailed study for various reasons. Alternatives considered but dismissed are discussed in the following paragraphs, along with the reasons for dismissal.

2.5.1 Previously Considered Route Alignments

This subsection describes discrete components of the segment alignments for the CHPE Project route that the Applicant initially proposed in its 2010 amended Presidential permit application, but were not included in the Joint Proposal or in the NYSPSC Certificate issued for the proposed CHPE Project. These previously proposed components of the CHPE Project route are not part of the proposed CHPE Project route as approved in the Certificate; however, these components were presented to the public during DOE's 2010 public scoping process about the project. **Figures 2-19** through **2-21** show the previously proposed CHPE Project alignments. They are further described as follows by geographical segment.

Lake Champlain Segment. There were no previously proposed CHPE Project alignments within the Lake Champlain Segment between MPs 0.0 and 101.

Overland Segment. The Overland Segment contained the previously proposed Lower Lake Champlain, Schenectady, and Middle Hudson River alignments, as shown in **Figure 2-19**.

Lower Lake Champlain Alignment. Instead of exiting the Lake Champlain at MP 101, under the 2010 version of the route the transmission line would have continued south in Lake Champlain and exited the lake and entered the CP railroad ROW near MP 112 in Whitehall. The transmission line would have traversed a federally maintained navigation channel throughout the entire reach of this option. No cooling stations would have been required under this alignment as it would be nearly entirely aquatic.

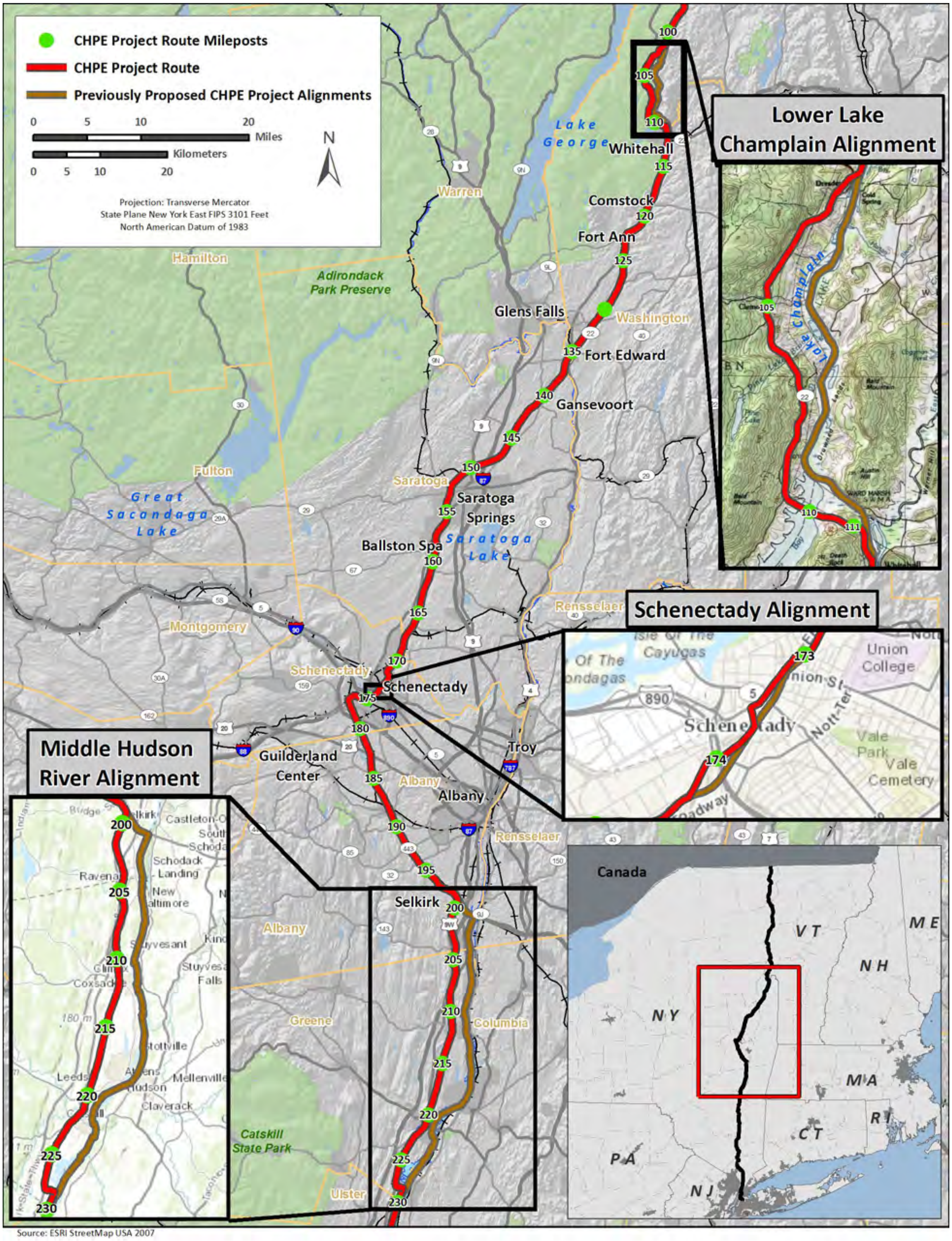


Figure 2-19. Previously Considered CHPE Project Alignments in the Overland Segment

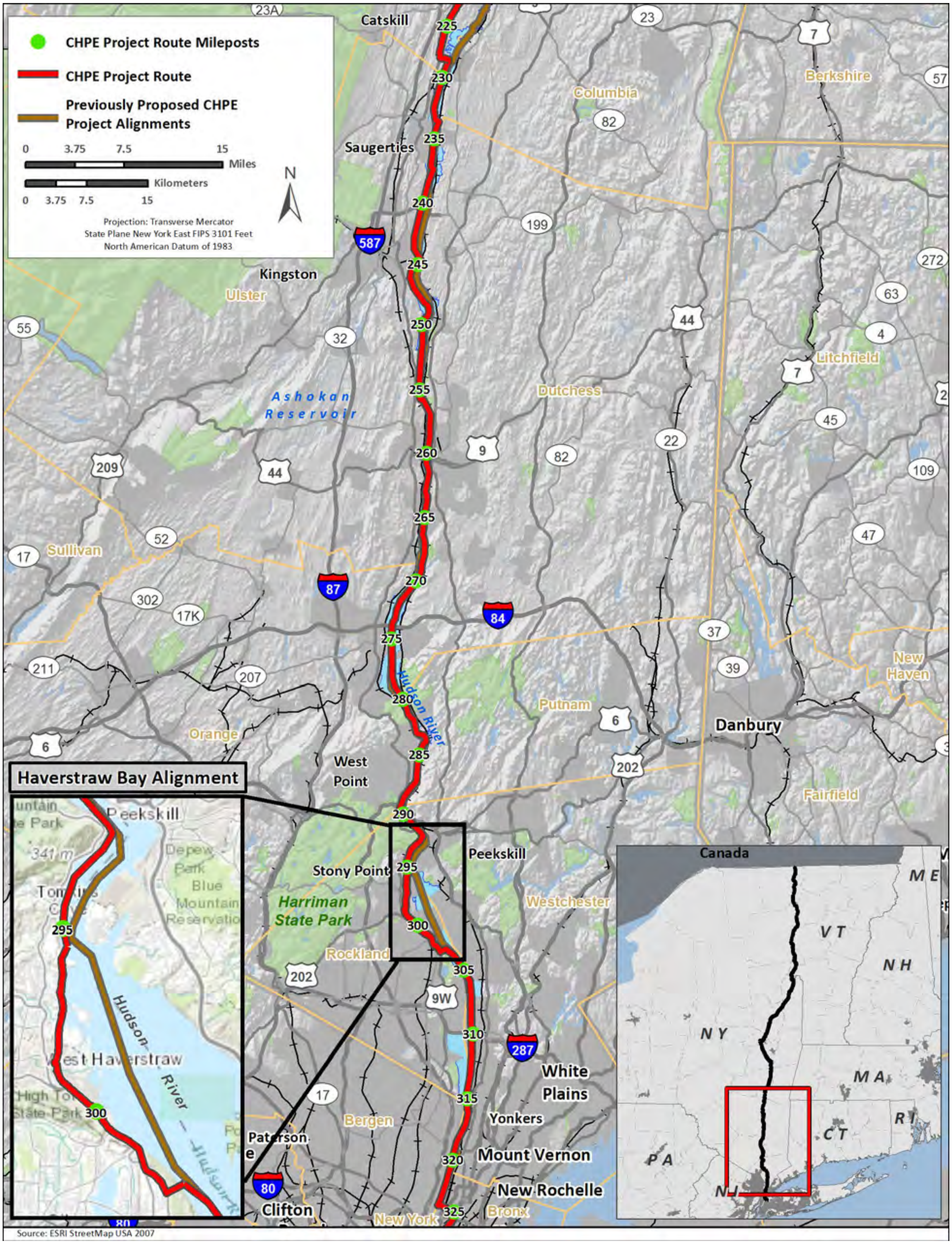


Figure 2-20. Previously Considered CHPE Project Alignments in the Hudson River Segment