January 7, 2015

Hon. Kathleen H. Burgess
Secretary
State of New York
Public Service Commission
Empire State Plaza
Agency Building 3
Albany, New York 12223-1350

Re: Case 13-M-0457 -- Application of New York Transmission Owners Pursuant to Article VII for Authority to Construct and Operate Electric Transmission Facilities in Multiple Counties in New York State—January 7 Filing in Response to the December 16, 2014 Order of the New York State Public Service Commission.

Dear Secretary Burgess:

Pursuant to Article VII of the New York State Public Service Law and the Order of the New York State Public Service Commission (the "Commission") issued and effective on December 16, 2014 establishing modified procedures for comparative evaluation, enclosed please find for filing on behalf of NY Transco LLC ("NY Transco"), Central Hudson Gas and Electric Corporation ("Central Hudson"), Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid"), New York State Electric & Gas Corporation ("NYSEG"), all entities hereinafter identified as "Indicated NYTOs" for ease of reference, five electronic copies (each electronic copy on a DVD) of the Indicated NYTOs' Part A data required for NYISO Analysis at the request of DPS staff. The lists of required submissions of Part A data were set forth in Appendices B and C to the December 16 Commission Order, as modified by the letter of December 30, 2014 by the Commission Secretary granting an extension of time for the submission of certain information. All requested data is provided for the alternative proposals offered for comparative evaluation by the Indicated NYTOs (the "Alternative Proposals").

As the enclosures will set forth in greater detail, the Alternative Proposals consist of changes to previously proposed segments or newly proposed projects which have been arranged as the following nine separate alternatives: (1) a modification to the 345kV Oakdale to Fraser Line proposed on October 1, 2013 including a slight revision to the proposed route and structure-type changes, and the elimination of the transmission line between New Scotland substation and Knickerbocker substation in the Edic to Pleasant Valley proposed project (Enhanced October 2013 Project); (2) the Knickerbocker to Pleasant Valley project; (3) the Leeds to Pleasant Valley reconductoring project; (4) the Hurley Avenue Phase Angle Regulators ("PARs") project (a proposal improving an existing substation and replacing two structures); (5) New Scotland to Leeds reconductoring and Leeds to Pleasant Valley new circuit project; (6) Edic to New Scotland

and Knickerbocker to Pleasant Valley project; (7) Edic to New Scotland and New Scotland to Leeds to Pleasant Valley reconductoring project; (8) Edic to New Scotland and the Hurley Avenue PARs project; and/or (9) Edic to New Scotland and New Scotland to Leeds reconductoring and Leeds to Pleasant Valley new circuit. Another substantial change since the October 1, 2013 filing are that the Transmission Owner Transmission Solutions ("TOTS") that were included in the October 1, 2013 filing have been withdrawn from these proceedings because they were selected as part of the Indian Point Contingency Plan approved by the Commission in Case 12-E-0503.[1] Finally, the NY Transco, which was recently formed, has joined as a co-applicant in this proceeding.

The Alternative Proposals meet the Commission's stated objective to "encourage innovation and the use of existing rights-of-way so that the State experiences smart growth of the electric grid with the least impact to the environment and our communities." (Commission December 16, 2014 Order at page 39). Specifically, these proposals will utilize the existing transmission rights of way and will require no expansion. Visual impacts will be improved through the rebuild of the existing corridor and utilizing new structures that are approximately the same height as the existing structures.

While the Indicated NYTOs have designed the Alternative Proposals to be in line with the Commission's expectations, the Indicated NYTOs do have substantial reservations concerning the statements in the Order addressing "Cost Recovery and Cost Allocation" and "Cost Estimates and Risk-sharing." As to these proposed projects, cost recovery, cost allocation and any risk sharing with regard to cost estimates and cost increases are ultimately within the exclusive jurisdiction of the Federal Energy Regulatory Commission ("FERC"). While we appreciate that the PSC is attempting to add more certainty to the costs, the facts are that transmission project costs can change as the project is implemented for reasons outside the control of the developer. Moreover, NY Transco has proposals with respect to each of these cost recovery, cost allocation and risk sharing issues pending before the FERC. Accordingly, the Indicated NYTOs reserve the right to review all of the terms and conditions of the Commission's final order before committing to proceed with the Alternative Proposals.[2]

The Indicated NYTOs are in the process of updating the Project Website (www.nytransco.com) to include information on the Alternative Proposals.

Certain confidential information has been redacted from this submission. The information that was redacted is either trade secrets or confidential commercial information within the meaning of Public Officers Law Section 87(2)(d) or confidential critical infrastructure information within the meaning of Public Officers Law Section 86(5) which, if disclosed, could endanger the life or safety of persons within the meaning of Public Officers Law Section

[1] The two TOTS projects included in the October 1, 2013 submission to the PSC are the Ramapo to Rock Tavern 345 kV Transmission Line project being developed by Con Edison (Case 13-T-0586) and the Marcy South Series Compensation (MSSC) Project being developed by the New York Power Authority (NYPA) and NYSEG (Case 13-T-0515). Because of the withdrawal of these projects from this proceeding and because Con Edison and NYPA are not sponsoring any other projects, they are not applicants to this filing.

[2] For the above reasons, the Indicated NYTOs expressly decline to characterize their cost estimates contained in the enclosed Part A data as binding.

87(2)(f). By separate letter to the Administrative Law Judges assigned to this proceeding, the Indicated NYTOs are requesting that the redacted trade secrets, confidential commercial information, and critical infrastructure information be granted confidential treatment.

As directed in the Commission's December 16, 2014 Order, this redacted submission is being filed with you in the application-specific docket to which the filing pertains Case 13-M-0457, and being served on the active party list.

Respectfully submitted,

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cc: ALJ Prestemon
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Service List for Case 13-M-0457

Submission of Indicated New York Transmission Owners
For Authority to Construct and Operate Electric Transmission Facilities in Multiple Counties in New York

Information Required for NYISO Analysis at the Order of the PSC

January 7, 2015 Submittal

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INFORMATION REQUIRED FOR NYISO ANALYSIS
AT THE ORDER OF THE PSC
JANUARY 7, 2015

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4.0 EVIDENCE OF FINANCING

See Section 2 for evidence of financing.

ATTACHMENT 1 – Modeling Data

ATTACHMENT 2 – Developer Qualifications

1. Niagara Mohawk Power Corporation d/b/a National Grid
2. Central Hudson Gas and Electric Corporation
3. New York State Electric & Gas Corporation/Rochester Gas and Electric Corporation

ATTACHMENT 3 – Capital Cost Estimates

FILING SUMMARY

Pursuant to the December 16, 2014, New York Public Service Commission's ("PSC") Order in the Alternating Current Transmission Upgrade Proceeding first established in November 2012,[1] the NY Transco LLC ("NY Transco"), Central Hudson Gas and Electric Corporation ("Central Hudson"), Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid"), and New York State Electric & Gas Corporation ("NYSEG"), all entities hereinafter identified as "Indicated NYTOs" or "Applicant" for ease of reference are submitting a modification to their initial project proposal filed in October 2013 and eight innovative transmission line alternatives in response to the PSC February 2014 solicitation for alternative projects. Although it is expected that only one alternative will be accepted as final, multiple alternatives are being submitted as they present different approaches to achieving the multiple objectives in this proceeding and provide a variety of system and societal benefits.

These project alternatives were conceived and developed taking into consideration the extensive public input from residents and property owners throughout New York. All of these alternatives substantially improve upon the October 2013 submittal. Key elements of these proposals are:

All projects will be constructed within the existing right of way or properties currently owned by the applicants. There is no need to acquire additional land to expand the right of way.

- Proposed alternatives optimize the use of existing right of way. For example, in the Hudson Valley where some projects include the construction of a new circuit in place of existing circuits, the total number of structures on the right of way will be less than what exists today after the project is completed.

- New structure heights through the Hudson Valley will be comparable in height to existing structures on the right of way.

[1] Order Establishing Modified Procedures for Comparative Evaluation, PSC case nos.12-T-0502, 13-E-0488, 113-T-0454, 1-T-0455, 13-T-0456, 13-M-0457, and 13-T-0461 (issued and effective December 16, 2014).

- In most of the alternatives aging transmission infrastructure, some approaching 100 years old, will be replaced with new, more modern facilities. Visual impacts of the right of way will improve and the upgrades will increase the transmission lines' ability to be resilient to catastrophic weather events.

- A re-configured electric system provides greater system operating flexibility, resiliency, and capacity which is expected to meet the region's transmission needs for the decades to come.

- All proposed alternatives improve the UPNY/SENY interface transfers and most of the projects provide greater than 1,000 MW of increased transfer capacity. These will significantly reduce system congestion.

More details and information on the proposals are available at: www.nytransco.com and www.nysenergysolution.com.

More details and information on the PSC's Alternating Current Transmission Proceeding are available at www.dps.ny.gov/ACTransmission.

1.0 MODELING DATA

1.1 Description of Data Requested/Provided

Attachment 1 provides a power flow modeling data change file, in Siemens PTI PSS/E v32 format, to alter the power flow case to include each project scenario. This file covers each project scenario to show the PSC and NYISO the upgrades modeled in the file and the basis for the physical data. Updated interface definitions are included for UPNY-SENY, UPNY-SENY-Closed, Central East, and Total East. Contingency definition files also are included. The files list which contingency definitions are no longer valid with each project scenario and which new definitions replace them. The final data file provides system alternative one-line diagrams of the projects, including proposed substation breaker layouts, which were the basis for the contingency definition files.

2.0 DEVELOPER QUALIFICATION AND TIMING

National Grid, NYSEG, and CHG&E have submitted information to the NYISO ("NYISO Response") in accordance with the NYISO OATT Attachment Y Section 31.2.4.1. These submittals are included in this filing in Attachment 2. Responses to the NYSPSC information requests are cross-referenced to these filings as applicable.

Transco is an affiliate of National Grid, NYSEG, CHG&E, and Consolidated Edison. It is a new entity which will develop, construct, operate and maintain the proposed new transmission facilities. As a new entity with no direct experience, Transco will contract with its affiliates or with third party contractors to provide the experience and qualified resources necessary to safely and reliably develop, construct and operate the proposed facilities. Transco intends to purchase the projects and continue their development after receipt of all its regulatory approvals.

2.1 Technical and Engineering Qualifications and experience of the Developer relevant to the development, construction, operation, and maintenance of a transmission facility.

For National Grid, NYSEG, and CHG&E please see the response to question #2 in the NYISO Response. Transco will contract with the affiliates to provide the necessary technical and engineering expertise to develop, construct, operate and maintain the transmission facilities as permissible by law. Transco will further supplement these resources through contracts with industry experienced consultants and contractors.

2.2 Current and expected capabilities of the Developer to finance, develop and construct a transmission facility and to operate and maintain it for the life of the facility.

For National Grid, NYSEG, and CHG&E please see the response to question #3 in the NYISO Response. Transco will adopt the relevant practices of their affiliates necessary to safely and reliably develop and operate the transmission facilities.

2.3 Developer's Capability to Finance Proposed Transmission Facilities

2.3.1 Evidence of experience financing or arranging financing for transmission facilities including a description of up to 10 such projects financed over the previous ten years, the capital costs and financial structure of such projects, a description of any financing obtained for these projects through rates approved by the Commission, the financing closing date of such projects, and whether any of the projects are in default.

National Grid, NYSEG, CHG&E and Transco, individually a Developer or collectively the Developers, plan to finance transmission facilities with a mix of debt and equity consistent with their financing strategies, which is

primarily driven by regulatory requirements and the capital structure assumed in the establishment of rates. National Grid, NYSEG, and CHG&E, each an Indicated NYTO, provide electrical distribution and transmission and gas distribution services in New York, which is regulated by the PSC. The Indicated NYTOs derive revenues from energy delivery to its customers using rates approved by the PSC. The Indicated NYTO's investments in regulated assets included in rate base are a source of revenue for the Indicated NYTOs. The Indicated NYTOs have historically financed construction expenditures through internally generated cash flows and the raising of capital in the capital markets. In addition to raising additional capital in the capital markets the Indicated NYTOs have various lines/revolvers in place for operations.

As Transco is a new entity, created in November 2014, the Members[1] of Transco have committed nearly $3 billion of capital for Transco's Projects, representing 100% of the costs for the Projects. To support this commitment, the Members of Transco have received parental/affiliate guarantees totaling nearly $3 billion (see response to Section 31.4.4.1.3(5)). The plan is to eventually fund the cost of Transco's projects with debt and equity as outlined in its Section 203 and 219 filings with FERC (see FERC filing ER15-572-000 for further financing plans and ability).

2.3.2 Audited annual financial statements from the most recent three years and most recent quarterly financial statement.

Audited annual financial statements for the most recent three years and the most recent quarterly financial statements are available online as follows:

National Grid (including subsidiaries) - http://investors.nationalgrid.com/reports/2013-14/us.aspx for the most recent annual reports and http://investors.nationalgrid.com/ for the most recent quarterly report for National Grid plc (includes quarterly information for National Grid)

NYSEG - http://www.iberdrolausanetworks.com/FinancialInformation/financialstatements.html

CHG&E - http://www.chenergygroup.com/financialinformation/index.html - most recent annual reports and quarterly financial reports are included with its immediate parent, CH Energy, Inc.

Transco was formed on November 14, 2014, and there are no annual audited financial statements or quarterly financial statements.

[1] National Grid, Central Hudson, NYSEG/RGE, and Con Edison/Orange & Rockland.

2.3.3 Credit Rating

Senior long term unsecured debt ratings for the Developers are as follows:

- National Grid – Moody's and S&P is an A2/A- rating.
- NYSEG – Moody's is an A3 (Stable) rating; S&P is a BBB+ (Positive) rating; and Fitch is a BBB+ (Stable).
- CHG&E – Moody's is an A2 rating; S&P is an A rating; and Fitch is an A rating.
- NY Transco – Currently there is no credit rating for NY Transco. NY Transco should be able to obtain a credit rating once NY Transco receives FERC approval for its current Section 205 and 219 Filings with FERC (ER15-572-000).

2.3.4 Description of any prior bankruptcy declarations, material defaults, dissolution, merger or acquisition within the previous five years.

None of the Developers have been involved in any bankruptcy proceedings or any other adverse financial proceedings in the last five years that would materially adversely impact its ability to own or to execute a proposed Project.

Please refer to NYISO Response #6 for further information.

2.3.5 Other evidence that demonstrates current and expected capability to finance a project to solve a Public Policy Transmission Need.

Please refer to NYISO Response #7 for additional information.

As noted previously, Transco is a newly created entity which has made a filing with FERC for the three TOTS projects and two AC Proceeding projects. Until Transco gets approval from FERC, its members have received parental guarantees (KeySpan Corporation, Iberdrola USA Networks, Inc., CH Energy Group, Inc. and Consolidated Edison, Inc.) totaling approximately $3 billion to complete construction of these projects. Once Transco receives FERC approval, Transco will be recapitalized with an appropriate amount of long term debt to ensure compliance with Regulatory and Credit Rating requirements.

3.0 PROJECT INFORMATION REQUIREMENTS

3.1 Project Submittal Summary

Pursuant to the Commission's December 16, 2014 Order in the Alternating Current Transmission Upgrade Proceeding first established in November 2012,[2] the Applicant submits modifications to its initial project proposal filed in October 2013. In addition, eight alternative proposals are being submitted in response to the PSC February 2014 solicitation for alternative projects that increase UPNY/SENY transfers and increase Central East interface transfers while being constructed within existing right-of-way ("ROW"). All of these alternatives substantially improve upon the October 2013 submittal. These project alternatives are listed in Table 3.1. Each of these nine alternative proposals or projects will reduce congestion on the UPNY/SENY and/or Central East transmission interfaces by increasing transfer capability while also addressing the important issue of aging infrastructure. Many of these projects will replace transmission facilities that are approaching or beyond 100 years of age and will thereby ensure the future reliable and resilient operation of the transmission system. In addition to meeting these PSC objectives, the projects replace aging infrastructure integrate a range of economic, social, and environmental benefits, and achieve wider public policy objectives. The benefits and value of these proposed projects vary. However they all can be constructed within existing ROW or on properties already owned by the Applicant and most of them improve the visual impact over the current ROW configuration or they have no impact at all. The only project segment that may increase visual impact is the Oakdale to Fraser segment of the Oakdale to Fraser and Edic to New Scotland and Knickerbocker to Pleasant Valley Project.

The proposed project alternatives include transmission ROW segments defined by existing or proposed substation or switching station endpoints, with some segments being utilized by more than one project. The proposed project alternatives also include the addition of new switching stations and upgrades to existing substations. Segments and stations associated with the proposed projects are depicted on Figure 3.1. Each of the segments and most of the possible points of interconnection are within the existing transmission corridor network of the Applicant companies, of the New York Power Authority, and of Consolidated Edison.

For each of these alternative projects, all transmission lines will be constructed within existing ROW, with no need to acquire additional property to expand the ROW. Further, an innovative design approach allows most average structure heights to be at or close to existing structure heights, and provides an opportunity to reduce net impacts to wetlands and farmland along portions of the ROW.

[2] Order Establishing Modified Procedures for Comparative Evaluation, PSC case nos.12-T-0502, 13-E-0488, 113-T-0454, 1-T-0455, 13-T-0456, 13-M-0457, and 13-T-0461 (issued and effective December 16, 2014).

Each of the four UPNY/SENY Interface alternatives in Table 3.1 addresses system planning solutions that primarily increase transfer capability for the UPNY/SENY interface. These projects vary in complexity from simple (e.g. reconductoring) to more robust solutions that provide additional benefits of expandability, operability, resiliency, and a lessening of existing visual impacts.

Each of the five UPNY/SENY & Central East composite alternatives in Table 3.1 combines an UPNY/SENY solution with a Central East component (Edic to New Scotland). Increasing the transfer capability for the Central East interface will allow the upgrade on the UPNY/SENY interface to be more fully utilized and increase the benefits of reduced congestion across the State. These alternatives provide more robust overall system solutions, and create benefits such as adding multiple 345 kV paths on the bulk power systems, thereby significantly increasing system operational flexibility. These combined project segments also provide a more complete upgrade to relieve constraints from the Mohawk Valley down to the Hudson Valley. Further and particularly with the addition of the Central East component, aging transmission facilities are replaced with new, innovative designs.

Table 3.1: Applicant Proposed Alternatives

Description	Abbreviation
UPNY/SENY Interface Alternatives	
• Knickerbocker to Pleasant Valley 345 kV Transmission Line	KB-PV
• Leeds to Pleasant Valley 345 kV Transmission Line Reconductoring	LD-PV(R)
• Hurley Avenue PARs	HA
• New Scotland to Leeds 345 kV Transmission Line Reconductoring and Leeds to Pleasant Valley 345 kV Transmission Line	NS-LD(R)/LD-PV
UPNY/SENY & Central-East Composite Alternatives	
• Enhanced October 2013 Proposal	O-F/ED-PV
• Edic to New Scotland 345 kV Transmission Line and Knickerbocker to Pleasant Valley 345 kV Transmission Line	ED-NS/KB-PV
• Edic to New Scotland 345 kV Transmission Line and New Scotland to Leeds to Pleasant Valley 345 kV Transmission Line Reconductoring	ED-NS/NS-LD-PV(R)
• Edic to New Scotland 345 kV Transmission Line and Hurley Avenue PARs	ED-NS/HA
• Edic to New Scotland 345 kV Transmission Line and New Scotland to Leeds 345 kV Transmission Line Reconductoring and Leeds to Pleasant Valley 345 kV Transmission Line	ED-NS/NS-LD(R)/LD-PV

3.1.1 Alternative Project Discussion

These nine project alternatives are designed to achieve the primary objective of increasing the UPNY/SENY interface transfer by 1,000 MW. Seven of the nine projects proposed are able to meet this objective. They are also designed with a focus to strongly perform against the six criteria established by the PSC. These criteria include (1) increased transfer capability, (2) cost to ratepayers, (3) electric system impacts, (4) ability to utilize existing rights of way, (5) application of innovative technologies, and (6) environmental capability including visual impacts. While all nine alternative projects do not perform equally in all criteria, they each provide a

unique range of strengths to provide numerous benefits to the residents across New York. Aside from the transfer and congestion relief benefits, these alternatives provide operational flexibility and system reliability benefits that result in a more robust transmission system. They also provide increased emergency transfer capability, improved resource adequacy, a reduction in the amount of generation required to maintain system reliability, and greater flexibility to secure necessary outages to respond to transmission system emergencies and maintenance. Although resource adequacy studies have not been completed at this time, it is expected that the transfer increases provided by these alternatives are likely to mitigate the need for the new capacity zone in the Hudson Valley.

UPNY/SENY Alternatives

These projects are generally the lower cost proposals as they are primarily designed to address only transfer improvements on the UPNY/SENY interface.

- **LD-PV(R):** The LD-PV(R) Project increases UPNY/SENY transfers at a lower cost with few construction and environmental impacts. The Project by itself meets the full 1000 MW of UPNY/SENY transfer, though it does not improve the transfers across the Central-East interface. The Project does not address any of the aging infrastructure issues nor does it add to system resiliency.

- **HA:** The Hurley Avenue PARs Project increases UPNY/SENY transfers at a lower cost and with minimal construction and environmental impacts. The use of PARs increases operational flexibility by increasing interface UPNY/SENY transfers over all possible dispatch scenarios by improving operational flexibility. The Project by itself does not meet the full 1000 MW objective of UPNY/SENY transfer increase nor does it improve the transfers across the Central East interface. The Project does not address any of the aging infrastructure issues nor does it add to the system resiliency.

- **KB-PV:** The KB-PV Project fully meets the 1,000MW UPNY/SENY objective but it does not have Central East transfer benefits. As stated earlier for all of the projects, the Project will be constructed within the existing rights of way and the structure heights will be comparable to heights of existing structures. Further, there will be a reduction in the number of structures on the rights of way. The end result will improve the visual appearance of the rights of way. This Project will replace facilities over 80 years of age with new, more modern facilities and it will improve the operability and resiliency of the existing system.

- **NS-LD(R)/LD-PV:** The NS-LD(R)/LD-PV Project fully meets the 1,000 MW UPNY/SENY objective with some Central East transfer benefits. South of the Churchtown Substation the visual appearance of

the ROW will be improved in part by the replacement of aging infrastructure that is over 80 years of age. This Project will replace an existing 115kV river crossing with a 345kV river crossing, no net addition.

UPNY/SENY and Central East Alternatives

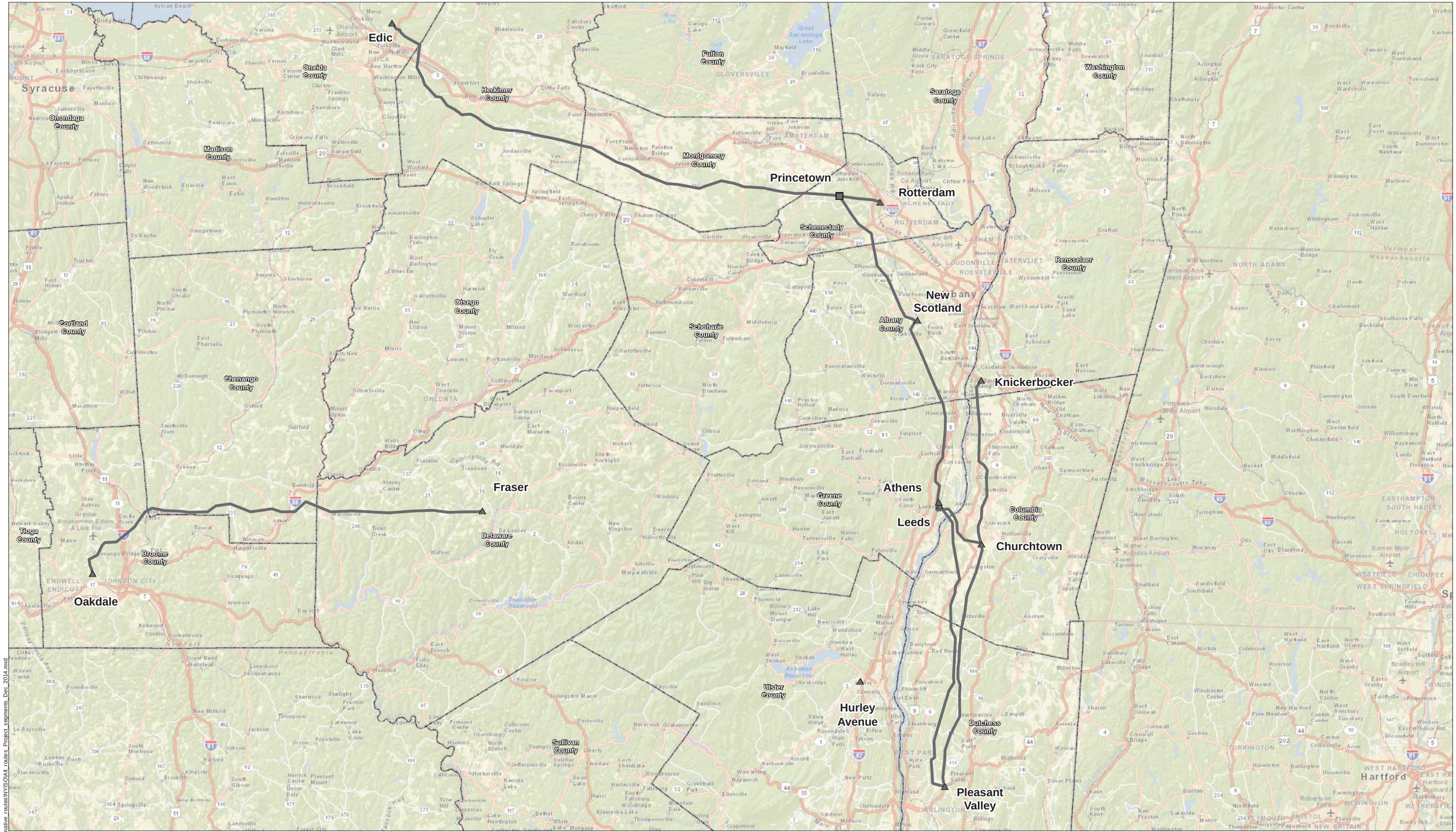
The UPNY/SENY and Central East projects meet or exceed the 1,000MW UPNY/SENY objectives and they provide significant Central East benefits. These projects are more costly, however, they provide significant system benefits including being able to address the issue of aging transmission infrastructure. These projects also improve the transmission system to enhance economic development opportunities. Further, since the ED-NS project replaces multiple structures with a single transmission structure, this removes many obstructions that currently exist with approved agricultural uses.

- **O-F/ED-PV:** Combining the KB-PV Project with the ED-NS component allows the upgrade on the UPNY-SENY interface to be more fully utilized and increase the benefits of reduced congestion across the State. It provides for a significant replacement of aging infrastructure and it adds to system resiliency. And importantly, the Oakdale-Fraser component facilitates the transfer capability to move renewable resources from the western part of the state to the eastern part of the state.[3]

- **ED-NS/KB-PV, ED-NS/NS-LD-PV(R), ED-NS/HA, and ED-NS/NS-LD(R)/LD-PV**: Combining Edic to New Scotland with each of these UPNY/SENY projects allows the upgrade on the UPNY-SENY interface to be more fully utilized and increase the benefits of reduced congestion across the State. It provides for a significant replacement of aging infrastructure and it improves the system resiliency.

Table 3.2 provides a characterization of the trade-offs associated with each of the proposed project alternatives. In general, more robust project solutions will have greater total costs but will provide the greater system benefits. Green shading indicates the biggest benefit or the lowest cost. Yellow shading provides a comparatively smaller benefit or a higher cost. Red shading provides the lowest overall benefit or the highest cost.

[3] It is also important to note that the Commission can consider the O-F component on its own merits separately from the ED-PV component. Similarly, either of these two components can be combined with Applicant's other alternative projects proposed in this proceeding.



Legend

- Proposed Project Station
- Proposed Project Junction
- Proposed Project Segment
- County Boundary

nationalgrid

Burns & McDonnell SINCE 1898

NYSEG

People. Power. Possibilities. Central Hudson A FORTIS COMPANY

Figure 3.1

Proposed Project Segments and Stations

January 2015

N W E S

0 5 10 20 30 40 Miles

Sources: BMcD Engineering, ESRI

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Table 3.2: Alternative Comparison Chart

	Transfer Capacity UPNY/ SENY	Transfer Capacity Central-East	Cost	Electric System Benefits[4]	Resiliency	Within Existing ROW	Agricultural/ Visual/ Wetland Impacts
KB-PV							
LD-PV (R)							
HA							
NS-LD (R) / LD-PV							
O-F / ED-PV							
ED-NS / KB-PV							
ED-NS / NS-LD-PV (R)							
ED-NS / HA							
ED-NS / NS-LD (R) / LD-PV							

[4] Electric System Benefits – The electric system benefits are comprised of two different categories; expandability and operability. Expandability refers to the proposed electric system additions' capability to serve system load increases and interconnect new generating facilities in the long-term. Operability refers to how the design of the proposed electric system addition will improve the ability of the system operator to take maintenance outages and have greater flexibility to dispatch generation with less transmission constraints.

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Enhanced October 2013 Project

Second Oakdale to Fraser 345 kV Transmission Line

and

Edic to New Scotland
345 kV Transmission Line
and

Knickerbocker to Pleasant Valley
345 kV Transmission Line Project
(O-F/ED-PV)

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SECOND OAKDALE TO FRASER 345 KV TRANSMISISON LINE
AND EDIC TO NEW SCOTLAND 345 KV TRANSMISSION LINE
AND KNICKERBOCKER TO PLEASANT VALLEY
345 KV TRANSMISSION LINE PROJECT
(O-F/ED-PV)

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3.3 Second Oakdale to Fraser 345 kV Transmission Line and Edic to New Scotland 345 kV Transmission Line and Knickerbocker to Pleasant Valley 345 kV Transmission Line Project (O-F/ED-PV)

3.3.1 Project Description

The Oakdale to Fraser and Edic to New Scotland and Knickerbocker to Pleasant Valley 345 kV Transmission Line Project (O-F/ED-PV) is comprised of six ROW segments: Oakdale to Fraser (O-F), Edic to Princetown Junction (ED-PT), Princetown Junction to New Scotland (PT-NS), Princetown Junction to Rotterdam (PT-RD), Knickerbocker to Churchtown (KB-CT), and Churchtown to Pleasant Valley (CT-PV). The Project includes the rebuild and expansion of the existing 230 kV Rotterdam Substation to include a 345 kV yard, modifications to the existing 345 kV Edic and New Scotland Substations, the construction of the new Knickerbocker 345 kV Switching Station, rebuild and expansion of the existing Churchtown 115 kV Switching Station, and modifications to the Consolidated Edison Pleasant Valley 345 kV Substation.

The location of the O-F/ED-PV Project is depicted in Figure O-F/ED-PV-1.

3.3.2 Physical Description

The Second Oakdale to Fraser 345 kV Transmission Line component of the Project consists of the construction of a new 345 kV transmission line of approximately 57.7 miles, starting at the Oakdale Substation in the Town of Union and terminating at the Fraser Substation in the Town of Delhi, built parallel to the existing 345 kV NYSEG Line #32 (the "Existing Line"). The substation work includes installation of new breakers, switches and other ancillary equipment which will be within the existing fenceline. The proposed design for this segment has been revised since the October 1, 2013 submission. Now, it will be constructed entirely within existing transmission line ROW using steel monopole structures, rather than lattice steel structures. To allow this, a modification/relocation involving one to three structures of the Existing Line will be made to provide adequate clearance between the new line and Existing Line. The Project ROW traverses Broome, Chenango and Delaware counties.

The ED-NS portion of the Project consists of the ED-PT, PT-NS, and PT-RD segments as described in further detail below.

The ED-PT Junction portion of the segment starts at the existing 345 kV Edic Substation in the Town of Marcy, Oneida County. The scope of work consists of the removal of two existing 230 kV lines and the construction of a new 345 kV line within approximately 66.8 miles of existing ROW. For approximately

12.6 miles out of Edic Substation, this will involve the removal of one set of 230 kV wires and insulators from each of the two existing 230/345 kV double-circuit monopole structures and the installation of one set of 345 kV wires and insulators to one of them. For the remaining approximately 54.2 miles, the two existing 230 kV H-frame structure lines will be removed and replaced with one new 345 kV line consisting predominately of H-frame structures. New 345 kV tubular steel monopole structures will be used intermittently through this segment for approximately 5.4 miles in total. All work at the existing 345 kV Edic Substation will be within the existing fenceline. This segment terminates at Princetown Junction in the Town of Princetown, Schenectady County. The ED-PT segment passes through the Towns of Marcy and Deerfield in Oneida County, the Towns of Schuyler, Frankfort, German Flatts, Little Falls, Stark, and Danube in Herkimer County, the Towns of Minden, Canajoharie, Root, Glen, Charleston, and Florida, in Montgomery County, and the Towns of Duanesburg and Princetown in Schenectady County.

The PT-NS segment starts at Princetown Junction. The scope of work consists of the construction of a new 345 kV line within approximately 19.7 miles of existing ROW. This segment will utilize approximately 11.5 miles of H-frame structures, 6.3 miles of monopole structures and 1.9 miles of 115/345 kV double-circuit monopole structures. This segment terminates at the existing 345 kV New Scotland Substation in the Town of New Scotland, Albany County. Work at the New Scotland Substation will require expansion of the existing fenceline. This expansion can occur within the substation property currently owned by National Grid. The PT-NS segment passes through the Town of Princetown in Schenectady County, and the Towns of Guilderland and New Scotland, in Albany County.

The PT-RD portion of the segment also starts at the Princetown Junction. The scope of work consists of the removal of two existing 230 kV H-frame structure lines and the construction of two new 345 kV compact monopole structure lines within approximately 5.0 miles of existing ROW. This segment terminates at the rebuilt and expanded 345 kV Rotterdam Substation in the Town of Rotterdam, Schenectady County. The rebuilt 345 kV Rotterdam Substation allows for the retirement of the two existing 230 kV lines between the existing 230 kV Porter Substation in the Town of Marcy, Oneida County and the existing 230 kV Rotterdam Substation. The work at the rebuilt 345 kV Rotterdam Substation will require expansion of the existing fenceline. This expansion can occur within the substation property currently owned by National Grid.

The KB-PV portion of the project consists of the KB-CT and CT-PV segments as described in further detail below.

Edic
(Existing 345 kV)

Princetown

Rotterdam
(Rebuilt 345 kV)

New Scotland
(Existing 345 kV)

Knickerbocker
(New 345 kV)

Churchtown
(Rebuilt 115 kV)

Pleasant
Valley
(Existing 345 kV)

Leeds

Athens

Hurley
Avenue

Fraser
(Existing 345 kV)

Oakdale
(Existing 345 kV)

Oneida County
Herkimer County
Fulton County
Saratoga County
Washington County
Onondaga County
Madison County
Montgomery County
Schenectady County
Rensselaer County
Albany County
Cortland County
Otsego County
Schoharie County
Chenango County
Greene County
Columbia County
Dutchess County
Ulster County
Delaware County
Broome County
Sullivan County

Legend

- New 345 kV Transmission Line (UPNY/SENY)
- New 345 kV Transmission Line (Central East)
- 345 kV Transmission Rebuild (Central East)
- New 345 kV Transmission Line (Total East)
- Other Project Segment
- Project Station
- Project Junction
- Other Project Station
- County Boundary

nationalgrid

Burns & McDonnell SINCE 1898

NYSEG

Figure O-F/ED-PV-1

Oakdale to Fraser and Edic to New Scotland and Knickerbocker to Pleasant Valley

January 2015

N W E S

0 5 10 20 30 40 Miles

Sources: BMcD Engineering, ESRI

I:\National_Grid\National_Grid_MXD\Alternative_routes\NYISO\Alt_routes_ED_NS_KB_PV_OD_FR_Dec_2014.mxd

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The KB-CT segment starts at the new 345 kV Knickerbocker Switching Station in the Town of Schodack, Rensselaer County. The scope of work consists of the removal of the existing 115 kV double-circuit lattice structure line and the construction of a new 115/345 kV double-circuit monopole structure line within approximately 21.9 miles of existing ROW. This segment terminates at the rebuilt and expanded 115 kV Churchtown Switching Station in the Town of Claverack, Columbia County. The rebuilt Churchtown Switching Station will require an expansion of the existing fence line. This expansion can occur within the substation property currently owned by NYSEG. The KB-CT segment passes through the Town of Schodack in Rensselaer County, and the Towns of Stuyvesant, Stockport, Ghent, and Claverack, in Columbia County.

The CT-PV segment starts at the rebuilt and expanded Churchtown Switching Station. The scope of work consists of the removal of two existing 115 kV double-circuit lattice structure lines, and the construction of a new 115/345 kV double-circuit monopole structure line within approximately 32.3 miles of existing ROW. This segment terminates at the existing Consolidated Edison 345 kV Pleasant Valley Substation in the Town of Pleasant Valley, Dutchess County. All work at the Pleasant Valley Substation will be within the existing fenceline. The CT-PV segment passes through the Towns of Claverack, Livingston, Gallatin, and Clermont in Columbia County, and the Towns of Milan, Clinton, and Pleasant Valley in Dutchess County.

Additional ancillary work on other system facilities may be required depending on the results of the NYISO system impact studies.

3.3.3 Electrical Description

It is the Applicant's expectation that the NYISO will prepare the analysis for the interface transfer impact for the O-F/ED-PV Project. However, the Applicant has undertaken this analysis and believes the N-1-1 transfer capability for UPNY-SENY to be increased in the range of 1,050 - 1,250 MW. In addition, this solution also increases the N-1 thermal Central-East transfer capability to be in the range of 350 - 450 MW.

Electrical single-line drawings of the 345 kV system, 115 kV system and individual switching stations and substations providing circuit-specific line and station data are provided in Section 1.0, Modeling Data.

Details of line upgrades for the O-F portion of the Project include:

a. Construct the new O-F segment with 1590 ACSR 54/19 “Falcon” conductor and two shield wires: (1) an optical ground wire and (2) an Alumoweld 7#7 Conductor.

b. The line will be supported by tubular steel monopole structures.

c. The structures will be galvanized and grey in color.

A summary of the substation modifications for the O-F portion of the Project includes:

a. Oakdale 345 kV Substation: Installation of new breakers and disconnect switches.

b. Fraser 345 kV Substation: Installation of new breakers and disconnect switches.

Details of line upgrades for the ED-NS portion of the Project include:

a. Construct the new 345 kV ED-NS transmission line between the Edic Substation and the New Scotland Substation using 2-bundle 954 kcmil ACSS “Cardinal” conductor primarily on new 345 kV structures. The majority of proposed structures from ED-PT will be between 0 feet (no difference) and 20 feet taller than what exists today. For approximately 3.6 miles of this 66.8 mile segment, the proposed structures will be 65 feet taller than what exists today. The proposed structures from PT-NS will be between 45 feet and 100 feet shorter than what exists today. The proposed structures from PT-RD will be between 30 feet shorter and 15 feet taller than what exists today.

b. Remove the two existing 230 kV lines between the Porter Substation and the Rotterdam Substation.

c. Interconnect the existing 345 kV Edic to New Scotland line into the rebuilt 345 kV Rotterdam Substation.

A summary of the substation modifications for the ED-NS portion of the Project includes:

a. Edic 345 kV Substation: Relocate the existing 345 kV Fraser line to the spare bay position and install a new circuit breaker. Terminate the new 345 kV New Scotland line to the bay position vacated by Fraser line. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

b. New Scotland 345 kV Substation: At the New Scotland Substation, new circuit breakers and a new line position will be added between the two existing bus sections. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. Rotterdam 345 kV Substation: Construct a new 345 kV yard on the existing 230 kV Rotterdam Substation site, connecting the existing 345 kV Edic to New Scotland line, the existing 230 kV Rotterdam to Eastover Road line, and to a rebuilt 115 kV yard.

Details of line upgrades for the KB-PV portion of the Project include:

a. Construct the new 345 kV KB-PV transmission line between the new Knickerbocker Switching Station and the existing Pleasant Valley Substation using 2-bundle 954 kcmil ACSS "Cardinal" conductor on new double-circuit 115/345 kV structures. The proposed structures for KB-PV will be between 5 feet shorter to 10 feet taller than what exists today.

b. Remove the existing 115 kV double-circuit lattice structure line in the ROW between the new Knickerbocker Switching Station and Churchtown Switching Station and the two existing 115 kV double-circuit lattice structure lines in the ROW between the Churchtown Switching Station and the existing Pleasant Valley Substation.

c. Rebuild a single 115 kV line between the new Knickerbocker Switching Station and the existing Pleasant Valley Substation using single 954 kcmil ACSS "Cardinal" conductor on the new double-circuit 115/345 kV structures.

A summary of the substation modifications for the KB-PV portion of the Project includes:

a. Knickerbocker 345 kV Switching Station: Construct new 345 kV Knickerbocker Switching Station connecting to the existing 345 kV New Scotland-Alps line and the new 345 kV Knickerbocker-Pleasant Valley line.

b. Pleasant Valley 345 kV Substation: Relocate the existing 345 kV Long Mountain line to the spare bay position and install a new circuit breaker. Terminate the new 345 kV Knickerbocker line to the bay position vacated by the Long Mountain line. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. Churchtown Switching Station: Demolish and construct a new expanded 115 kV switching station at Churchtown on the existing Churchtown 115 kV Substation site.

3.3.4 Innovations Incorporated

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.3.5 Other Technologies and Methods Being Studied

[redacted]

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.3.6 Evidence of Commercially Viable Technology

The transmission facilities proposed for the O-F/ED-PV Project consist of materials that have been successfully used on transmission lines for decades, including transmission lines in New York.

Overhead Transmission Engineering

Structures will consist of tubular steel, natural wood, or laminated wood. Conductors used on the project will be aluminum and either steel reinforced (ACSR) or steel supported (ACSS). Although ACSS is less commonly used, both ACSR and ACSS have been used throughout the industry for 40 years. Hardware on the project will consist of traditional ceramic insulators and various metallic connectors. The latest composite core conductors, ACCR and ACCC, which have been in commercial operation for over 10 years, were also evaluated. It was determined that the proposed project can realize the same benefits with ACSS and ACSR for a fraction of the cost of using ACCR or ACCC. It is estimated that the use of ACCR conductor would increase total project costs by approximately 30 percent.

Substation Engineering

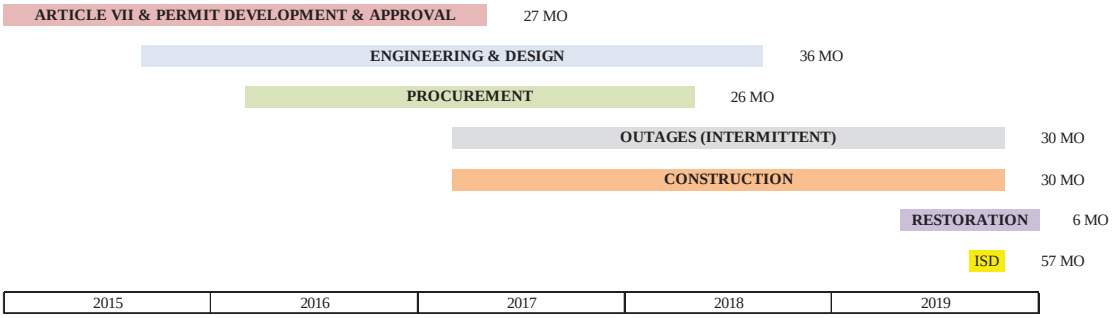
Structures will consist of tubular steel. The primary conductor used within the substations will be tubular rigid aluminum. Jumpers and strain conductors will consist of single and bundled steel reinforced aluminum conductor ACSR or all aluminum conductor AAC. Circuit breakers will be of the SF6 type, and shall be isolated with open air gang operated disconnect switches. Hardware within the stations will consist of traditional ceramic insulators and various metallic connectors. The structures, conductor equipment, and hardware used within the substations have been used throughout the industry for over 60 years. The application for these stations will utilize the latest manufacturing and operational technology based on this proven technology. All substations will be enclosed within an 8-foot high chain link security fence.

All material proposed for use on the project can be procured through traditional industry channels.

3.3.7 Schedule

The O-F/ED-PV Project is expected to take approximately 57 months to complete. Construction of substations and overhead lines is expected to take approximately 30 months. A high level schedule for the O-F/ED-PV Project is provided in Figure O-F/ED-PV-2. Assumptions built into the project schedule include: commencement of Part B filing in September 2015; staggered EM&CP filing and approvals; procurement of long lead items begin prior to final EM&CP approval; and intermittent outage schedules that include consideration for summer reliability constraints.

Figure O-F/ED-PV-2: Proposed Project Schedule



A conceptual construction sequencing plan developed for the ED-NS/KB-PV portions of the Project identifies outage requirements, as listed in Table ED-NS/KB-PV-1 and Table ED-NS/KB-PV-2, below. While developed to ensure a continual source of power to all affected substations, the construction sequence and outage plans are subject to change pending further load flow and system reliability studies. No long-term outages were scheduled during the summer peak load months of June through August. As most of the outages are to the 230 kV system and only a few to the bulk power system, it is not anticipated that there will be any appreciable congestion costs associated with this construction plan. The Oakdale to Fraser segment is being built adjacent to the existing line and is expected to require only outages for cutovers.

In addition to considering potential outage-related constraints, scheduling of construction activities to avoid or minimize impacts to sensitive environmental resources will need to be considered in developing the EM&CP and in developing the associated construction sequencing plan.

Table ED-NS/KB-PV-1:
Long Term Outages with no Emergency Return to Service Restoration Ability

Line or Sectionalized Line Segment Out of Service	Duration (weeks)	Approximate Time Frame
#13 Rotterdam-New Scotland 115 kV Line	3	Spring 2017
#31 Porter-Rotterdam 230 kV Line	10	Fall 2017
#30 Porter-Rotterdam 230 kV Line	14	Spring 2018
Ft. Orange (future)-Valkin Section of #15 Greenbush-Ft. Orange-Valkin-Hudson 115 kV Line & Schodack-Valkin Section of #14 Schodack-Valkin-Churchtown 115 kV Line	10	Fall 2017
Valkin-Hudson Section of #15 Greenbush-Ft. Orange-Valkin-Hudson 115 kV Line & Valkin-Churchtown Section of #14 Schodack-Valkin-Churchtown 115 kV Line	21	Fall 2017 to Spring 2018
ADM Milling-Pleasant Valley Section of #12 Hudson-ADM Milling-Pleasant Valley 115 kV Line & Valkin-Churchtown Section of #14 Schodack-Valkin-Churchtown 115 kV Line	9	Spring 2018
Hudson-ADM Milling Section of #12 Hudson-ADM Milling-Pleasant Valley 115 kV Line & Valkin-Churchtown Section of #14 Schodack-Valkin-Churchtown 115 kV Line	5	Fall 2018
T7 North Catskill-Milan 115 kV Line	6	Fall 2018

Table ED-NS/KB-PV-2:
Short Term Outages with no Emergency Return to Service Restoration Ability[2]

Line Out of Service	Duration (days)
#8 Lafarge-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line	1
#10 Milan-Pleasant Valley 115 kV Line	1
#12 Hudson-ADM Milling-Pleasant Valley 115 kV Line &	1
#13 Churchtown-Pleasant Valley 115 kV Line	1
#14 Schodack-Valkin-Churchtown 115 kV Line	1
#15 Greenbush-Ft. Orange-Valkin-Hudson 115 kV Line	1
T7 North Catskill-Milan 115 kV Line	1
#984 Churchtown-Craryville 115 kV Line	1
#398 Pleasant Valley-Long Mt. 345 kV Line	1-2
#2 New Scotland-Alps 345 kV Line	1-2
#14 Marcy-New Scotland 345 kV Line	2-3
(NYPA) Edic - Fraser 345 kV Line	1-2
(NYPA) #1 New Scotland-Gilboa 345 kV Line	3-4
#94 New Scotland-Leeds 345 kV Line	3-4

3.3.8 Capital Cost Estimates

See Attachment 3 for the capital cost estimate.

3.3.9 Risk Assessment

Permitting Risks

a. The proposed schedule includes 27 months to develop, file and obtain permits from state and federal agencies. A number of these approvals may lead to additional analysis or approvals. Schedule delays such as delay in commencing the Article VII Part B process and the ACOE permit can impact the project in-service date which will increase project costs. Complete permit filings along with efficient permit processes will minimize any potential schedule delays.

b. It is assumed that the Article VII development and Certificate approval process will not exceed 12 months.

[2] Lines identified may be subjected to multiple short term outages as will be required for sectionalizing, station cut-overs and wire installation crossings.

c. Since a number of environmental field investigations must take place in order to produce state and federal permit applications, schedule delays that push the window for field investigations outside of the proper season could delay the permitting development process an additional year.

d. Although the Applicant is striving to address known environmental issues, unanticipated permit requirements imposed by regulatory agencies can extend construction schedules, impact the in-service date, and increase project costs. For example, there may be a limitation on when the trees can be cleared for protection measures associated with the Northern Long Eared Bat.

e. The Cricket Valley Project is in the queue for utilizing the spare bay position at the Consolidated Edison Pleasant Valley 345 kV Substation. If the Cricket Valley Project should get approved before this project, a bay addition would be required, which could increase the permitting schedule and will increase project costs.

Procurement Risk

a. The proposed schedule provides for up to 26 months for the procurement of construction services and major equipment with long lead times (e.g. circuit breakers, disconnect switches). Risks can include raw material and manufacturing availability, quality and delivery logistics. Currently, the Applicant does not see fabrication and delivery problems with the major equipment needed for this Project. However, if markets change, delays could impact the in-service date

Construction Risk

a. During detailed design, subsurface core borings are performed in intervals along the Project route. During construction, unforeseen field conditions (e.g. excessive ground water, shallow bedrock, nested boulders, etc.) can be encountered. Typically, unforeseen field conditions result in an increased cost to the project. In more extreme cases, schedule impacts also occur.

b. Execution of a large construction project can include project management risks including securing a large number of labor resources, coordinating project activities, managing schedule, and keeping the project within budget.

c. The proposed schedule provides approximately 30 months for needed intermittent outage windows. If construction sequencing, outage sequencing plans, and commissioning sequencing are delayed due to system conditions and new outages take longer to schedule, the in-service date (as well as the overall Project cost) can be affected.

3.3.10 Status of NYISO Interconnection Studies

For the O-F portion of the Project, the NYISO issued the draft SIRS report to NYSEG on November 20, 2014. NYSEG reviewed the draft report and has not further comments at this time. It is anticipated that the NYISO will be issuing the final SIRS report soon.

For the ED-NS/KB-PV portion of the Project, Applicant has not yet filed with the NYISO an interconnection request for this portion of the Project and plans to file the request shortly after the filing of this submission.

3.3.11 Status of Equipment Availability and Procurement

No equipment has yet been procured for the Project.

Long lead items for the switching stations and substations for this Project include circuit breakers, disconnect switches, support and bus structures, dead end structures, lightning arresters, lightning masts, capacitor coupled voltage transformers, and control enclosures. Typical lead times for these items range from 8 to 30 weeks. This equipment is currently not expected to cause schedule delays and are common station procurement items.

Long lead items for overhead construction include 345 kV structures (lead times of approximately 20 to 26 weeks) and overhead conductor (lead times of approximately 12 to 16 weeks). This equipment is not currently expected to cause schedule delays.

3.3.12 Status of Contracts

There are currently no contracts under negotiation or in place relative to this Project.

3.3.13 Demonstration of Site Control

The Project will be constructed entirely within existing Applicant ROW on property either owned in fee by the Applicant or on property which the Applicant has easements for transmission construction. The Applicant has site control of all station locations with the exception of the 345 kV Pleasant Valley Substation which is owned by Consolidated Edison.

3.3.14 Status of Permits

No permits or certificates for the O-F/ED-PV Project have been received to date. Long lead permits include concurrent submittal and review for an Article VII Certificate and ACOE 404 Permit, and DPS

EM&CP approval (post Article VII approval, staggered submissions over 19 months). A full list of permits is provided in Table O-F/ED-PV-3.

Table O-F/ED-PV-3: Permits/Certificates Required

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Federal Permits					
Sections 10 (Rivers and Harbors Act of 1899) and 404 (Clean Water Act Permit)	U.S. Army Corps of Engineers, Buffalo [ED-NS only] and NY Districts (ACOE) - in consultation with U.S. Fish & Wildlife Service (USFWS) and tribes	All areas impacting jurisdictional waters/wetlands (Tidally influenced waters and Waters of the U. S.)		1 year after submittal	Prior to impacting jurisdictional waters/wetlands and start of construction
Threatened & Endangered Species (Endangered Species Act)	U.S. Fish & Wildlife Service (USFWS)	Areas that could contain potential T&E species or their respective habitat	Occurs during the review and approval by the ACOE		Prior to impacting areas that could contain potential T&E species or their respective habitat
Federal Aviation Administration (FAA) Notification of Construction or Alteration	Regional FAA Office	Any portion of the project (permanent structures or cranes) potentially affecting navigable airspace (structures over 200' in height or are located within a certain distance of an airport)	Concurrent with filing of EM&CP		Prior to applying for other construction related permits
State Permits					
Article VII Certificate of Environmental Compatibility and Public Need (Certificate) Approval	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
Environmental Management and Construction Plan (EM&CP)	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
State 401 Water Quality Certification	New York State Public Service Commission	All areas impacting jurisdictional waters/wetlands	Concurrent with Part B application		Concurrently with EM&CP Approval

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
State Permits, Continued					
SPDES General Permit (GP) for Stormwater Discharges from Construction Activities and New York State-Regulated Wetlands and Protected Waters	New York State Department of Environmental Conservation (NYSDEC)	Entire Project (segments, substations, laydown areas, staging areas, etc.)	Concurrent with filing of EM&CP		Prior to initiating any land disturbing activities, including vegetation clearing
Municipal Stormwater (MS4) Review	Town, city or village	All components in MS4 jurisdictions (if applicable)	Prior to completing/filing the EM&CP		
Cultural Resources Review (National Historical Preservation Act - NHPA)	New York State Parks (State Historic Preservation Officer [SHPO])	Entire project	Concurrent with filing of Part B application		Before starting construction in off-road areas or areas that have not been previously disturbed
Work Permit for Canal Crossing	New York State Canal Corporation	Where the Project crosses the Erie Canal	Coordination prior to construction (need final project design)		
Department of Transportation Utility Work Permit	NY DOT	Installation of utilities within or adjacent to state highway ROWs.	Coordination prior to construction (need final project design)		Construction
Hudson River Crossing					
Easement	State of New York Office of Parks, Recreation and Historic Preservation		Coordination prior to Part B application submittal		
Notification	Office of General Services		Coordination prior to Part B application submittal		

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Municipal Permits (Article VII Certificate Approval Supersedes Most Municipal Environmental Related Permits)					
Municipal Consultation Filing	City/Town	Entire Project	Coordination prior to Part B application submittal		
Local Airport Operator Review		Airports and aviation facilities within 5 miles of the Project	Coordination prior to construction (need final project design)		
Railroad ROW Entry Permit	Railroad Company	ROW access for design purposes	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)
Railroad ROW Construction Authorization	Railroad Company	Activities located within railroad right-of-way (ROW)	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)

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Knickerbocker to Pleasant Valley 345 kV Transmission Line Project (KB-PV)

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KNICKERBOCKER TO PLEASANT VALLEY
345 KV TRANSMISSION LINE PROJECT
(KB-PV)

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3.4 Knickerbocker to Pleasant Valley 345 kV Transmission Line Project (KB-PV)

3.4.1 Project Description

The Knickerbocker to Pleasant Valley 345 kV Transmission Line Project (KB-PV) is comprised of two right-of-way (ROW) segments, Knickerbocker to Churchtown (KB-CT) and Churchtown to Pleasant Valley (CT-PV), and includes the construction of the new Knickerbocker 345 kV Switching Station, rebuild and expansion of the existing Churchtown 115 kV Switching Station, and modifications to the existing Consolidated Edison Pleasant Valley 345 kV Substation.

The location of the KB-PV Project is depicted in Figure KB-PV-1.

3.4.2 Physical Description

The KB-CT segment starts at the new 345 kV Knickerbocker Switching Station in the Town of Schodack, Rensselaer County. The scope of work consists of the removal of the existing 80 year old 115 kV double-circuit lattice structure line and the construction of a new 115/345 kV double-circuit monopole structure line within approximately 21.9 miles of existing ROW. This segment terminates at the rebuilt and expanded 115 kV Churchtown Switching Station in the Town of Claverack, Columbia County. The rebuilt Churchtown Switching Station will require an expansion of the existing fenceline. This expansion can occur within the substation property currently owned by NYSEG. The KB-CT segment passes through the Town of Schodack in Rensselaer County, and the Towns of Stuyvesant, Stockport, Ghent, and Claverack, in Columbia County.

The CT-PV segment starts at the rebuilt and expanded Churchtown Switching Station. The scope of work consists of the removal of two existing 115 kV double-circuit lattice structure lines, and the construction of a new 115/345 kV double-circuit monopole structure line within approximately 32.3 miles of existing ROW. This segment terminates at the existing Consolidated Edison 345 kV Pleasant Valley Substation in the Town of Pleasant Valley, Dutchess County. All work at the Pleasant Valley Substation will be within the existing fenceline. The CT-PV segment passes through the Towns of Claverack, Livingston, Gallatin, and Clermont in Columbia County, and the Towns of Milan, Clinton, and Pleasant Valley in Dutchess County.

Additional ancillary work on other system facilities may be required depending on the results of the NYISO system impact studies.

3.4.3 Electrical Description

A System Impact Study (SIS) for National Grid's Knickerbocker-Pleasant Valley 345 kV line project (Queue #384) was completed in July 2013. The project reviewed in this SIS increased the N-1 normal thermal transfer capability on the UPNY-SENY interface by 1,250 MW and the Central-East N-1 normal thermal interface increased by 400 MW. Using the most up-to-date modeling information available, internal studies continue to show an N-1 normal thermal increase of approximately 1,150 MW on UPNY-SENY and 350 MW on Central-East.

Electrical single-line drawings of the 345 kV system, 115 kV system and individual switching stations and substations providing circuit-specific line and station data are contained in the confidential data provided in Section 1.0, Modeling Data.

Details of the KB-PV Project line upgrades include**:**

a. Construct the new 345 kV KB-PV transmission line between the new Knickerbocker Switching Station and the existing Pleasant Valley Substation using 2-bundle 954 kcmil ACSS "Cardinal" conductor on new double-circuit 115/345 kV structures. The proposed structures for KB-PV will be between 5 feet shorter to 10 feet taller than what exists today.

b. Remove the existing 115 kV double-circuit lattice structure line in the ROW between the new Knickerbocker Switching Station and rebuilt and expanded Churchtown Switching Station and the two existing 115 kV double-circuit lattice structure lines in the ROW between the Churchtown Switching Station and the existing Pleasant Valley Substation.

c. Rebuild a single 115 kV line between the new Knickerbocker Switching Station and the existing Pleasant Valley Substation using single 954 kcmil ACSS "Cardinal" conductor on the new double-circuit 115/345 kV structures.

A summary of the station modifications include:

a. Knickerbocker 345 kV Switching Station: Construct new 345 kV Knickerbocker Switching Station connecting to the existing New Scotland-Alps 345 kV circuit and the new Knickerbocker-Pleasant Valley 345 kV circuit.

b. Pleasant Valley 345 kV Substation: Relocate the existing 345 kV Long Mountain line to the spare bay position and install a new circuit breaker. Terminate the new 345 kV Knickerbocker

Edic
Princetown
Rotterdam
New Scotland
Knickerbocker (New 345 kV)
Churchtown (Rebuilt 115 kV)
Pleasant Valley (Existing 345 kV)
Athens
Leeds
Fraser
Oakdale
Hurley Avenue
Oneida County
Herkimer County
Fulton County
Saratoga County
Washington County
Onondaga County
Madison County
Montgomery County
Schenectady County
Rensselaer County
Albany County
Cortland County
Otsego County
Schoharie County
Chenango County
Greene County
Columbia County
Dutchess County
Tioga County
Broome County
Delaware County
Sullivan County
Ulster County
Syracuse
Utica
Schenectady
Albany
Hartford

Legend

- New 345 kV Transmission Line (UPNY/SENY)
- Other Project Segment
- Project Station
- Other Project Station
- Other Project Junction
- County Boundary

nationalgrid

Burns & McDonnell SINCE 1898

Figure KB-PV-1

Knickerbocker to Pleasant Valley

January 2015

N W E S

0 5 10 20 30 40 Miles

Sources: BMcD Engineering, ESRI

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line to the bay position vacated by the Long Mountain line. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. Churchtown Switching Station: Demolish existing Churchtown 115 kV switching station and construct a new expanded 115 kV switching station at Churchtown on the existing site.

3.4.4 Innovations Incorporated

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[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

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3.4.5 Other Technologies and Methods Being Studied

[redacted]

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

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[redacted]

[redacted]

3.4.6 Evidence of Commercially Viable Technology

The transmission facilities proposed for the various projects consist of materials that have been successfully used on transmission lines for decades, including transmission lines in New York.

Overhead Transmission Engineering

Structures will consist of tubular steel, natural wood, or laminated wood. Conductors used on the project will be aluminum and either steel reinforced (ACSR) or steel supported (ACSS). Although ACSS is less commonly used, both ACSR and ACSS have been used throughout the industry for 40 years. Hardware on the project will consist of traditional ceramic insulators and various metallic connectors. The latest composite core conductors, ACCR and ACCC, which have been in commercial operation for over 10 years, were also evaluated. It was determined that the proposed project can realize the same benefits with ACSS and ACSR for a fraction of the cost of using ACCR or ACCC. It is estimated that the use of ACCR conductor would increase total project costs by approximately 30 percent.

Substation Engineering

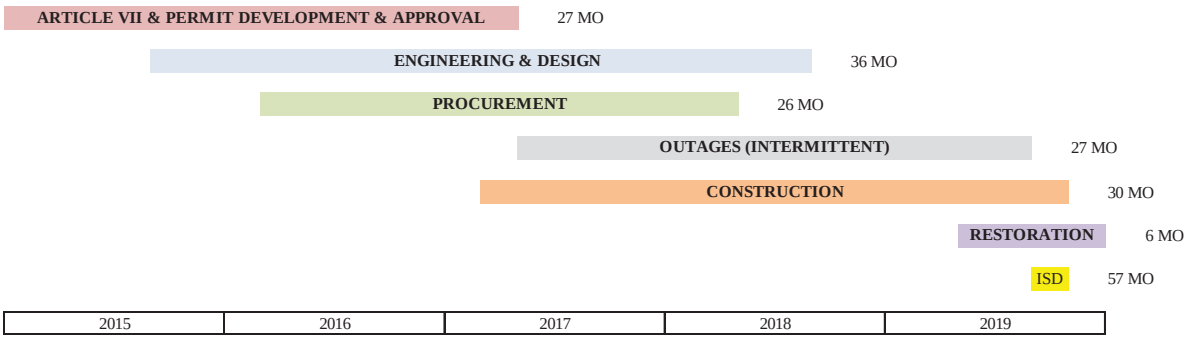
Structures will consist of tubular steel. The primary conductor used within the substations will be tubular rigid aluminum. Jumpers and strain conductors will consist of single and bundled steel reinforced aluminum conductor ACSR. Circuit breakers will be of the SF6 type, and shall be isolated with open air gang operated disconnect switches. Hardware within the stations will consist of traditional ceramic insulators and various metallic connectors. The structures, conductor equipment, and hardware used within the substations have been used throughout the industry for over 60 years. The application for these stations will utilize the latest manufacturing and operational technology based on this proven technology. All substations will be enclosed within an 8-foot high chain link security fence.

All material proposed for use on the project can be procured through traditional industry channels.

3.4.7 Schedule

The KB-PV Project is expected to take approximately 57 months to complete. Construction of substations and overhead lines is expected to take approximately 30 months. A high level schedule for the KB-PV Project is provided in Figure KB-PV-2. Assumptions built into the project schedule include: commencement of Part B filing in September 2015; staggered EM&CP filing and approvals; procurement of long lead items begin prior to final EM&CP approval; and intermittent outage schedules that include consideration for summer reliability constraints.

Figure KB-PV-2: Proposed Project Schedule



A conceptual construction sequencing plan developed for this Project identifies outage requirements, as listed in Table KB-PV-1 and Table KB-PV-2, below.

Table KB-PV-1:
Long Term Outages with no Emergency Return to Service Restoration Ability

Line or Sectionalized Line Segment Out of Service	Duration (weeks)	Approximate Time Frame
Ft. Orange (future)-Valkin Section of #15 Greenbush-Ft. Orange-Valkin-Hudson 115 kV Line & Schodack-Valkin Section of #14 Schodack-Valkin-Churchtown 115 kV Line	10	Fall 2017
Valkin-Hudson Section of #15 Greenbush-Ft. Orange-Valkin-Hudson 115 kV Line & Valkin-Churchtown Section of #14 Schodack-Valkin-Churchtown 115 kV Line	21	Fall 2017 to Spring 2018
ADM Milling-Pleasant Valley Section of #12 Hudson-ADM Milling-Pleasant Valley 115 kV Line & Valkin-Churchtown Section of #14 Schodack-Valkin-Churchtown 115 kV Line	9	Spring 2018
Hudson-ADM Milling Section of #12 Hudson-ADM Milling-Pleasant Valley 115 kV Line & Valkin-Churchtown Section of #14 Schodack-Valkin-Churchtown 115 kV Line	5	Fall 2018
T7 North Catskill-Milan 115 kV Line	6	Fall 2018

Table KB-PV-2:
Short Term Outages with no Emergency Return to Service Restoration Ability[2]

Line Out of Service	Duration (days)
#8 Lafarge-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line	1
#10 Milan-Pleasant Valley 115 kV Line	1
#12 Hudson-ADM Milling-Pleasant Valley 115 kV Line &	1
#13 Churchtown-Pleasant Valley 115 kV Line	1
#14 Schodack-Valkin-Churchtown 115 kV Line	1
#15 Greenbush-Ft. Orange-Valkin-Hudson 115 kV Line	1
T7 North Catskill-Milan 115 kV Line	1
#984 Churchtown-Craryville 115 kV Line	1
#398 Pleasant Valley-Long Mt. 345 kV Line	1-2
#2 New Scotland-Alps 345 kV Line	1-2

While developed to ensure a continual source of power to all affected substations, the construction sequence and outage plans are subject to change pending further load flow and system reliability studies. No long-term outages were scheduled during the summer peak load months of June through August. As most of the outages are to the 115 kV system and only a few to the bulk power system, it is not anticipated that there will be any appreciable congestion costs associated with this construction plan.

In addition to considering potential outage-related constraints, scheduling of construction activities to avoid or minimize impacts to sensitive environmental resources will need to be considered in developing the EM&CP and in developing the associated construction sequencing plan.

3.4.8 Capital Cost Estimate

See Attachment 3 for capital cost estimate.

3.4.9 Risk Assessment

Permitting Risks

a. The proposed schedule includes 27 months to develop, file and obtain permits from state and federal agencies. A number of these approvals may lead to additional analysis or approvals. Schedule delays such as delay in commencing the Article VII Part B process and the ACOE

[2] Lines identified may be subjected to multiple short term outages as will be required for sectionalizing, station cut-overs and wire installation crossings.

permit can impact the project in-service date which will increase project costs. Complete permit filings along with efficient permit processes will minimize any potential schedule delays.

b. It is assumed that the Article VII Certificate approval process will not exceed 12 months.

c. Since a number of environmental field investigations must take place in order to produce state and federal permit applications, schedule delays that push the window for field investigations outside of the proper season could delay the permitting development process an additional year.

d. Although the Applicant is striving to address known environmental issues, unanticipated permit requirements imposed by regulatory agencies can extend construction schedules, impact the in-service date, and increase project costs. For example, there may be a limitation on when the trees can be cleared for protection measures associated with the Northern Long Eared Bat.

e. The Cricket Valley Project is in the queue for utilizing the spare bay position at the Consolidated Edison Pleasant Valley 345 kV Substation. If the Cricket Valley Project should get approved before this project, a bay addition would be required (with no expansion of the existing fenceline), which could increase the permitting schedule and will increase project costs.

Procurement Risks

a. The proposed schedule provides for up to 26 months for the procurement of construction services and major equipment with long lead times (e.g. circuit breakers, disconnect switches). Risks can include raw material and manufacturing availability, quality and delivery logistics. Currently, the Applicant does not see fabrication and delivery problems with the major equipment needed for this Project. However, if markets change, delays could impact the in-service date.

Construction Risks

a. During detailed design, subsurface core borings are performed in intervals along the Project route. During construction, unforeseen field conditions (e.g. excessive ground water, shallow bedrock, nested boulders, etc.) can be encountered. Typically, unforeseen field conditions result in an increased cost to the project. In more extreme cases, schedule impacts also occur.

b. Execution of a large construction project can include project management risks including securing a large number of labor resources, coordinating project activities, managing schedule, and keeping the project within budget.

c. The proposed schedule provides approximately 27 months for needed intermittent outage windows. If construction sequencing, outage sequencing plans, and commissioning sequencing are delayed due to system conditions and new outages take longer to schedule, the in-service date (as well as the overall Project cost) can be affected.

3.4.10 Status of NYISO Interconnection Studies

A System Impact Study (SIS) for National Grid's Knickerbocker to Pleasant Valley 345 kV line project (Queue #384) was completed in July 2013. National Grid plans to confer with the NYISO to seek a determination whether the minor modifications to the 115 kV system in the area of Columbia and Dutchess Counties constitute a material modification from the previously completed SIS. The Applicant has prepared a revised scoping document and is ready to start the NYISO review process shortly after this filing.

3.4.11 Status of Equipment Availability and Procurement

No equipment has yet been procured for the Project.

Long lead items for the Knickerbocker and Churchtown Switching Stations, and the Pleasant Valley Substation, include circuit breakers, disconnect switches, support and bus structures, dead end structures, lightning arresters, lightning masts, capacitor coupled voltage transformers, and control enclosures. Typical lead times for these items range from 8 to 30 weeks. This equipment is currently not expected to cause schedule delays and are common station procurement items.

Long lead items for overhead construction include 345 kV structures (lead times of approximately 20 to 26 weeks) and overhead conductor (lead times of approximately 12 to 16 weeks). This equipment is not currently expected to cause schedule delays.

3.4.12 Status of Contracts

There are currently no contracts under negotiation or in place relative to this Project.

3.4.13 Demonstration of Site Control

The Project will be constructed entirely within existing Applicant ROW on property either owned in fee by the Applicant or on property which the Applicant has easements for transmission construction. The Applicant has site control of all station locations with the exception of the 345 kV Pleasant Valley Substation which is owned by Consolidated Edison.

3.4.14 Status of Permits

No permits or certificates for the KB-PV Project have been received to date. Long lead permits include concurrent submittal and review for an Article VII Certificate and ACOE 404 Permit, and DPS EM&CP approval (post Article VII approval, staggered submissions over 19 months). A full list of permits is provided in Table KB-PV-3.

Table KB-PV-3: Permits/Certificates Required

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Federal Permits					
Sections 10 (Rivers and Harbors Act of 1899) and 404 (Clean Water Act Permit)	U.S. Army Corps of Engineers, Buffalo [ED-NS only] and NY Districts (ACOE) - in consultation with U.S. Fish & Wildlife Service (USFWS) and tribes	All areas impacting jurisdictional waters/wetlands (Tidally influenced waters and Waters of the U. S.)		1 year after submittal	Prior to impacting jurisdictional waters/wetlands and start of construction
Threatened & Endangered Species (Endangered Species Act)	U.S. Fish & Wildlife Service (USFWS)	Areas that could contain potential T&E species or their respective habitat	Occurs during the review and approval by the ACOE		Prior to impacting areas that could contain potential T&E species or their respective habitat
Federal Aviation Administration (FAA) Notification of Construction or Alteration	Regional FAA Office	Any portion of the project (permanent structures or cranes) potentially affecting navigable airspace (structures over 200' in height or are located within a certain distance of an airport)	Concurrent with filing of EM&CP		Prior to applying for other construction related permits
State Permits					
Article VII Certificate of Environmental Compatibility and Public Need (Certificate) Approval	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
Environmental Management and Construction Plan (EM&CP)	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
State 401 Water Quality Certification	New York State Public Service Commission	All areas impacting jurisdictional waters/wetlands	Concurrent with Part B application		Concurrently with EM&CP Approval

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
State Permits, Continued					
SPDES General Permit (GP) for Stormwater Discharges from Construction Activities and New York State-Regulated Wetlands and Protected Waters	New York State Department of Environmental Conservation (NYSDEC)	Entire Project (segments, substations, laydown areas, staging areas, etc.)	Concurrent with filing of EM&CP		Prior to initiating any land disturbing activities, including vegetation clearing
Municipal Stormwater (MS4) Review	Town, city or village	All components in MS4 jurisdictions (if applicable)	Prior to filing the EM&CP		
Cultural Resources Review (National Historical Preservation Act - NHPA)	New York State Parks (State Historic Preservation Officer [SHPO])	Entire project	Concurrent with filing of Part B application		Before starting construction in off-road areas or areas that have not been previously disturbed
Department of Transportation Utility Work Permit	NY DOT	Installation of utilities within or adjacent to state highway ROWs.	Coordination prior to construction (need final project design)		Construction
Municipal Permits (Article VII Certificate Approval Supersedes Most Municipal Environmental Related Permits)					
Municipal Consultation Filing	City/Town	Entire Project	Coordination prior to Part B application submittal		
Local Airport Operator Review		Airports and aviation facilities within 5 miles of the Project	Coordination prior to construction (need final project design)		
Railroad ROW Entry Permit	Railroad Company	ROW access for design purposes	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)
Railroad ROW Construction Authorization	Railroad Company	Activities located within railroad right-of-way (ROW)	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)

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Leeds to Pleasant Valley 345 kV Transmission Line Reconductoring Project (LD-PV(R))

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LEEDS TO PLEASANT VALLEY 345 KV TRANSMISSION LINE RECONDUCTORING PROJECT (LD-PV(R))

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3.5 Leeds to Pleasant Valley 345 kV Transmission Line Reconductoring Project

3.5.1 Project Description

The Leeds to Pleasant Valley 345 kV Transmission Line Reconductoring Project (LD-PV(R)) is comprised of one right-of-way (ROW) segment, Leeds to Pleasant Valley (LD-PV), and includes minor modifications to the existing 345 kV Leeds Switching Station and the existing Consolidated Edison 345 kV Pleasant Valley Substation.

The location of the LD-PV(R) Project is depicted in Figure LD-PV(R)-1.

3.5.2 Physical Description

The LD-PV segment starts at the existing Leeds Switching Station in the Town of Athens, Greene County. The scope of work consists of the reconductoring of two existing 345 kV lattice structure lines and replacement of certain structures for approximately 39.8 miles within an existing ROW. This segment includes an existing aerial crossing of the Hudson River and terminates at the Pleasant Valley Substation in the Town of Pleasant Valley, Dutchess County. This segment also includes reconductoring of two existing 345 kV lines for the 0.5-mile section from the Athens Junction to the Athens Substation, all within the Town of Athens, Greene County. All work at the Leeds Switching Station, Athens Substation and Pleasant Valley Substation will be within existing fencelines. The LD-PV segment passes through the Town of Athens and the Village of Athens in Greene County, the Towns of Greenport, Livingston and Clermont in Columbia County, and the Towns of Milan, Clinton, Hyde Park, and Pleasant Valley in Dutchess County.

3.5.3 Electrical Description

It is the Applicant's expectation that the NYISO will prepare the analysis for the interface transfer impact for the LD-PV(R) Project. However, the Applicant has undertaken this analysis and believes the N-1-1 transfer capability for UPNY-SENY to be increased in the range of 1,150 - 1,350 MW. This solution does not degrade the Central-East transfer capability.

Electrical single-line drawings of the 345 kV system, 115 kV system and individual switching stations and substations providing circuit-specific line and station data are contained in the confidential data provided in Section 1.0, Modeling Data.

Details of the LD-PV(R) Project line upgrades include:

a. Reconductor two existing 345 kV lines (i.e., replacing existing transmission wires with new higher capacity wires) between the existing Leeds Substation and the existing Pleasant Valley Substation, using higher capacity 2-bundle 795 kcmil ACSS "Drake" conductor on existing 345 kV structures.

b. Rebuild approximately 10% of the existing structures due to ground clearance requirements with the new conductor. New structures will consist of tubular steel with conductors remaining in a horizontal configuration. Most structures that are not replaced will receive structural reinforcement.

A summary of the minor station modifications includes:

a. Leeds 345 kV Switching Station: Reconductor existing terminals for the 345 kV lines. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

b. Athens 345 kV Substation: Reconductor existing terminals for the 345 kV lines. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. Pleasant Valley 345 kV Substation: Reconductor existing terminals for the 345 kV lines. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

3.5.4 Innovations Incorporated

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[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

Edic
Princetown
Rotterdam
New Scotland
Knickerbocker
Fraser
Athens
Leeds (Existing 345 kV)
Churchtown
Oakdale
Hurley Avenue
Pleasant Valley (Existing 345 kV)
Oneida County
Herkimer County
Fulton County
Saratoga County
Washington County
Onondaga County
Madison County
Montgomery County
Schenectady County
Rensselaer County
Albany County
Schoharie County
Otsego County
Cortland County
Chenango County
Greene County
Columbia County
Broome County
Delaware County
Ulster County
Dutchess County
Sullivan County

Legend

- Reconductored 345 kV Transmission Line (UPNY/SENY)
- Other Project Segment
- Other Project Station
- Other Project Junction
- Project Station
- County Boundary

nationalgrid

Burns & McDonnell SINCE 1898

Figure LD-PV(R)-1

Leeds to Pleasant Valley (Reconductor)

January 2015

N W E S

0 5 10 20 30 40 Miles

Sources: BMcD Engineering, ESRI

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3.5.5 Other Technologies and Methods Being Studied

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[redacted]

[redacted]

[redacted]

[redacted]

3.5.6 Evidence of Commercially Viable Technology

The transmission facilities proposed for the various projects consist of materials that have been successfully used on transmission lines for decades, including transmission lines in New York.

Overhead Engineering

New structures will consist of tubular steel. Conductors used on the Project will be aluminum and steel supported (ACSS). Although ACSS is less commonly used, it has been used throughout the industry for 40 years. Hardware on the Project will consist of traditional ceramic insulators and various metallic connectors. The latest composite core conductors, ACCR and ACCC, which have been in commercial operation for over 10 years, were also evaluated. It was determined that the proposed Project can realize the same benefits with ACSS and ACSR for a fraction of the cost of using ACCR or ACCC. It is estimated that the use of ACCR conductor would increase total project costs by approximately 30 percent.

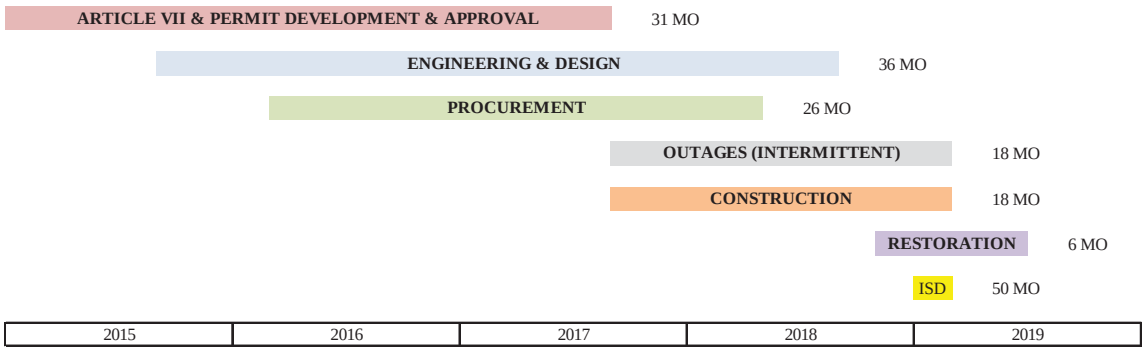
All material proposed for use on the Project can be procured through traditional industry channels.

3.5.7 Schedule

The LD-PV(R) Project is expected to take 50 months in to complete. Construction within substations and reconductoring of overhead lines is expected to take approximately 18 months. Typical construction methods would dismantle and build new; however this method would not provide the ability to return the circuit to service. After evaluation and consultation with the transmission control center, it has been determined that construction methods must be used which will allow the circuit to be restored within a 24 to 48 hour window which is required on a highly congested transmission corridor.

A high level schedule for the LD-PV(R) Project is provided in Figure LD-PV(R)-2. Assumptions built into the Project schedule include: commencement of Part B filing in September 2015; staggered EM&CP filing and approvals; procurement of long lead items begin prior to final EM&CP approvals; and intermittent outage schedules that include consideration for summer reliability constraints.

Figure LD-PV(R)-2: Proposed Project Schedule



A conceptual construction sequencing plan has been developed for this Project which identifies the outage requirements listed in Table LD-PV-1 and Table LD-PV-2, below. While developed to ensure a continual source of power to all affected substations, the construction sequence and outage plans are subject to change pending further load flow and system reliability studies. No long-term outages were scheduled during the summer peak load months of June through August.

As most of the outages are to the 345 kV bulk power system, it could be anticipated that there will be congestion costs associated with this construction plan.

In addition to considering potential outage-related constraints, scheduling of construction activities to avoid or minimize impacts to sensitive environmental resources will need to be considered in developing the EM&CP and in developing the associated construction sequencing plan.

Table LD-PV-1:
Long Term Outages with 24 to 48-hour Emergency Return to Service Restoration Ability

Line Out of Service	Duration (weeks)	Approximate Time Frame
#95 Leeds - Athens 345 kV Line	2	Fall 2017
#91 Athens - Pleasant Valley 345 kV Line	29	Fall 2017 to Spring 2018
#92 Leeds- Pleasant Valley 345 kV Line	5	Spring 2018, Fall 2018 & Winter 2018-2019

Table LD-PV-2:
Short Term Outages with no Emergency Return to Service Restoration Ability

Line Out of Service	Duration (days)
Various lower voltage line crossings possible - yet to be determined	1-5

3.5.8 Capital Cost Estimate

See Attachment 3 for capital cost estimate.

3.5.9 Risk Assessment

Permitting Risk

a. The proposed schedule includes 31 months to develop, file and obtain permits from state and federal agencies. A number of these approvals may lead to additional analysis or approvals. Schedule delays such as delay in commencing the Article VII Part B process and the ACOE permit can impact the Project in-service date which will increase Project costs. Complete permit filings along with efficient permit processes will minimize any potential schedule delays.

b. It is assumed that the Article VII development and Certificate approval process will not exceed 12 months.

c. Since a number of environmental field investigations must take place in order to produce state and federal permit applications, schedule delays that push the window for field investigations outside of the proper season could delay the permitting development process an additional year.

d. Although the Applicant is striving to address known environmental issues, unanticipated permit requirements imposed by regulatory agencies can extend construction schedules, impact the in-service date, and increase Project costs. For example, there may be a limitation on when the trees can be cleared for protection measures associated with the Northern Long Eared Bat.

Scope Risk

a. The estimate and schedule assumes a 10% structure replacement. Detailed engineering has not been performed and could result in an increase in the number of structures to be replaced.

Procurement Risk

a. The proposed schedule provides for up to 26 months for the procurement of construction services and major equipment with long lead times. Risks can include raw material and manufacturing availability, quality and delivery logistics. Currently the Applicant does not see fabrication and delivery problems with the major equipment needed for this Project. However, if markets change, delays could impact the in-service date.

Construction Risk

a. During detailed design, subsurface core borings are performed in intervals along the Project route. During construction, unforeseen field conditions (e.g. excessive ground water, shallow bedrock, nested boulders, etc.) can be encountered. Typically, unforeseen field conditions result in an increased cost to the Project. In more extreme cases, schedule impacts also occur.

b. Execution of a large construction Project can include project management risks including securing a large number of labor resources, coordinating project activities, managing schedule and keeping the Project within budget.

c. The proposed schedule provides approximately 18 months for needed intermittent outage windows. If construction sequencing, outage sequencing plans, and commissioning sequencing are delayed due to system conditions and new outages take longer to schedule, the in-service date (as well as the overall Project cost) can be affected.

3.5.10 Status of NYISO Interconnection Studies

The Applicant has not yet filed with the NYISO for an interconnection request for this Project and plans to file the request shortly after the filing of this submission.

3.5.11 Status of Equipment Availability and Procurement

No equipment has yet been procured for the Project.

Long lead items for overhead construction include 345 kV structures and overhead conductor (lead times of approximately 12 to 20 weeks). This equipment is not currently expected to cause schedule delays.

3.5.12 Status of Contracts

There are currently no contracts under negotiation or in place relative to this Project.

3.5.13 Demonstration of Site Control

The Project will be constructed entirely within existing Applicant ROW on property either owned in fee by the Applicant or on property which the Applicant has easements for transmission construction. The Applicant has site control of all station locations with the exception of the 345 kV Pleasant Valley Substation which is owned by Consolidated Edison.

3.5.14 Status of Permits

No permits or certificate for the LD-PV(R) Project have been received to date. Long lead permits include concurrent submittal and review for Article VII Certification and ACOE 404 Permit, and PSC EM&CP approval (post Article VII approval, staggered submissions over 19 months). A full list of permits is provided in Table LD-PV(R)-3.

Table LD-PV(R)-3: Permits/Certificates Required

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Federal Permits					
Sections 10 (Rivers and Harbors Act of 1899) and 404 (Clean Water Act Permit)	U.S. Army Corps of Engineers, Buffalo [ED-NS only] and NY Districts (ACOE) - in consultation with U.S. Fish & Wildlife Service (USFWS) and tribes	All areas impacting jurisdictional waters/wetlands (Tidally influenced waters and Waters of the U. S.)		1 year after submittal	Prior to impacting jurisdictional waters/wetlands and start of construction
Threatened & Endangered Species (Endangered Species Act)	U.S. Fish & Wildlife Service (USFWS)	Areas that could contain potential T&E species or their respective habitat	Occurs during the review and approval by the ACOE		Prior to impacting areas that could contain potential T&E species or their respective habitat
US Coast Guard Approval for work within navigable waters (Section 9 of the Rivers and Harbors Act of 1899)	US Coast Guard	Navigable waters	Concurrent with filing of EM&CP		
Federal Aviation Administration (FAA) Notification of Construction or Alteration	Regional FAA Office	Any portion of the Project (permanent structures or cranes) potentially affecting navigable airspace (structures over 200' in height or are located within a certain distance of an airport)	Concurrent with filing of EM&CP		Prior to applying for other construction related permits
State Permits					
Article VII Certificate of Environmental Compatibility and Public Need (Certificate) Approval	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
Environmental Management and Construction Plan (EM&CP)	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
State Permits, Continued					
State 401 Water Quality Certification	New York State Public Service Commission	All areas impacting jurisdictional waters/wetlands	Concurrent with Part B application		Concurrently with EM&CPAppr
SPDES General Permit (GP) for Stormwater Discharges from Construction Activities and New York State-Regulated Wetlands and Protected Waters	New York State Department of Environmental Conservation (NYSDEC)	Entire Project (segments, substations, laydown areas, staging areas, etc.)	Concurrent with filing of EM&CP		Prior to initiating any land disturbing activities, including vegetation clearing
Municipal Stormwater (MS4) Review	Town, city or village	All components in MS4 jurisdictions (if applicable)	Prior to filing the EM&CP		
Cultural Resources Review (National Historical Preservation Act - NHPA)	New York State Parks (State Historic Preservation Officer [SHPO])	Entire Project	Concurrent with filing of Part B application		Before starting construction in off-road areas or areas that have not been previously disturbed
Department of Transportation Utility Work Permit	NY DOT	Installation of utilities within or adjacent to state highway ROWs.	Coordination prior to construction (need final project design)		Construction
Hudson River Crossing					
Coastal Management Program (CMP) and Local Waterfront Revitalization Program (LWRP)	New York Department of State	Hudson Riverfront	Concurrent with filing of 404 application		
Easement	State of New York Office of Parks, Recreation and Historic Preservation		Coordination prior to Part B application submittal		
Notification	Office of General Services		Coordination prior to Part B application submittal		

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Municipal Permits (Article VII Certificate Approval Supersedes Most Municipal Environmental Related Permits)					
Municipal Consultation Filing	City/Town	Entire Project	Coordination prior to Part B application submittal		
Local Airport Operator Review		Airports and aviation facilities within 5 miles of the Project	Coordination prior to construction (need final project design)		
Railroad ROW Entry Permit	Railroad Company	ROW access for design purposes	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)
Railroad ROW Construction Authorization	Railroad Company	Activities located within railroad right-of-way (ROW)	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)

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Hurley Avenue PARs Project
(HA)

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HURLEY AVENUE PARS PROJECT
(HA)

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3.6 Hurley Avenue PARs (HA)

3.6.1 Project Description

The Hurley Avenue Phase Angle Regulators (PARs) Project (HA) is designed to improve the flow of power across the UPNY/SENY transmission line interface. This project includes the installation of the three 575 MW (+/- 30 degree) Phase Angle Regulators (PARs) and two 135 MVAr switched shunt capacitors and associated interconnection equipment at Central Hudson's Hurley Avenue Substation located in the Town of Ulster, Ulster County, NY.

The location of the HA Project is depicted in Figure HA-1.

3.6.2 Physical Description

The HA PARs project will consist of the following equipment and components:

a. Three parallel 345 kV 575 MW (+/- 30 degree) PARs installed in series with the 301 transmission line to Leeds;

b. Two 345 kV 135 MVAr switched shunt capacitor banks;

c. One additional 345 kV circuit breaker for the interconnection of the PARs;

d. Two 345 kV circuit breakers for the interconnection of the shunt capacitor banks;

e. Six disconnect switches for the PARs;

f. Two disconnect switches for a bypass of the PARs;

g. Two disconnect switches for the shunt capacitors banks; and

h. Other appurtenances including substation bus work, relay protection equipment, and panels.

This project also includes the replacement of station connections at both the Hurley Avenue and Leeds substations and replacement of two transmission line structures ½ mile south of Route 23A in the Town of Catskill, Greene County, NY on the 301 Hurley to Leeds 345kV transmission line all designed to maximize the rating of the existing transmission line.

This project will require expansion of the current footprint of the Hurley Avenue Substation. This expansion can occur within the substation property currently owned by Central Hudson. The expansion of the Hurley Avenue Substation footprint will be approximately 255 feet to the west and 120 feet to the south.

3.6.3 Electrical Description

A System Impact Study (SIS) for Central Hudson's Hurley Avenue PARs project has not yet been filed nor completed. The Applicant has modeled this project and estimates that the project increased the N-1-1 thermal transfer capability on the UPNY-SENY interface by 400 MW. There were no significant increases to the UPNY-ConEd interface, the Central-East interface, or the Total-East interface.

Electrical single-line drawings providing circuit specific line data are contained in the confidential data provided in Section 1.0, Modeling Data.

Details of the HA Project line upgrades include:

a. Rebuild two structures comprised of poles 108371/108372 and 108373/108374 ½ mile south of NYS Route 23 in the Town of Catskill, NY in Greene County to improve conductor clearance by less than 1 foot to increase the line ratings to the conductor thermal limit.

A summary of the station modifications include:

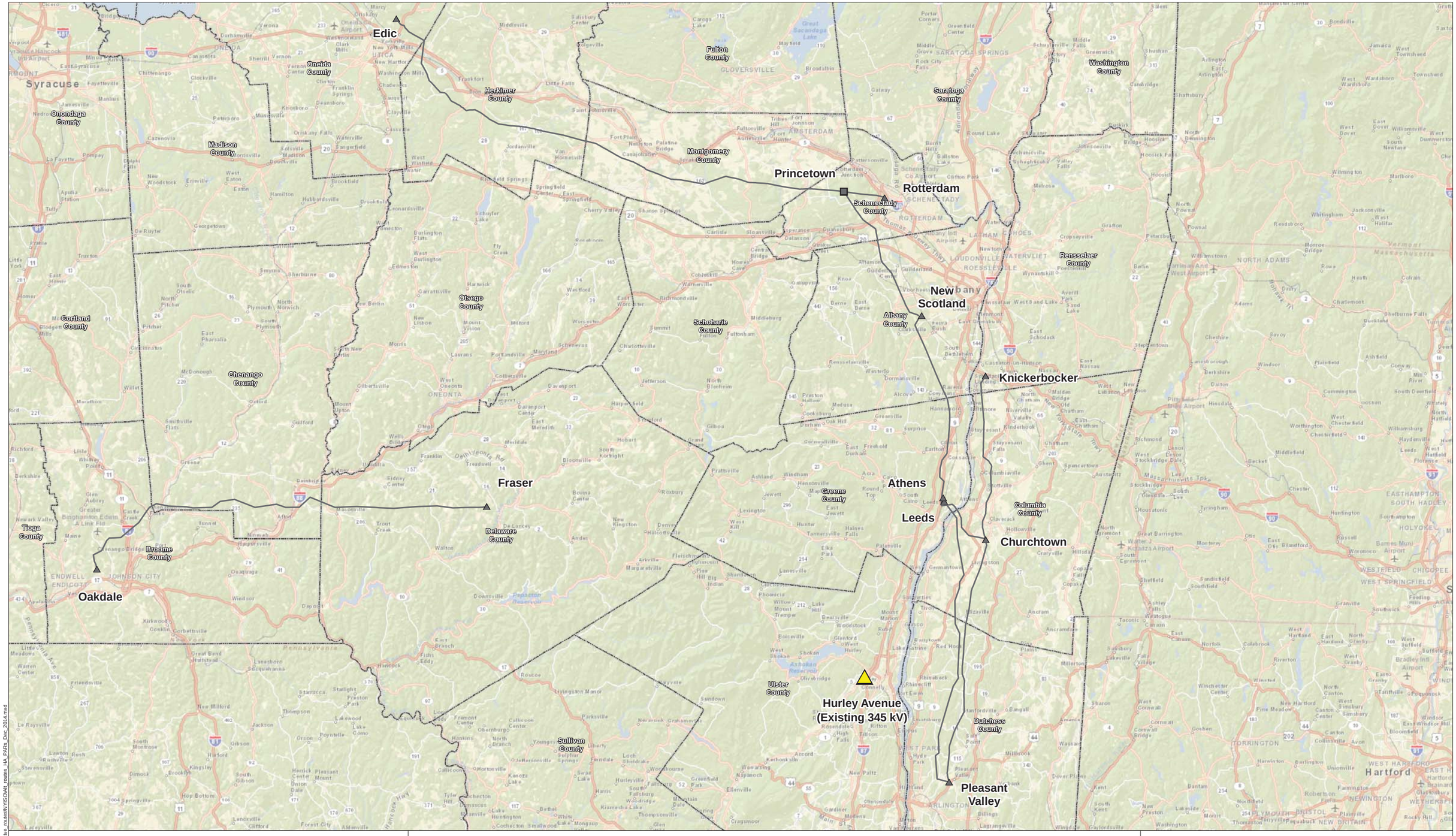
a. Hurley Avenue Substation: Install three 345 kV, 575 MW PARs (+/- 30%) in series with the 301 transmission line from Hurley Avenue to Leeds substation. Install a parallel bypass for these PARs in the station as well.

b. Hurley Avenue Substation: Install two 345 kV 135 MVAr shunt capacitors on the 345 kV bus.

c. Hurley Avenue Substation: Install three 345 kV circuit breakers, one for each of the two shunt capacitors, and one on the ring bus for the PAR.

d. Hurley Avenue Substation: Upgrade terminal equipment on the 301 - 345 kV line to increase the line ratings to the conductor thermal limit.

e. Leeds Substation: Upgrade terminal equipment on the 301 - 345 kV line to increase the line ratings to the conductor thermal limit.



Legend

- Other Project Segment
- Other Project Junction
- Project Station
- County Boundary
- Other Project Station

People. Power. Possibilities. Central Hudson A FORTIS COMPANY

Burns & McDonnell SINCE 1898

Figure HA-1

Hurley Avenue PARs

January 2015

N W E S

0 5 10 20 30 40 Miles

Sources: BMcD Engineering, ESRI

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3.6.4 Innovations Incorporated

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3.6.5 Evidence of Commercially Viable Technology

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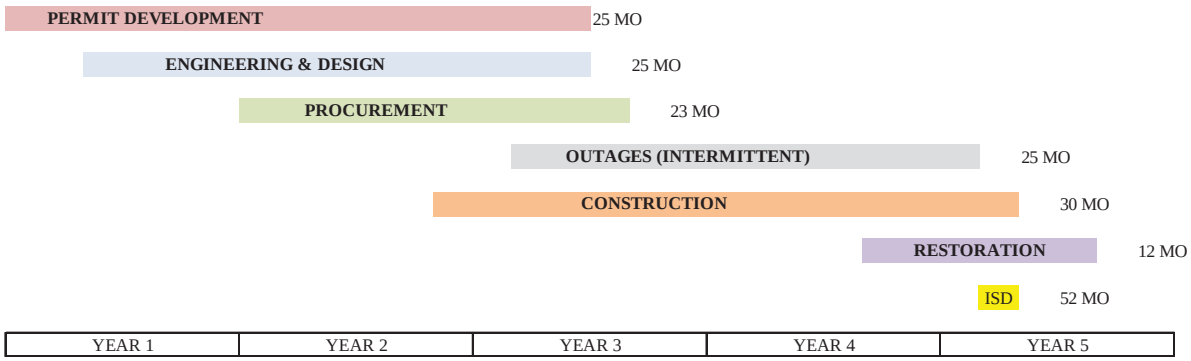
3.6.6 Schedule

The Project is expected to take approximately 52 months to complete. Construction of substations and overhead lines is expected to take approximately 30 months. A high level schedule for the HA Project is provided in Figure HA-2. Assumptions built into the project schedule include: staggered construction filing and approvals; procurement of long lead items begin prior to final permit approval; and intermittent outage schedules that include consideration for summer reliability constraints.

Figure HA-2: Proposed Project Schedule



A conceptual construction sequencing plan has been developed for this project which identifies the outage requirements listed in Table HA-1 and Table HA-2, below. While developed to ensure a continual source of power to all affected substations, the construction sequence and outage plans are subject to change pending further load flow and system reliability studies. No long-term outages were scheduled during the summer peak load months of June through August.

3.6.7 Capital Cost Estimate

Please see Attachment 3 for capital cost estimate.

Table HA-1:
Long Term Outages with no Emergency Return to Service Restoration Ability

Line or Sectionalized Line Segment Out of Service	Duration (weeks)
301 Transmission Line between Hurley Avenue Substation and Leeds Substation	3 weeks
Hurley Avenue 345 kV to 115 kV spare transformer	2 weeks

Table HA-2:
Short Term Outages with no Emergency Return to Service Restoration Ability

Line or Sectionalized Line Segment Out of Service	Duration (days)
none	

3.6.8 Risk Assessment

Permitting Risk

a. The proposed schedule includes 25 months to obtain permits from state and federal agencies. A number of these approvals may lead to additional analysis or approvals. Schedule delays over the 25 months in the permit process can impact the project in-service date which will increase project costs. Complete permit filings along with efficient permit processes will minimize any potential schedule delays.

b. It is assumed that no Article VII Certificate will be needed for this project but that the current approval process in the AC Proceeding will result in a timeline similar to the Article VII process.

c. Since a number of environmental field investigations must take place in order to produce state and federal permit applications, schedule delays that push the window for field investigations outside of the proper season could delay the permitting development process an additional year.

d. Although the Applicant is striving to address known environmental issues, unanticipated permit requirements imposed by regulatory agencies can extend construction schedules, impact the in-service date, and increase project costs. For example, there may be a limitation on when the trees can be cleared for protection measures associated with the Northern Long Eared Bat.

Procurement Risk

a. The proposed schedule provides for up to 23 months for the procurement of construction services and major equipment with long lead times (e.g. PARs, circuit breakers, disconnect switches).

Risks can include raw material and manufacturing availability, quality and delivery logistics. Currently the applicants do not see fabrication and delivery problems with the major equipment needed for this Project. However, if markets change, delays could impact the in-service date.

Construction Risk

a. During detailed design, subsurface core borings are performed in intervals along the Project route. During construction, unforeseen field conditions (e.g. excessive ground water, shallow bedrock, nested boulders, etc.) can be encountered. Typically, unforeseen field conditions result in an increased cost to the project. In more extreme cases, schedule impacts also occur.

b. Execution of a large construction project can include project management risks including securing a large number of labor resources, coordinating project activities, managing schedule and keeping the project within budget.

c. The proposed schedule provides approximately 30 months for needed intermittent outage windows. If construction sequencing, outage sequencing plans, and commissioning sequencing are delayed due to system conditions and new outages take longer to schedule, the in-service date can be effected.

3.6.9 Status of NYISO Interconnection Studies

The Applicant has not yet filed an application for a System Impact Study (SIS). The Applicant plans to file a request for SIS shortly after the filing of this submission.

3.6.10 Status of Equipment Availability and Procurement

Long lead items for the Hurley Avenue substation work, includes the PARs, the shunt capacitors, the circuit breakers, the disconnect switches, support and bus structures, dead end structures, lightning arresters, lightning masts, capacitor coupled voltage transformers, and control enclosures. Typical lead times for these items range from 20 to 80 weeks. This equipment is currently not expected to cause schedule delays and most with the exception of the PARs are common station procurement items.

Long lead items for Transmission construction include 345 kV structures (lead times of approximately 20 to 30 weeks). This equipment is not currently expected to cause schedule delays.

3.6.11 Status of Contracts

There are currently no contracts under negotiation or in place relative to this Project.

3.6.12 Demonstration of Site Control

The Project will be constructed entirely within existing Applicant ROW or on property owned in fee by the Applicant.

3.6.13 Status of Permits

No permits or certificates for the HA Project have been received to date. Long lead permits include concurrent submittal and review through this proceeding (12 months), and local site plan amendment and building permit approval (staggered submissions over 25 months). A full list of permits is provided in Table HA-3.

Table HA-3: Permits/Certificates Required

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Federal Permits					
Threatened & Endangered Species (Endangered Species Act)	U.S. Fish & Wildlife Service (USFWS)	Areas that could contain potential T&E species or their respective habitat	Occurs during the review and approval by the ACOE		Prior to impacting areas that could contain potential T&E species or their respective habitat
Federal Aviation Administration (FAA) Notification of Construction or Alteration	Regional FAA Office	Any portion of the project (permanent structures or cranes) potentially affecting navigable airspace (structures over 200' in height or are located within a certain distance of an airport)	Concurrent with filing of the Building Permit		Prior to applying for other construction related permits
State Permits					
State 401 Water Quality Certification	New York State Public Service Commission	All areas impacting jurisdictional waters/wetlands	Concurrent with Part B application		Concurrently with EM&CP Approval
SPDES General Permit (GP) for Stormwater Discharges from Construction Activities and New York State-Regulated Wetlands and Protected Waters	New York State Department of Environmental Conservation (NYSDEC)	Entire Project (segments, substations, laydown areas, staging areas, etc.)	Concurrent with filing of the Building Permit		Prior to initiating any land disturbing activities, including vegetation clearing
Municipal Stormwater (MS4) Review	Town, city or village	All components in MS4 jurisdictions (if applicable)	Concurrent with filing of the Building Permit		
Cultural Resources Review Under National Historical Preservation Act (NHPA)	New York State Parks (State Historic Preservation Officer [SHPO])	Entire project	Concurrent with filing of Part B application		Before starting construction in off-road areas or areas that have not been previously disturbed

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Municipal Permits					
Site Plan Amendment and Building Permit	Town of Ulster	Substation Component	Concurrent with filing of Part B application		Prior to conducting any on-site activities
Railroad ROW Entry Permit	Railroad Company	ROW access for design purposes	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)
Department of Transportation Utility Work Permit	NY DOT	Installation of utilities within or adjacent to state highway ROWs.	Coordination prior to construction (need final project design)		Construction
Railroad ROW Construction Authorization	Railroad Company	Activities located within railroad right-of-way (ROW)	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)

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New Scotland to Leeds 345 kV Transmission Line Reconductoring and Leeds to Pleasant Valley 345 kV Transmission Line Project (NS-LD(R)/LD-PV)

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NEW SCOTLAND TO LEEDS 345 KV TRANSMISSION LINE RECONDUCTORING
AND
LEEDS TO PLEASANT VALLEY 345 KV TRANSMISSION LINE PROJECT
(NS-LD(R)/LD-PV)

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3.7 New Scotland to Leeds 345 kV Transmission Line Reconductoring and Leeds to Pleasant Valley 345 kV Transmission Line Project

3.7.1 Project Description

The New Scotland to Leeds 345 kV Transmission Line Reconductoring and Leeds to Pleasant Valley 345 kV Transmission Line Project (NS-LD(R)/LD-PV) is comprised of three right-of-way (ROW) segments, New Scotland to Leeds (NS-LD), Leeds to Churchtown (LD-CT), and Churchtown to Pleasant Valley (CT-PV), and includes the upgrade of two stations, Leeds 345 kV Switching Station and Consolidated Edison's 345 kV Pleasant Valley Substation, and the rebuild and expansion of the existing Churchtown 115 kV Switching Station.

The location of the NS-LD(R)/LD-PV Project is depicted in Figure NS-LD(R)/LD-PV-1.

3.7.2 Physical Description

The NS-LD segment starts at the existing 345 kV New Scotland Substation in the Town of New Scotland, Albany County. The scope of work consists of the reconductoring of two existing 345 kV lattice structure lines and replacement of certain structures for approximately 25.9 miles within an existing ROW. This segment terminates at the 345 kV Leeds Switching Station in the Town of Athens, Greene County. Work at the New Scotland Substation will be within the existing fenceline. Work at the Leeds Switching Station will be within the existing fenceline. This segment passes through the Towns of New Scotland and Coeymans in Albany County, and the Towns of New Baltimore, Coxsackie, and Athens in Greene County.

The LD-PV portion of the project consists of the LD-CT and CT-PV segments as described in further detail below. The scope of work consists of construction of a new 345 kV circuit between the 345 kV Leeds Switching Station in the Town of Athens, Greene County and the Consolidated Edison Pleasant Valley 345 kV Substation in the Town of Pleasant Valley, Dutchess County, within approximately 41.2 miles of existing ROW.

The LD-CT segment starts at the Leeds Switching Station in the Town of Athens, Greene County. The scope of work consists of the removal of the existing 80 year old 115 kV double-circuit lattice structure lines and the construction of a new 115/345 kV double-circuit monopole structure line within approximately 8.9 miles of existing ROW. This segment includes an existing aerial crossing of the Hudson River and terminates at the rebuilt and expanded 115 kV Churchtown Switching Station in the Town of Claverack, Columbia County. The rebuilt Churchtown Switching Station will require an

expansion of the existing fenceline. This expansion can occur within the switching station property currently owned by the Applicant. All work at the 345 kV Leeds Switching Station will be within the existing fenceline. The LD-CT segment passes through the Town of Athens and the Village of Athens in Greene County and the Towns of Greenport and Claverack in Columbia County.

The CT-PV segment starts at the rebuilt and expanded Churchtown Switching Station. The scope of work consists of the removal of two existing 115 kV double-circuit lattice structure lines, and the construction of a new 115/345 kV double-circuit monopole structure line within approximately 32.3 miles of existing ROW. This segment terminates at the existing Consolidated Edison 345 kV Pleasant Valley Substation in the Town of Pleasant Valley, Dutchess County. All work at the Pleasant Valley Substation will be within the existing fenceline. The CT-PV segment passes through the Towns of Claverack, Livingston, Gallatin, and Clermont in Columbia County, and the Towns of Milan, Clinton, and Pleasant Valley in Dutchess County.

Additional ancillary work on other system facilities may be required depending on the results of the NYISO system impact studies.

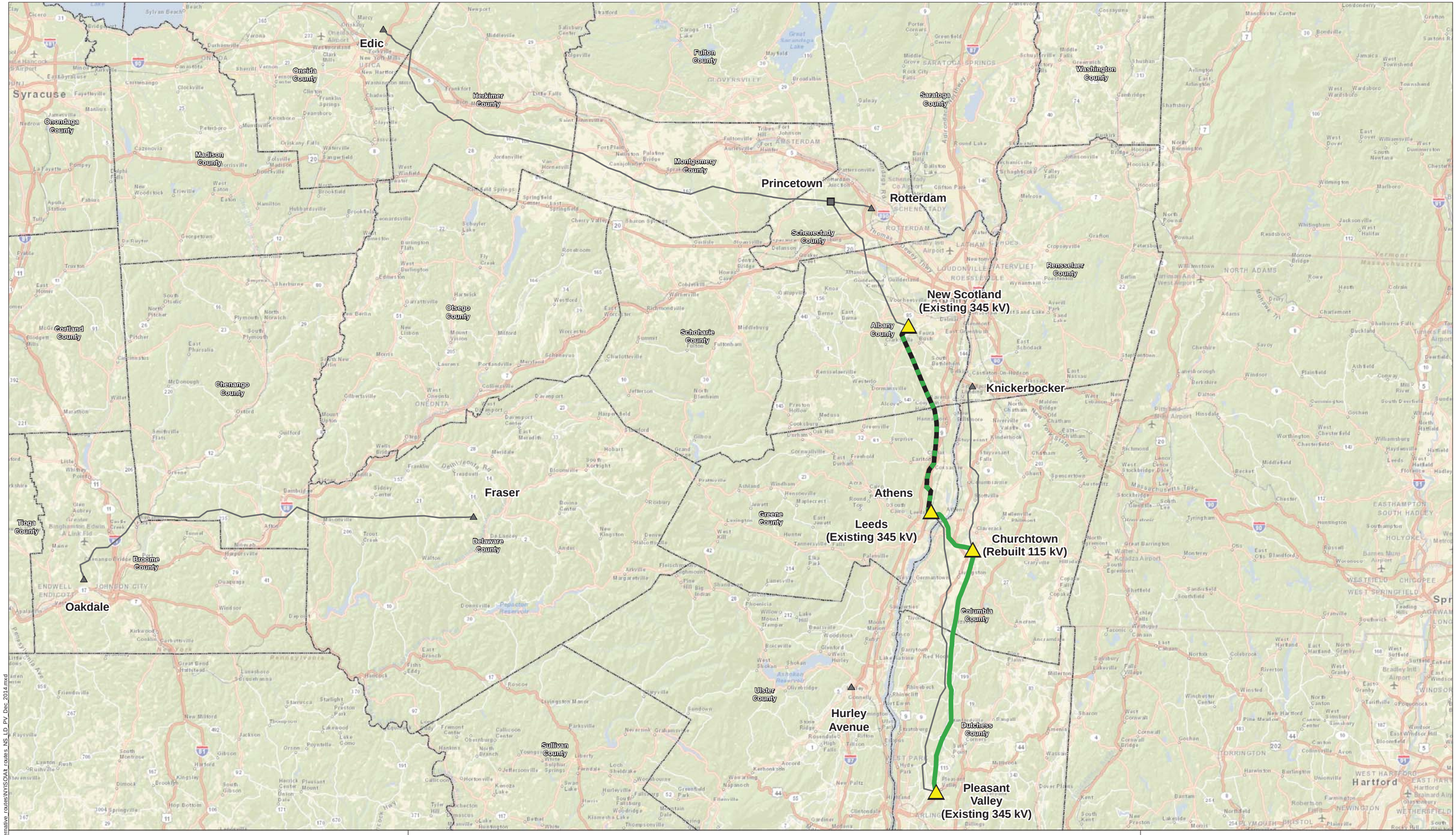
3.7.3 Electrical Description

It is the Applicant's expectation that the NYISO will prepare the analysis for the interface transfer impact for the NS-LD(R)/LD-PV Project. However, the Applicant has undertaken this analysis and believes the N-1-1 transfer capability for UPNY-SENY to be increased in the range of 1,450 – 1,650 MW. In addition, this solution also increases the N-1 thermal Central-East transfer capability to be increased in the range of 5 - 25 MW.

Electrical single-line drawings of the 345 kV system, 115 kV system and individual switching stations and substations providing circuit-specific line and station data are contained in the confidential data provided in Section 1.0, Modeling Data.

Details of the NS-LD(R)/LD-PV Project line upgrades include:

a. Reconductor two existing 345 kV lines (i.e., replacing existing transmission wires with new higher capacity wires) between the existing New Scotland Substation and the existing Leeds Substation, using new higher capacity 2-bundle 795 kcmil "Drake" ACSS conductor on existing 345 kV structures.



Legend

- New 345 kV Transmission Line (UPNY/SENY)
- Reconductored 345 kV Transmission Line (UPNY/SENY)
- Other Project Segment
- Project Station
- Other Project Station
- Other Project Junction
- County Boundary

nationalgrid

Burns & McDonnell SINCE 1898

Figure NS-LD(R)/LD-PV-1

New Scotland to Leeds (Reconductor) and Leeds to Pleasant Valley

January 2014

N W E S

0 5 10 20 30 40 Miles

Sources: BMcD Engineering, ESRI

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b. Rebuild approximately 10% of the existing structures between NS-LD due to ground clearance requirements with the new conductor. New structures will consist of tubular steel with conductors remaining in a horizontal configuration. Most structures that are not replaced will receive structural reinforcement.

c. Construct the new 345 kV LD-PV transmission line between the existing 345 kV Leeds Switching Station and the existing 345 kV Pleasant Valley Substation using 2-bundle 954 kcmil ACSS "Cardinal" conductor on new double-circuit 115/345 kV structures. The proposed structures from LD-PV will be between 5 feet shorter to 10 feet taller than what exists today.

d. Remove the existing 115 kV double-circuit lattice structure line in the ROW between the existing 345 kV Leeds Switching Station and 115 kV Churchtown Switching Station and the two existing 115 kV double-circuit lattice structure lines in the ROW between the 115 kV Churchtown Switching Station and the existing 345 kV Pleasant Valley Substation.

e. Rebuild a single 115 kV line between the existing 345 kV Leeds Switching Station and the existing 345 kV Pleasant Valley Substation using single 954 kcmil ACSS "Cardinal" conductor on the new double-circuit 115/345 kV structures.

A summary of the station modifications include:

a. New Scotland 345 kV Substation: Reconductor existing terminals for the 345 kV lines. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

b. Leeds 345 kV Switching Station: A new circuit breaker and line terminal will be added for the new 345 kV Leeds-Pleasant Valley line. Reconductor existing terminals for the 345 kV lines from the 345 kV New Scotland Substation. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. Pleasant Valley 345 kV Substation: Relocate the existing 345 kV Long Mountain line to the spare bay position and install a new circuit breaker. Terminate the new 345 kV Knickerbocker line to the bay position vacated by the Long Mountain line. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

d. Churchtown 115 kV Switching Station: Demolish and construct a new expanded 115 kV switching station at Churchtown on the existing Churchtown 115 kV Substation site.

3.7.4 Innovations Incorporated

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

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[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.7.5 Other Technologies and Methods Being Studied

[redacted]

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

3.7.6 Evidence of Commercially Viable Technology

The transmission facilities proposed for the NS-LD(R)/LD-PV Project consist of materials that have been successfully used on transmission lines for decades, including transmission lines in New York.

Overhead Transmission Engineering

Structures will consist of tubular steel, natural wood, or laminated wood. Conductors used on the project will be aluminum and either steel reinforced (ACSR) or steel supported (ACSS). Although ACSS is less

commonly used, both ACSR and ACSS have been used throughout the industry for 40 years. Hardware on the project will consist of traditional ceramic insulators and various metallic connectors. The latest composite core conductors, ACCR and ACCC, which have been in commercial operation for over 10 years, were also evaluated. It was determined that the proposed project can realize the same benefits with ACSS and ACSR for a fraction of the cost of using ACCR or ACCC. It is estimated that the use of ACCR conductor would increase total project costs by approximately 30 percent.

Substation Engineering

Structures will consist of tubular steel. The primary conductor used within the substations will be tubular rigid aluminum. Jumpers and strain conductors will consist of single and bundled steel reinforced aluminum conductor ACSR. Circuit breakers will be of the SF6 type, and shall be isolated with open air gang operated disconnect switches. Hardware within the stations will consist of traditional ceramic insulators and various metallic connectors. The structures, conductor equipment, and hardware used within the substations have been used throughout the industry for over 60 years. The application for these stations will utilize the latest manufacturing and operational technology based on this proven technology. All substations will be enclosed within an 8 foot high chain link security fence.

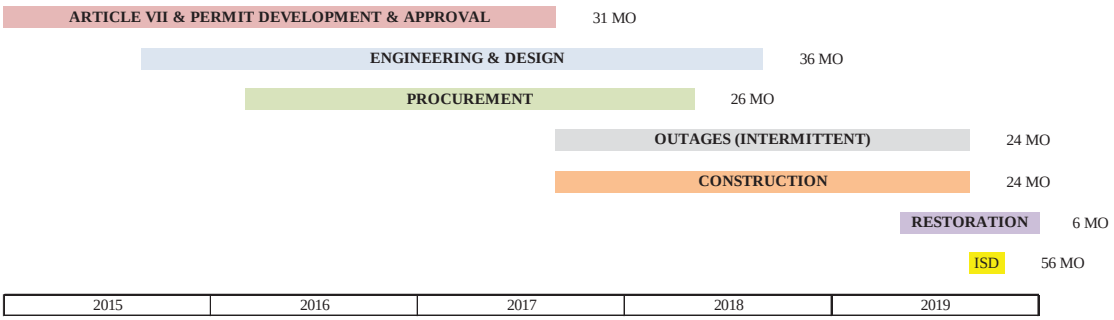
All material proposed for use on the project can be procured through traditional industry channels.

3.7.7 Schedule

The NS-LD(R)/LD-PV Project is expected to take approximately 56 months to complete. Construction of substations and overhead lines is expected to take approximately 24 months. Typical construction methods would dismantle and build new; however this method would not provide the ability to return the circuit to service. After evaluation and consultation with the transmission control center, it has been determined that construction methods must be used which will allow the circuit to be restored within a 24 to 48 hour window which is required on a highly congested transmission corridor.

A high level schedule for the NS-LD(R)/LD-PV Project is provided in Figure NS-LD(R)/LD-PV-2. Assumptions built into the project schedule include: commencement of Part B filing in September 2015; staggered EM&CP filing and approvals; procurement of long lead items begin prior to final EM&CP approval; and intermittent outage schedules that include consideration for summer reliability constraints.

Figure NS-LD(R)/LD-PV-2: Proposed Project Schedule



A conceptual construction sequencing plan has been developed for this project which identifies the outage requirements listed in Table NS-LD(R)/LD-PV-1, Table NS-LD(R)/LD-PV-2, and Table NS-LD(R)/LD-PV-3, below. While developed to ensure a continual source of power to all affected substations, the construction sequence and outage plans are subject to change pending further load flow and system reliability studies. No long-term outages were scheduled during the summer peak load months of June through August.

As most of the outages are to the 115 kV system and only a few to the bulk power system, it is not anticipated that there will be any appreciable congestion costs associated with this construction plan.

In addition to considering potential outage-related constraints, scheduling of construction activities to avoid or minimize impacts to sensitive environmental resources will need to be considered in developing the EM&CP and in developing the associated construction sequencing plan.

Table NS-LD(R)/LD-PV-1:
Long Term Outages with 24 to 48-hours Emergency Return to Service Restoration Ability

Line Out of Service	Duration (weeks)	Approximate Time Frame
#93 New Scotland-Leeds 345 kV Line	29	Fall 2017 to Spring 2018
#94 New Scotland-Leeds 345 kV Line	5	Spring 2018 & Fall 2018

Table NS-LD(R)/LD-PV-2:
Long Term Outages with no Emergency Return to Service Restoration Ability

Line or Sectionalized Line Segment Out of Service	Duration (weeks)	Approximate Time Frame
Long Lane-Buckley Corners Section of #8 Long Lane-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line	4	Fall 2017
Long Lane-Buckley Corners Section of #8 Long Lane-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line & T7 North Catskill-Milan 115 kV Line	8	Fall 2017
Buckley Corners-Blue Stores Section of #8 Long Lane-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line & T7 North Catskill-Milan 115 kV Line	7	Winter 2017 - 2018
T7 North Catskill-Milan 115 kV Line	6	Fall 2018

Table NS-LD(R)/LD-PV-3:
Short Term Outages with no Emergency Return to Service Restoration Ability

Line Out of Service	Duration (days)
#8 Lafarge-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line	1
#10 Milan-Pleasant Valley 115 kV Line	1
#12 Hudson-ADM Milling-Pleasant Valley 115 kV Line &	1
#13 Churchtown-Pleasant Valley 115 kV Line	1
#14 Schodack-Valkin-Churchtown 115 kV Line	1
T7 North Catskill-Milan 115 kV Line	1
#984 Churchtown-Craryville 115 kV Line	1
#398 Pleasant Valley-Long Mt. 345 kV Line	1-2
#92 Leeds-Pleasant Valley 345 kV Line	1-2

3.7.8 Capital Cost Estimate

See Attachment 3 for capital cost estimate.

3.7.9 Risk Assessment

Permitting Risk

a. The proposed schedule includes 31 months to develop, file and obtain permits from state and federal agencies. A number of these approvals may lead to additional analysis or approvals.

Schedule delays such as delay in commencing the Article VII Part B process and the ACOE permit can impact the project in-service date which will increase project costs. Complete permit filings along with efficient permit processes will minimize any potential schedule delays.

b. It is assumed that the Article VII development and Certificate approval process will not exceed 12 months.

c. Since a number of environmental field investigations must take place in order to produce state and federal permit applications, schedule delays that push the window for field investigations outside of the proper season could delay the permitting development process an additional year.

d. Although the Applicant is striving to address known environmental issues, unanticipated permit requirements imposed by regulatory agencies can extend construction schedules and impact in-service date which can increase project costs.

e. The Cricket Valley Project is in the queue for utilizing the spare bay position at the Consolidated Edison Pleasant Valley 345 kV Substation. If the Cricket Valley Project should get approved before this project, a bay addition would be required (with no expansion of the existing fenceline), which could increase the permitting schedule and will increase project costs.

Scope Risk

a. Between New Scotland and Leeds, the estimate and schedule assume 10% of existing structures will be replaced. Detailed engineering has not yet been performed and may result in additional structures being replaced.

Procurement Risk

a. The proposed schedule provides for up to 26 months for the procurement of construction services and major equipment with long lead times (e.g. circuit breakers, disconnect switches). Risks can include raw material and manufacturing availability, quality and delivery logistics. Currently the Applicant does not see fabrication and delivery problems with the major equipment needed for this Project. However, if markets change, delays could impact the in-service date.

Construction Risk

a. During detailed design, subsurface core borings are performed in intervals along the Project route. During construction, unforeseen field conditions (e.g. excessive ground water, shallow

bedrock, nested boulders, etc.) can be encountered. Typically, unforeseen field conditions result in an increased cost to the project. In more extreme cases, schedule impacts also occur.

b. Execution of a large construction project can include project management risks including securing a large number of labor resources, coordinating project activities, managing schedule, and keeping the project within budget.

c. The proposed schedule provides approximately 24 months for needed intermittent outage windows. If construction sequencing, outage sequencing plans, and commissioning sequencing are delayed due to system conditions and new outages take longer to schedule, the in-service date (as well as the overall Project costs) can be affected.

3.7.10 Status of NYISO Interconnection Studies

The Applicant has not yet filed with the NYISO for an interconnection request for this Project and plans to file the request shortly after the filing of this submission.

3.7.11 Status of Equipment Availability and Procurement

No equipment has yet been procured for the Project.

Long lead items for the Leeds and Churchtown Switching Station and the New Scotland and Pleasant Valley Substation, include circuit breakers, disconnect switches, support and bus structures, dead end structures, lightning arresters, lightning masts, capacitor coupled voltage transformers, and control enclosures. Typical lead times for these items range from 8 to 30 weeks. This equipment is currently not expected to cause schedule delays and are common station procurement items.

Long lead items for overhead construction include 345 kV structures (lead times of approximately 20 to 26 weeks) and overhead conductor (lead times of approximately 12 to 16 weeks). This equipment is not currently expected to cause schedule delays.

3.7.12 Status of Contracts

There are currently no contracts under negotiation or in place relative to this Project.

3.7.13 Demonstration of Site Control

The Project will be constructed entirely within existing ROW on property either owned in fee by the Applicant or on property which the Applicant has easements for transmission construction. The

Applicant has site control of all station locations with the exception of the 345 kV Pleasant Valley Substation which is owned by Consolidated Edison.

3.7.14 Status of Permits

No permits or certificates have been received to date. Long lead permits include concurrent submittal and review for an Article VII Certificate and ACOE 404 Permit, and DPS EM&CP approval (post Article VII approval, staggered submissions over 19 months). A full list is permits are provided in Table NS-LD(R)/LD-PV-4.

Table NS-LD(R)/LD-PV-4: Permits/Certificates Required

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Federal Permits					
Sections 10 (Rivers and Harbors Act of 1899) and 404 (Clean Water Act Permit)	U.S. Army Corps of Engineers, Buffalo [ED-NS only] and NY Districts (ACOE) - in consultation with U.S. Fish & Wildlife Service (USFWS) and tribes	All areas impacting jurisdictional waters/wetlands (Tidally influenced waters and Waters of the U. S.)		1 year after submittal	Prior to impacting jurisdictional waters/wetlands and start of construction
Threatened & Endangered Species (Endangered Species Act)	U.S. Fish & Wildlife Service (USFWS)	Areas that could contain potential T&E species or their respective habitat	Occurs during the review and approval by the ACOE		Prior to impacting areas that could contain potential T&E species or their respective habitat
US Coast Guard Approval for work within navigable waters (Section 9 of the Rivers and Harbors Act of 1899)	US Coast Guard	Navigable waters	Concurrent with filing of EM&CP		
Federal Aviation Administration (FAA) Notification of Construction or Alteration	Regional FAA Office	Any portion of the project (permanent structures or cranes) potentially affecting navigable airspace (structures over 200' in height or are located within a certain distance of an airport)	Concurrent with filing of EM&CP		Prior to applying for other construction related permits
State Permits					
Article VII Certificate of Environmental Compatibility and Public Need (Certificate) Approval	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
Environmental Management and Construction Plan (EM&CP)	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
State 401 Water Quality Certification	New York State Public Service Commission	All areas impacting jurisdictional waters/wetlands	Concurrent with Part B application		Concurrently with EM&CP Approval

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
State Permits, Continued					
SPDES General Permit (GP) for Stormwater Discharges from Construction Activities and New York State-Regulated Wetlands and Protected Waters	New York State Department of Environmental Conservation (NYSDEC)	Entire Project (segments, substations, laydown areas, staging areas, etc.)	Concurrent with filing of EM&CP		Prior to initiating any land disturbing activities, including vegetation clearing
Municipal Stormwater (MS4) Review	Town, city or village	All components in MS4 jurisdictions (if applicable)	Prior to filing the EM&CP		
Cultural Resources Review (National Historical Preservation Act - NHPA)	New York State Parks (State Historic Preservation Officer [SHPO])	Entire project	Concurrent with filing of Part B application		Before starting construction in off-road areas or areas that have not been previously disturbed
Department of Transportation Utility Work Permit	NY DOT	Installation of utilities within or adjacent to state highway ROWs.	Coordination prior to construction (need final project design)		Construction
Hudson River Crossing					
Coastal Management Program (CMP) and Local Waterfront Revitalization Program (LWRP)	New York Department of State	Hudson Riverfront	Concurrent with filing of 404 application		
Easement	State of New York Office of Parks, Recreation and Historic Preservation		Coordination prior to Part B application submittal		
Notification	Office of General Services		Coordination prior to Part B application submittal		
Municipal Permits (Article VII Certificate Approval Supersedes Most Municipal Environmental Related Permits)					
Municipal Consultation Filing	City/Town	Entire Project	Coordination prior to Part B application submittal		
Local Airport Operator Review		Airports and aviation facilities within 5 miles of the Project	Coordination prior to construction (need final project design)		
Railroad ROW Entry Permit	Railroad Company	ROW access for design purposes	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)
Railroad ROW Construction Authorization	Railroad Company	Activities located within railroad right-of-way (ROW)	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)

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Edic to New Scotland
345 kV Transmission Line
and
Knickerbocker to Pleasant Valley
345 kV Transmission Line Project
(ED-NS/KB-PV)

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EDIC TO NEW SCOTLAND 345 KV TRANSMISSION LINE
AND KNICKERBOCKER TO PLEASANT VALLEY
345 KV TRANSMISSION LINE PROJECT
(ED-NS/KB-PV)

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3.8 Edic to New Scotland 345 kV Transmission Line and Knickerbocker to Pleasant Valley 345 kV Transmission Line Project (ED-NS/KB-PV)

3.8.1 Project Description

The Edic to New Scotland and Knickerbocker to Pleasant Valley 345 kV Transmission Line Project (ED-NS/KB-PV) is comprised of five ROW segments, Edic to Princetown Junction (ED-PT), Princetown Junction to New Scotland (PT-NS), Princetown Junction to Rotterdam (PT-RD), Knickerbocker to Churchtown (KB-CT), and Churchtown to Pleasant Valley (CT-PV). The Project includes the rebuild and expansion of the existing 230 kV Rotterdam Substation to include a 345 kV yard, modifications to the existing 345 kV Edic and New Scotland Substations, the construction of the new Knickerbocker 345 kV Switching Station, rebuild and expansion of the existing Churchtown 115 kV Switching Station, and modifications to the Consolidated Edison Pleasant Valley 345 kV Substation.

The location of the ED-NS/KB-PV Project is depicted in Figure ED-NS/KB-PV-1.

3.8.2 Physical Description

The ED-NS portion of the project consists of the ED-PT, PT-NS, and PT-RD segments as described in further detail below.

The ED-PT Junction portion of the segment starts at the existing 345 kV Edic Substation in the Town of Marcy, Oneida County. The scope of work consists of the removal of two existing 230 kV lines and the construction of a new 345 kV line within approximately 66.8 miles of existing ROW. For approximately 12.6 miles out of Edic Substation, this will involve the removal of one set of 230 kV wires and insulators from each of the two existing 230/345 kV double-circuit monopole structures and the installation of one set of 345 kV wires and insulators to one of them. For the remaining approximately 54.2 miles, the two existing 230 kV H-frame structure lines will be removed and replaced with one new 345 kV line consisting predominately of H-frame structures. New 345 kV tubular steel monopole structures will be used intermittently through this segment for approximately 5.4 miles in total. All work at the existing 345 kV Edic Substation will be within the existing fence line. This segment terminates at Princetown Junction in the Town of Princetown, Schenectady County. The ED-PT segment passes through the Towns of Marcy and Deerfield in Oneida County, the Towns of Schuyler, Frankfort, German Flatts, Little Falls, Stark, and Danube in Herkimer County, the Towns of Minden, Canajoharie, Root, Glen, Charleston, and Florida, in Montgomery County, and the Towns of Duanesburg and Princetown in Schenectady County.

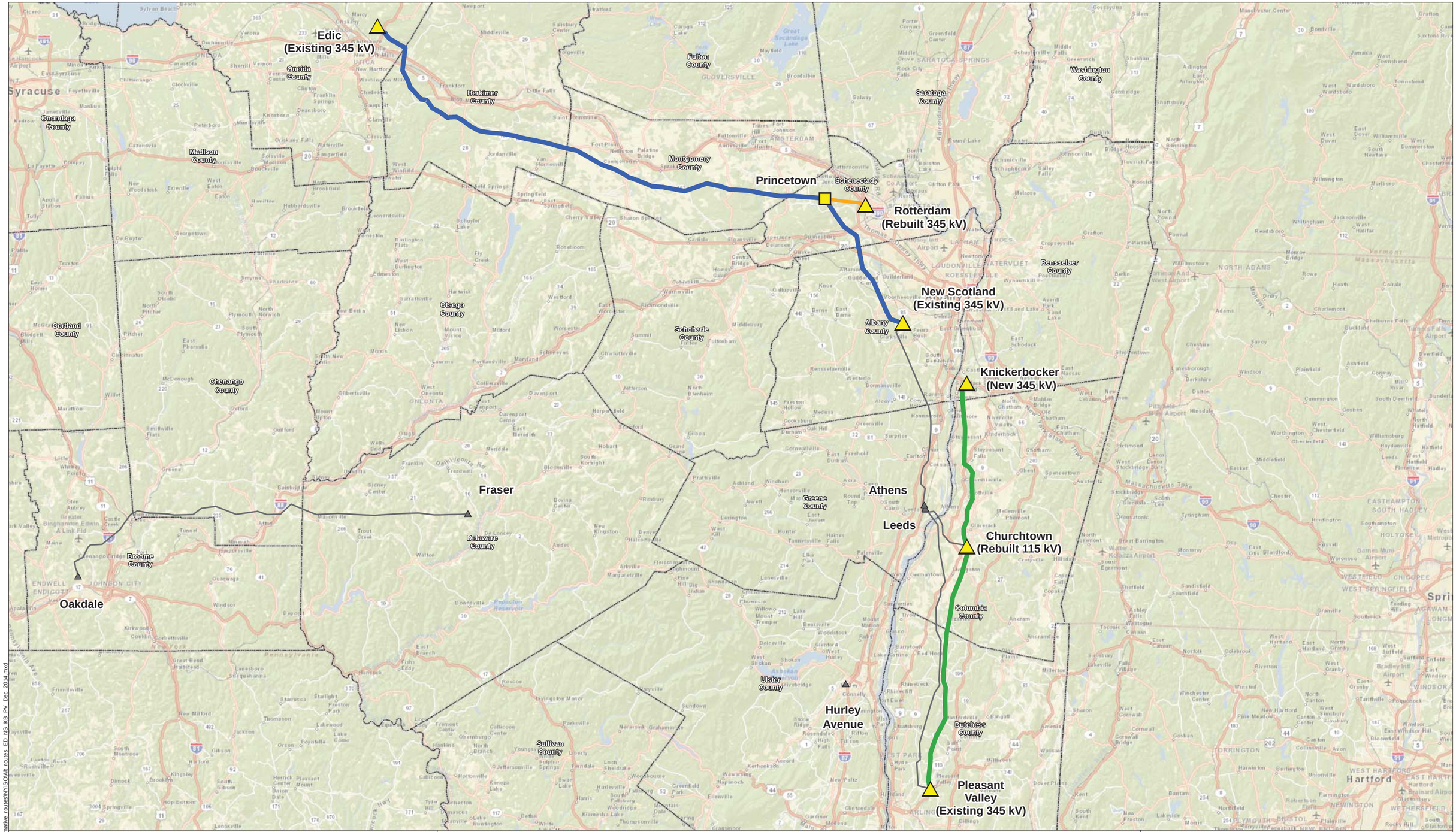
The PT-NS segment starts at Princetown Junction. The scope of work consists of the construction of a new 345 kV line within approximately 19.7 miles of existing ROW. This segment will utilize approximately 11.5 miles of H-frame structures, 6.3 miles of monopole structures and 1.9 miles of 115/345 kV double-circuit monopole structures. This segment terminates at the existing 345 kV New Scotland Substation in the Town of New Scotland, Albany County. Work at the New Scotland Substation will require expansion of the existing fenceline. This expansion can occur within the substation property currently owned by National Grid. The PT-NS segment passes through the Town of Princetown in Schenectady County, and the Towns of Guilderland and New Scotland, in Albany County.

The PT-RD portion of the segment also starts at the Princetown Junction. The scope of work consists of the removal of two existing 230 kV H-frame structure lines and the construction of two new 345 kV compact monopole structure lines within approximately 5.0 miles of existing ROW. This segment terminates at the rebuilt and expanded 345 kV Rotterdam Substation in the Town of Rotterdam, Schenectady County. The rebuilt 345 kV Rotterdam Substation allows for the retirement of the two existing 230 kV lines between the existing 230 kV Porter Substation in the Town of Marcy, Oneida County and the existing 230 kV Rotterdam Substation. The work at the rebuilt 345 kV Rotterdam Substation will require expansion of the existing fenceline. This expansion can occur within the substation property currently owned by National Grid.

The KB-PV portion of the project consists of the KB-CT and CT-PV segments as described in further detail below.

The KB-CT segment starts at the new 345 kV Knickerbocker Switching Station in the Town of Schodack, Rensselaer County. The scope of work consists of the removal of the existing 80 year old 115 kV double-circuit lattice structure line and the construction of a new 115/345 kV double-circuit monopole structure line within approximately 21.9 miles of existing ROW. This segment terminates at the rebuilt and expanded 115 kV Churchtown Switching Station in the Town of Claverack, Columbia County. The rebuilt Churchtown Switching Station will require an expansion of the existing fenceline. This expansion can occur within the substation property currently owned by NYSEG. The KB-CT segment passes through the Town of Schodack in Rensselaer County, and the Towns of Stuyvesant, Stockport, Ghent, and Claverack, in Columbia County.

The CT-PV segment starts at the rebuilt and expanded Churchtown Switching Station. The scope of work consists of the removal of two existing 115 kV double-circuit lattice structure lines, and the construction of a new 115/345 kV double-circuit monopole structure line within approximately 32.3 miles of existing



Legend

- New 345 kV Transmission Line (UPNY/SENY)
- New 345 kV Transmission Line (Central East)
- 345 kV Transmission Rebuild (Central East)
- Other Project Segment
- Project Station
- Project Junction
- Other Project Station
- County Boundary

nationalgrid

Burns & McDonnell SINCE 1898

Figure ED-NS/KB-PV-1

Edic to New Scotland and Knickerbocker to Pleasant Valley

January 2015

N W E S

0 5 10 20 30 40 Miles

Sources: BMcD Engineering, ESRI

I:\National_Grid\National_Grid_MXD\Alternative routes\NYISO\Alt routes_ED_NS_KB_PV_Dec_2014.mxd

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ROW. This segment terminates at the existing Consolidated Edison 345 kV Pleasant Valley Substation in the Town of Pleasant Valley, Dutchess County. All work at the Pleasant Valley Substation will be within the existing fenceline. The CT-PV segment passes through the Towns of Claverack, Livingston, Gallatin, and Clermont in Columbia County, and the Towns of Milan, Clinton, and Pleasant Valley in Dutchess County.

Additional ancillary work on other system facilities may be required depending on the results of the NYISO system impact studies.

3.8.3 Electrical Description

It is the Applicant's expectation that the NYISO will prepare the analysis for the interface transfer impact for the ED-NS/KB-PV Project. However, the Applicant has undertaken this analysis and believes the N-1-1 transfer capability for UPNY-SENY to be increased in the range of 1,050 - 1,250 MW. In addition, this solution also increases the N-1 thermal Central-East transfer capability to be in the range of 350 - 450 MW.

Electrical single-line drawings of the 345 kV system, 115 kV system and individual switching stations and substations providing circuit-specific line and station data are contained in the confidential data provided in Section 1.0, Modeling Data

Details of line upgrades for the ED-NS portion of the Project include:

a. Construct the new 345 kV ED-NS transmission line between the Edic Substation and the New Scotland Substation using 2-bundle 954 kcmil ACSS "Cardinal" conductor primarily on new 345 kV structures. The majority of proposed structures from ED-PT will be between 0 feet (no difference) and 20 feet taller than what exists today. For approximately 3.6 miles of this 66.8 mile segment, the proposed structures will be 65 feet taller than what exists today. The proposed structures from PT-NS will be between 45 feet and 100 feet shorter than what exists today. The proposed structures from PT-RD will be between 30 feet shorter and 15 feet taller than what exists today.

b. Remove the two existing 230 kV lines between the Porter Substation and the Rotterdam Substation.

c. Interconnect the existing 345 kV Edic to New Scotland line into the rebuilt 345 kV Rotterdam Substation.

A summary of the substation modifications for the ED-NS portion of the Project includes:

a. Edic 345 kV Substation: Relocate the existing 345 kV Fraser line to the spare bay position and install a new circuit breaker. Terminate the new 345 kV New Scotland line to the bay position vacated by Fraser line. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

b. New Scotland 345 kV Substation: At the New Scotland Substation, new circuit breakers and a new line position will be added between the two existing bus sections. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. Rotterdam 345 kV Substation: Construct a new 345 kV yard on the existing 230 kV Rotterdam Substation site, connecting the existing 345 kV Edic to New Scotland line, the existing 230 kV Rotterdam to Eastover Road line, and to a rebuilt 115 kV yard.

d. Eastover Road 230 kV Substation: Existing relaying and equipment will need evaluation for fault duty and electrical rating.

Details of line upgrades for the KB-PV portion of the Project include:

Construct the new 345 kV KB-PV transmission line between the new Knickerbocker Switching Station and the existing Pleasant Valley Substation using 2-bundle 954 kcmil ACSS “Cardinal” conductor on new double-circuit 115/345 kV structures. The proposed structures for KB-PV will be between 5 feet shorter to 10 feet taller than what exists today.

a. Remove the existing 115 kV double-circuit lattice structure line in the ROW between the new Knickerbocker Switching Station and rebuilt and expanded Churchtown Switching Station and the two existing 115 kV double-circuit lattice structure lines in the ROW between the Churchtown Switching Station and the existing Pleasant Valley Substation.

b. Rebuild a single 115 kV line between the new Knickerbocker Switching Station and the existing Pleasant Valley Substation using single 954 kcmil ACSS ”Cardinal” conductor on the new double-circuit 115/345 kV structures.

A summary of the substation modifications for the KB-PV portion of the Project includes:

a. Knickerbocker 345 kV Switching Station: Construct new 345 kV Knickerbocker Switching Station connecting to the existing 345 kV New Scotland-Alps line and the new 345 kV Knickerbocker-Pleasant Valley line.

b. Pleasant Valley 345 kV Substation: Relocate the existing 345 kV Long Mountain line to the spare bay position and install a new circuit breaker. Terminate the new 345 kV Knickerbocker line to the bay position vacated by the Long Mountain line. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. New Scotland, Alps and Long Mountain 345 kV Substations: Existing relaying and equipment will need evaluation for fault duty and electrical rating.

d. Churchtown Switching Station: Demolish existing Churchtown 115 kV switching station and construct a new expanded 115 kV switching station at Churchtown on the existing site.

3.8.4 Innovations Incorporated

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.8.5 Other Technologies and Methods Being Studied

[redacted]

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

[redacted]

[redacted]

3.8.6 Evidence of Commercially Viable Technology

The transmission facilities proposed for the ED-NS/KB-PV Project consist of materials that have been successfully used on transmission lines for decades, including transmission lines in New York.

Overhead Transmission Engineering

Structures will consist of tubular steel, natural wood, or laminated wood. Conductors used on the project will be aluminum and either steel reinforced (ACSR) or steel supported (ACSS). Although ACSS is less commonly used, both ACSR and ACSS have been used throughout the industry for 40 years. Hardware on the project will consist of traditional ceramic insulators and various metallic connectors. The latest composite core conductors, ACCR and ACCC, which have been in commercial operation for over 10 years, were also evaluated. It was determined that the proposed project can realize the same benefits with ACSS and ACSR for a fraction of the cost of using ACCR or ACCC. It is estimated that the use of ACCR conductor would increase total project costs by approximately 30 percent.

Substation Engineering

Structures will consist of tubular steel. The primary conductor used within the substations will be tubular rigid aluminum. Jumpers and strain conductors will consist of single and bundled steel reinforced aluminum conductor ACSR. Circuit breakers will be of the SF6 type, and shall be isolated with open air gang operated disconnect switches. Hardware within the stations will consist of traditional ceramic

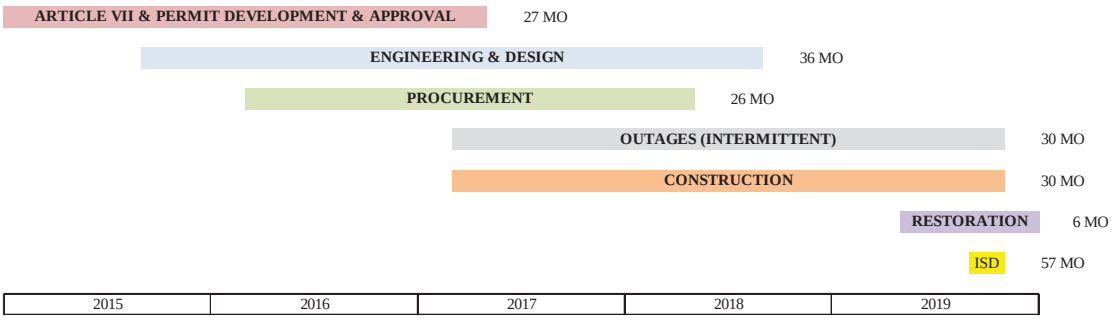
insulators and various metallic connectors. The structures, conductor equipment, and hardware used within the substations have been used throughout the industry for over 60 years. The application for these stations will utilize the latest manufacturing and operational technology based on this proven technology. All substations will be enclosed within an 8-foot high chain link security fence.

All material proposed for use on the project can be procured through traditional industry channels.

3.8.7 Schedule

The ED-NS/KB-PV Project is expected to take approximately 57 months to complete. Construction of substations and overhead lines is expected to take approximately 30 months. A high level schedule for the ED-NS/KB-PV Project is provided in Figure ED-NS/KB-PV-2. Assumptions built into the project schedule include: commencement of Part B filing in September 2015; staggered EM&CP filing and approvals; procurement of long lead items begin prior to final EM&CP approval; and intermittent outage schedules that include consideration for summer reliability constraints.

Figure ED-NS/KB-PV-2: Proposed Project Schedule



A conceptual construction sequencing plan developed for this project identifies outage requirements, as listed in Table ED-NS/KB-PV-1 and Table ED-NS/KB-PV-2, below. While developed to ensure a continual source of power to all affected substations, the construction sequence and outage plans are subject to change pending further load flow and system reliability studies. No long-term outages were scheduled during the summer peak load months of June through August. As most of the outages are to the 230 kV system and only a few to the bulk power system, it is not anticipated that there will be any appreciable congestion costs associated with this construction plan.

In addition to considering potential outage-related constraints, scheduling of construction activities to avoid or minimize impacts to sensitive environmental resources will need to be considered in developing the EM&CP and in developing the associated construction sequencing plan.

3.8.8 Capital Cost Estimate

See Attachment 3 for capital cost estimate.

Table ED-NS/KB-PV-1:
Long Term Outages with no Emergency Return to Service Restoration Ability

Line or Sectionalized Line Segment Out of Service	Duration (weeks)	Approximate Time Frame
#13 Rotterdam-New Scotland 115 kV Line	3	Spring 2017
#31 Porter-Rotterdam 230 kV Line	10	Fall 2017
#30 Porter-Rotterdam 230 kV Line	14	Spring 2018
Ft. Orange (future)-Valkin Section of #15 Greenbush-Ft. Orange-Valkin-Hudson 115 kV Line & Schodack-Valkin Section of #14 Schodack-Valkin-Churchtown 115 kV Line	10	Fall 2017
Valkin-Hudson Section of #15 Greenbush-Ft. Orange-Valkin-Hudson 115 kV Line & Valkin-Churchtown Section of #14 Schodack-Valkin-Churchtown 115 kV Line	21	Fall 2017 to Spring 2018
ADM Milling-Pleasant Valley Section of #12 Hudson-ADM Milling-Pleasant Valley 115 kV Line & Valkin-Churchtown Section of #14 Schodack-Valkin-Churchtown 115 kV Line	9	Spring 2018
Hudson-ADM Milling Section of #12 Hudson-ADM Milling-Pleasant Valley 115 kV Line & Valkin-Churchtown Section of #14 Schodack-Valkin-Churchtown 115 kV Line	5	Fall 2018
T7 North Catskill-Milan 115 kV Line	6	Fall 2018

Table ED-NS/KB-PV-2:
Short Term Outages with no Emergency Return to Service Restoration Ability[2]

Line Out of Service	Duration (days)
#8 Lafarge-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line	1
#10 Milan-Pleasant Valley 115 kV Line	1
#12 Hudson-ADM Milling-Pleasant Valley 115 kV Line &	1
#13 Churchtown-Pleasant Valley 115 kV Line	1
#14 Schodack-Valkin-Churchtown 115 kV Line	1
#15 Greenbush-Ft. Orange-Valkin-Hudson 115 kV Line	1
T7 North Catskill-Milan 115 kV Line	1
#984 Churchtown-Craryville 115 kV Line	1
#398 Pleasant Valley-Long Mt. 345 kV Line	1-2
#2 New Scotland-Alps 345 kV Line	1-2
#14 Marcy-New Scotland 345 kV Line	2-3
(NYPA) Edic - Fraser 345 kV Line	1-2
(NYPA) #1 New Scotland-Gilboa 345 kV Line	3-4
#94 New Scotland-Leeds 345 kV Line	3-4

3.8.9 Risk Assessment

Permitting Risks

a. The proposed schedule includes 27 months to develop, file and obtain permits from state and federal agencies. A number of these approvals may lead to additional analysis or approvals. Schedule delays such as delay in commencing the Article VII Part B process and the ACOE permit can impact the project in-service date which will increase project costs. Complete permit filings along with efficient permit processes will minimize any potential schedule delays.

b. It is assumed that the Article VII development and Certificate approval process will not exceed 12 months.

c. Since a number of environmental field investigations must take place in order to produce state and federal permit applications, schedule delays that push the window for field investigations outside of the proper season could delay the permitting development process an additional year.

[2] Lines identified may be subjected to multiple short term outages as will be required for sectionalizing, station cut-overs and wire installation crossings.

d. Although the Applicant is striving to address known environmental issues, unanticipated permit requirements imposed by regulatory agencies can extend construction schedules, impact the in-service date, and increase project costs. For example, there may be a limitation on when the trees can be cleared for protection measures associated with the Northern Long Eared Bat.

e. The Cricket Valley Project is in the queue for utilizing the spare bay position at the Consolidated Edison Pleasant Valley 345 kV Substation. If the Cricket Valley Project should get approved before this project, a bay addition would be required, which could increase the permitting schedule and will increase project costs.

Procurement Risk

a. The proposed schedule provides for up to 26 months for the procurement of construction services and major equipment with long lead times (e.g. circuit breakers, disconnect switches). Risks can include raw material and manufacturing availability, quality and delivery logistics. Currently, the Applicant does not see fabrication and delivery problems with the major equipment needed for this Project. However, if markets change, delays could impact the in-service date

Construction Risk

a. During detailed design, subsurface core borings are performed in intervals along the Project route. During construction, unforeseen field conditions (e.g. excessive ground water, shallow bedrock, nested boulders, etc.) can be encountered. Typically, unforeseen field conditions result in an increased cost to the project. In more extreme cases, schedule impacts also occur.

b. Execution of a large construction project can include project management risks including securing a large number of labor resources, coordinating project activities, managing schedule, and keeping the project within budget.

c. The proposed schedule provides approximately 30 months for needed intermittent outage windows. If construction sequencing, outage sequencing plans, and commissioning sequencing are delayed due to system conditions and new outages take longer to schedule, the in-service date (as well as the overall Project cost) can be affected.

3.8.10 Status of NYISO Interconnection Studies

The Applicant has not yet filed with the NYISO for interconnection request studies for this Project and plans to file the request shortly after the filing of this submission.

3.8.11 Status of Equipment Availability and Procurement

No equipment has yet been procured for the Project.

Long lead items for the Knickerbocker and Churchtown Switching Stations, and the Edic, New Scotland, Rotterdam, and Pleasant Valley Substations, include circuit breakers, disconnect switches, support and bus structures, dead end structures, lightning arresters, lightning masts, capacitor coupled voltage transformers, and control enclosures. Typical lead times for these items range from 8 to 30 weeks. This equipment is currently not expected to cause schedule delays and are common station procurement items.

Long lead items for overhead construction include 345 kV structures (lead times of approximately 20 to 26 weeks) and overhead conductor (lead times of approximately 12 to 16 weeks). This equipment is not currently expected to cause schedule delays.

3.8.12 Status of Contracts

There are currently no contracts under negotiation or in place relative to this Project.

3.8.13 Demonstration of Site Control

The Project will be constructed entirely within existing Applicant ROW on property either owned in fee by the Applicant or on property which the Applicant has easements for transmission construction. The Applicant has site control of all station locations with the exception of the 345 kV Pleasant Valley Substation which is owned by Consolidated Edison and Long Lane Substation owned by Northeast Utilities.

3.8.14 Status of Permits

No permits or certificates for the ED-NS/KB-PV Project have been received to date. Long lead permits include concurrent submittal and review for an Article VII Certificate and ACOE 404 Permit, and DPS EM&CP approval (post Article VII approval, staggered submissions over 19 months). A full list of permits is provided in Table ED-NS/KB-PV-3.

Table ED-NS/KB-PV-3: Permits/Certificates Required

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Federal Permits					
Sections 10 (Rivers and Harbors Act of 1899) and 404 (Clean Water Act Permit)	U.S. Army Corps of Engineers, Buffalo [ED-NS only] and NY Districts (ACOE) - in consultation with U.S. Fish & Wildlife Service (USFWS) and tribes	All areas impacting jurisdictional waters/wetlands (Tidally influenced waters and Waters of the U. S.)		1 year after submittal	Prior to impacting jurisdictional waters/wetlands and start of construction
Threatened & Endangered Species (Endangered Species Act)	U.S. Fish & Wildlife Service (USFWS)	Areas that could contain potential T&E species or their respective habitat	Occurs during the review and approval by the ACOE		Prior to impacting areas that could contain potential T&E species or their respective habitat
Federal Aviation Administration (FAA) Notification of Construction or Alteration	Regional FAA Office	Any portion of the project (permanent structures or cranes) potentially affecting navigable airspace (structures over 200' in height or are located within a certain distance of an airport)	Concurrent with filing of EM&CP		Prior to applying for other construction related permits
State Permits					
Article VII Certificate of Environmental Compatibility and Public Need (Certificate) Approval	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
Environmental Management and Construction Plan (EM&CP)	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
State 401 Water Quality Certification	New York State Public Service Commission	All areas impacting jurisdictional waters/wetlands	Concurrent with Part B application		Concurrently with EM&CP Approval

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
State Permits, Continued					
SPDES General Permit (GP) for Stormwater Discharges from Construction Activities and New York State-Regulated Wetlands and Protected Waters	New York State Department of Environmental Conservation (NYSDEC)	Entire Project (segments, substations, laydown areas, staging areas, etc.)	Concurrent with filing of EM&CP		Prior to initiating any land disturbing activities, including vegetation clearing
Municipal Stormwater (MS4) Review	Town, city or village	All components in MS4 jurisdictions (if applicable)	Prior to filing the EM&CP		
Cultural Resources Review (National Historical Preservation Act - NHPA)	New York State Parks (State Historic Preservation Officer [SHPO])	Entire project	Concurrent with filing of Part B application		Before starting construction in off-road areas or areas that have not been previously disturbed
Work Permit for Canal Crossing	New York State Canal Corporation	Where the Project crosses the Erie Canal	Coordination prior to construction (need final project design)		
Department of Transportation Utility Work Permit	NY DOT	Installation of utilities within or adjacent to state highway ROWs.	Coordination prior to construction (need final project design)		Construction
Hudson River Crossing					
Easement	State of New York Office of Parks, Recreation and Historic Preservation		Coordination prior to Part B application submittal		
Notification	Office of General Services		Coordination prior to Part B application submittal		

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Municipal Permits (Article VII Certificate Approval Supersedes Most Municipal Environmental Related Permits) Continued					
Municipal Consultation Filing	City/Town	Entire Project	Coordination prior to Part B application submittal		
Local Airport Operator Review		Airports and aviation facilities within 5 miles of the Project	Coordination prior to construction (need final project design)		
Railroad ROW Entry Permit	Railroad Company	ROW access for design purposes	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)
Railroad ROW Construction Authorization	Railroad Company	Activities located within railroad right-of-way (ROW)	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)

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Edic to New Scotland
345 kV Transmission Line
and
New Scotland to Leeds to Pleasant Valley 345 kV
Transmission Line Reconductoring Project
(ED-NS/NS-LD-PV(R))

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EDIC TO NEW SCOTLAND 345 KV TRANSMISSION LINE
AND NEW SCOTLAND TO LEEDS TO PLEASANT VALLEY
345 KV RECONDUCTORING PROJECT
(ED-NS/NS-LD-PV(R))

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3.9 Edic to New Scotland 345 kV Transmission Line and New Scotland to Leeds to Pleasant Valley 345 kV Reconductoring Project (ED-NS/NS-LD-PV(R))

3.9.1 Project Description

The Edic to New Scotland 345 kV Transmission Line and New Scotland to Leeds to Pleasant Valley 345 kV Transmission Line Reconductoring Project (ED-NS/NS-LD-PV(R)) is comprised of five ROW segments, Edic to Princetown Junction (ED-PT), Princetown Junction to New Scotland (PT-NS), Princetown Junction to Rotterdam (PT-RD), New Scotland to Leeds (NS-LD), and Leeds to Pleasant Valley (LD-PV). The Project includes the rebuild and expansion of the existing 230 kV Rotterdam Substation to include a 345 kV yard, modifications to the existing 345 kV Edic and New Scotland Substations, and minor modifications to the existing 345 kV Leeds Switching Station and the existing Consolidated Edison Pleasant Valley 345 kV Substation.

The location of the ED-NS/NS-LD-PV(R) Project is depicted in Figure ED-NS/NS-LD-PV(R)-1.

3.9.2 Physical Description

The ED-NS portion of the project consists of the ED-PT, PT-NS, and PT-RD segments as described in further detail below.

The ED-PT segment starts at the existing 345 kV Edic Substation in the Town of Marcy, Oneida County. The scope of work consists of the removal of two existing 230 kV lines and the construction of a new 345 kV line within approximately 66.8 miles of existing ROW. For approximately 12.6 miles out of Edic Substation, this will involve the removal of one set of 230 kV wires and insulators from each of the two existing 230/345 kV double-circuit monopole structures and the installation of one set of 345 kV wires and insulators to one of them. For the remaining approximately 54.2 miles, the two existing 230 kV H-frame structure lines will be removed and replaced with one new 345 kV line consisting predominately of H-frame structures. New 345 kV compact monopole structures will be used intermittently through this 54.2-mile segment for approximately 5.4 miles in total. All work at the existing 345 kV Edic Substation will be within the existing fenceline. This segment terminates at Princetown Junction in the Town of Princetown, Schenectady County. The ED-PT segment passes through the Towns of Marcy and Deerfield in Oneida County, the Towns of Schuyler, Frankfort, German Flatts, Little Falls, Stark, and Danube in Herkimer County, the Towns of Minden, Canajoharie, Root, Glen, Charleston, and Florida, in Montgomery County, and the Towns of Duanesburg and Princetown in Schenectady County.

The PT-NS segment starts at Princetown Junction. The scope of work consists of the construction of a new 345 kV line within approximately 19.7 miles of existing ROW. This segment will utilize approximately 11.5 miles of H-frame structures, 6.3 miles of compact monopole structures and 1.9 miles of 115/345 kV double-circuit compact monopole structures. This segment terminates at the existing 345 kV New Scotland Substation in the Town of New Scotland, Albany County. Work at the New Scotland Substation will require expansion of the existing fenceline. This expansion can occur within the substation property currently owned by National Grid. The PT-NS segment passes through the Town of Princetown in Schenectady County, and the Towns of Guilderland and New Scotland, in Albany County.

The PT-RD segment also starts at the Princetown Junction. The scope of work consists of the removal of two existing 230 kV H-frame structure lines and the construction of two new 345 kV compact monopole structure lines within approximately 5.0 miles of existing ROW. This segment terminates at the existing 230 kV Rotterdam Substation in the Town of Rotterdam, Schenectady County. The addition of 345 kV lines to Rotterdam Substation will require the addition of a 345 kV yard and the expansion of the existing fenceline. This expansion can occur within the substation property currently owned by National Grid. The rebuilt 345 kV Rotterdam Substation allows for the retirement of the two existing 230 kV lines between the existing 230 kV Porter Substation in the Town of Marcy, Oneida County and the Rotterdam Substation.

The NS-LD-PV(R) portion of the Project consists of the NS-LD and LD-PV segments as described in further detail below.

The NS-LD segment starts at the existing 345 kV New Scotland Substation in the Town of New Scotland, Albany County. The scope of work consists of the reconductoring of two existing 345 kV lattice structure lines and replacement of certain structures for approximately 25.9 miles within an existing ROW. This segment terminates at the 345 kV Leeds Switching Station in the Town of Athens, Greene County. Work at the New Scotland Substation will require expansion of the existing fenceline. This expansion can occur within the substation property currently owned by National Grid. Work at the Leeds Switching Station will be within the existing fenceline. This segment passes through the Towns of New Scotland and Coeymans in Albany County, and the Towns of New Baltimore, Coxsackie, and Athens in Greene County.

The LD-PV segment starts at the existing Leeds Switching Station in the Town of Athens, Greene County. The scope of work consists of the reconductoring of two existing 345 kV lattice structure lines and replacement of certain structures for approximately 39.8 miles within an existing ROW. This

Edic
(Existing 345 kV)

Princetown

Rotterdam
(Rebuilt 345 kV)

New Scotland
(Existing 345 kV)

Knickerbocker

Athens

Leeds
(Existing 345 kV)

Churchtown

Pleasant
Valley
(Existing 345 kV)

Hurley
Avenue

Fraser

Oakdale

Onondaga County
Madison County
Oneida County
Herkimer County
Fulton County
Saratoga County
Washington County
Montgomery County
Schenectady County
Rensselaer County
Albany County
Cortland County
Otsego County
Schoharie County
Chenango County
Greene County
Columbia County
Broome County
Delaware County
Ulster County
Dutchess County
Sullivan County

Legend

- New 345kV Transmission Line (Central East)
- Reconductored 345kV Transmission Line (UPNY/SENY)
- 345 kV Transmission Rebuild (Central East)
- Other Project Segment
- Project Station
- Project Junction
- Other Project Station
- County Boundary

nationalgrid

Burns & McDonnell SINCE 1898

Figure ED-NS/NS-LD-PV(R)-1

Edic to New Scotland and New Scotland to Leeds to Pleasant Valley (Reconductor)

January 2015

N W E S

0 5 10 20 30 40 Miles

Sources: BMcD Engineering, ESRI

Note: This page intentionally left blank

segment includes an existing aerial crossing of the Hudson River and terminates at the Pleasant Valley Substation in the Town of Pleasant Valley, Dutchess County. This segment also includes reconductoring of two existing 345 kV lines for the 0.5-mile section from the Athens Junction to the Athens Substation, all within the Town of Athens, Greene County. All work at the Leeds Switching Station, Athens Substation, and Pleasant Valley Substation will be within existing fencelines. The LD-PV segment passes through the Town of Athens and the Village of Athens in Greene County, the Towns of Greenport, Livingston, and Clermont in Columbia County, and the Towns of Milan, Clinton, Hyde Park, and Pleasant Valley in Dutchess County.

Additional ancillary work on other system facilities may be required depending on the results of the NYISO system impact studies.

3.9.3 Electrical Description

It is the Applicant's expectation that the NYISO will prepare the analysis for the interface transfer impact for the ED-NS/NS-LD-PV(R) Project. However, the Applicant has undertaken this analysis and believes the N-1-1 transfer capability for UPNY-SENY to be increased in the range of 1,350 - 1,550 MW. In addition, this solution also increases the N-1 thermal Central-East transfer capability to be in the range of 300 - 500 MW.

Electrical single-line drawings of the 345 kV system, 115 kV system and individual switching stations and substations providing circuit specific line data are contained in the confidential data provided in Section 1.0, Modeling Data.

Details of line upgrades for the ED-NS portion of the Project include:

a. Construct the new 345 kV ED-NS transmission line between the Edic Substation and the New Scotland Substation using 2-bundle 954 kcmil ACSS "Cardinal" conductor primarily on new 345 kV structures. The majority of proposed structures from ED-PT will be between 0 feet (no difference) and 20 feet taller than what exists today. For approximately 3.6 miles of this 66.8 mile segment, the proposed structures will be 65 feet taller than what exists today. The proposed structures from PT-NS will be between 45 feet and 100 feet shorter than what exists today. The proposed structures from PT-RD will be between 30 feet shorter and 15 feet taller than what exists today.

b. Remove the two existing 230 kV lines between the Porter Substation and the Rotterdam Substation.

c. Interconnect the existing 345 kV Edic to New Scotland line into the rebuilt 345 kV Rotterdam Substation using 2-bundle 954 kcmil ACSS "Cardinal" conductor on new 345 kV structures.

A summary of the substation modifications for the ED-NS portion of the Project includes:

a. Edic 345 kV Substation: Relocate the existing 345 kV Fraser line to the spare bay position and install a new circuit breaker. Terminate the new 345 kV New Scotland line to the bay position vacated by Fraser line. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

b. New Scotland 345 kV Substation: At the New Scotland Substation, new circuit breakers and a new line position will be added between the two existing bus sections. Existing relaying and equipment will need evaluation for fault duty and electrical rating. The expansion will be on National Grid owned property.

c. Rotterdam 345 kV Substation: Construct a new 345 kV yard on the existing 230 kV Rotterdam Substation site, connecting the existing 345 kV Edic to New Scotland line, the existing 230 kV Rotterdam to Eastover Road line, and to a rebuilt 115 kV yard. The expansion will be on National Grid owned property.

d. Eastover Road 230 kV Substation: Existing relaying and equipment will need evaluation for fault duty and electrical rating.

Details of line upgrades for the NS-LD-PV(R) portion of the Project include:

a. Reconductor two existing 345 kV lines (i.e., replacing existing transmission wires with new higher capacity wires) between the existing New Scotland Substation and existing Leeds Substation and between the Leeds Substation and the existing Pleasant Valley Substation, using higher capacity 2-bundle 795 kcmil ACSS "Drake" conductor on existing 345 kV structures. One of these lines loops into and out of the Athens 345 kV Substation.

b. Rebuild approximately 10% of the existing structures for ground clearance requirements due to the new conductor. New structures will consist of tubular steel with conductors remaining in a horizontal configuration. Most structures that are not replaced will receive structural reinforcement.

A summary of the minor substation and switching station modifications for the NS-LD-PV(R) portion of the Project includes:

a. New Scotland 345 kV Substation: Reconductor existing terminals for the 345 kV lines. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

b. Leeds 345 kV Switching Station: Reconductor existing terminals for the 345 kV lines. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. Athens 345 kV Substation: Reconductor existing terminals for the 345 kV lines. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

d. Pleasant Valley 345 kV Substation: Reconductor existing terminals for the 345 kV lines. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

3.9.4 Innovations Incorporated

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

3.9.5 Other Technologies and Methods Being Studied

[redacted]

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.9.6 Evidence of Commercially Viable Technology

The transmission facilities proposed for the ED-NS/NS-LD-PV(R) Project consist of materials that have been successfully used on transmission lines for decades, including transmission lines in New York.

Overhead Transmission Engineering

Structures will consist of tubular steel, natural wood, or laminated wood. Conductors used on the project will be aluminum and either steel reinforced (ACSR) or steel supported (ACSS). Although ACSS is less commonly used, both ACSR and ACSS have been used throughout the industry for 40 years. Hardware on the project will consist of traditional ceramic insulators and various metallic connectors. The latest composite core conductors, ACCR and ACCC, which have been in commercial operation for over 10 years, were also evaluated. It was determined that the proposed Project can realize the same benefits with ACSS and ACSR for a fraction of the cost of using ACCR or ACCC. It is estimated that the use of ACCR conductor would increase total project costs by approximately 30 percent.

Substation Engineering

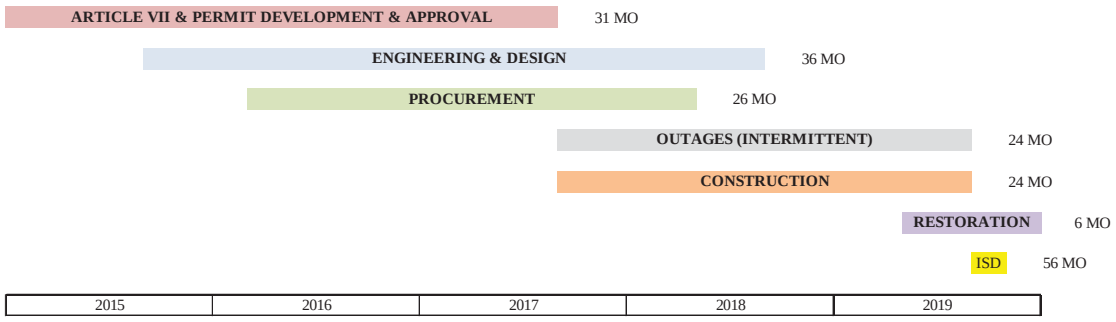
Structures will consist of tubular steel. The primary conductor used within the substations will be tubular rigid aluminum. Jumpers and strain conductors will consist of single and bundled steel reinforced aluminum conductor ACSR. Circuit breakers will be of the SF6 type, and shall be isolated with open air gang operated disconnect switches. Hardware within the stations will consist of traditional ceramic insulators and various metallic connectors. The structures, conductor equipment, and hardware used within the substations have been used throughout the industry for over 60 years. The application for these stations will utilize the latest manufacturing and operational technology based on this proven technology. All substations will be enclosed within an 8-foot high chain link security fence.

All material proposed for use on the project can be procured through traditional industry channels.

3.9.7 Schedule

The ED-NS/NS-LD-PV(R) Project is expected to take approximately 56 months to complete. Construction of substations and overhead lines is expected to take approximately 24 months. A high level schedule for the ED-NS/NS-LD-PV(R) Project is provided in Figure ED-NS/NS-LD-PV(R)-2. Assumptions built into the project schedule include: commencement of Part B filing in September 2015; staggered EM&CP filing and approvals; procurement of long lead items begin prior to final EM&CP approval; and intermittent outage schedules that include consideration for summer reliability constraints.

Figure ED-NS/NS-LD-PV(R)-2: Proposed Project Schedule



A conceptual construction sequencing plan developed for this Project identifies outage requirements, as listed in Table ED-NS/NS-LD-PV(R)-1, Table ED-NS/NS-LD-PV(R)-2 and Table ED-NS/NS-LD-

PV(R)-3, below. While developed to ensure a continual source of power to all affected substations, the construction sequence and outage plans are subject to change pending further load flow and system reliability studies. No long-term outages were scheduled during the summer peak load months of June through August. This Project requires continuous outage on 230 kV and 345 kV lines. It is not anticipated that there will be any appreciable congestion costs associated with scheduled 230 kV continuous line outages. However, the congestion costs associated with the scheduled 345 kV continuous line outages, which are required to reconductor the NS-LD-PV(R) portion of the Project, could become significant. To mitigate these impacts, the 345 kV transmission line reconductor work will be coordinated so that the existing 345 kV lines can be put back into service within 24 to 48 hours.

In addition to considering potential outage-related constraints, scheduling of construction activities to avoid or minimize impacts to sensitive environmental resources will need to be considered in developing the EM&CP and in developing the associated construction sequencing plan.

Table ED-NS/NS-LD-PV(R)-1:
Long Term Outages with 24 to 48-hour Emergency Return to Service Restoration Ability

Line Out of Service	Duration (weeks)	Approximate Time Frame
#95 Leeds-Athens 345 kV Line	9	Fall 2017
#91 Athens-Pleasant Valley 345 kV Line	23	Fall 2017 to Spring 2018
#92 Leeds-Pleasant Valley 345 kV Line	23	Spring 2018, Fall 2018 & Winter 2018-2019
#93 New Scotland-Leeds 345 kV Line	16	Spring 2019 & Fall 2019
#94 New Scotland-Leeds 345 kV Line	16	Fall 2019 & Winter 2019 - 2020

Table ED-NS/NS-LD-PV(R)-2:
Long Term Outages with no Emergency Return to Service Restoration Ability

Line Out of Service	Duration (weeks)	Approximate Time Frame
#13 Rotterdam-New Scotland 115 kV Line	3	Fall 2017
#31 Porter-Rotterdam 230 kV Line	10	Fall 2017
#30 Porter-Rotterdam 230 kV Line	10	Spring 2018
#30 Porter-Rotterdam 230 kV Line	6	Fall 2018

Table ED-NS/NS-LD-PV(R)-3:
Short Term Outages with no Emergency Return to Service Restoration Ability[1]

Line Out of Service	Duration (days)
Various lower voltage line crossings possible - yet to be determined	TBD
#14 Marcy-New Scotland 345 kV Line	2-3
(NYPA) Edic-Fraser 345 kV Line	1-2
(NYPA) #1 New Scotland-Gilboa 345 kV Line	3-4
#94 New Scotland-Leeds 345 kV Line	3-4

3.9.8 Capital Cost Estimate

See Attachment 3 for capital cost estimate.

3.9.9 Risk Assessment

Permitting Risks

a. The proposed schedule includes 31 months to develop, file and obtain permits from state and federal agencies. A number of these approvals may lead to additional analysis or approvals. Schedule delays such as delay in commencing the Article VII Part B process and the ACOE permit can impact the project in-service date which will increase project costs. Complete permit filings along with efficient permit processes will minimize any potential schedule delays.

b. It is assumed that the Article VII development and Certificate approval process will not exceed 12 months.

c. Since a number of environmental field investigations must take place in order to produce state and federal permit applications, schedule delays that push the window for field investigations outside of the proper season could delay the permitting development process an additional year.

d. Although the Applicant is striving to address known environmental issues, unanticipated permit requirements imposed by regulatory agencies can extend construction schedules, impact the in-service date, and increase project costs. For example, there may be a limitation on when the trees can be cleared for protection measures associated with the Northern Long Eared Bat.

[1] Lines identified may be subjected to multiple short term outages as will be required for sectionalizing, station cut-overs and wire installation crossings.

Scope Risk

a. The estimate and schedule assumes a 10% structure replacement. Detailed engineering has not been performed and could result in an increase in the number of structures to be replaced.

Procurement Risk

a. The proposed schedule provides for up to 26 months for the procurement of construction services and major equipment with long lead times (e.g. circuit breakers, disconnect switches). Risks can include raw material and manufacturing availability, quality and delivery logistics. Currently, the Applicant does not see fabrication and delivery problems with the major equipment needed for this Project. However, if markets change, delays could impact the in-service date

Construction Risk

a. During detailed design, subsurface core borings are performed in intervals along the Project route. During construction, unforeseen field conditions (e.g. excessive ground water, shallow bedrock, nested boulders, etc.) can be encountered. Typically, unforeseen field conditions result in an increased cost to the project. In more extreme cases, schedule impacts also occur.

b. Execution of a large construction project can include project management risks including securing a large number of labor resources, coordinating project activities, managing schedule, and keeping the project within budget.

c. The proposed schedule provides approximately 24 months for needed intermittent outage windows. If construction sequencing, outage sequencing plans, and commissioning sequencing are delayed due to system conditions and new outages take longer to schedule, the in-service date (as well as the overall Project cost) can be affected.

3.9.10 Status of NYISO Interconnection Studies

The Applicant has not yet filed with the NYISO for interconnection request for this Project and plans to file the request shortly after the filing of this submission.

3.9.11 Status of Equipment Availability and Procurement

No equipment has yet been procured for the Project.

Long lead items for the Leeds Switching Station, and the Edic, New Scotland, Rotterdam, Athens, and Pleasant Valley Substations, include circuit breakers, disconnect switches, support and bus structures, dead end structures, lightning arresters, lightning masts, capacitor coupled voltage transformers, and

control enclosures. Typical lead times for these items range from 8 to 30 weeks. This equipment is currently not expected to cause schedule delays and are common station procurement items.

Long lead items for overhead construction include 345 kV structures (lead times of approximately 20 to 26 weeks) and overhead conductor (lead times of approximately 12 to 16 weeks). This equipment is not currently expected to cause schedule delays.

3.9.12 Status of Contracts

There are currently no contracts under negotiation or in place relative to this Project.

3.9.13 Demonstration of Site Control

The Project will be constructed entirely within existing Applicant ROW on property either owned in fee by the Applicant or on property which the Applicant has easements for transmission construction. The Applicant has site control of all station locations with the exception of the 345 kV Pleasant Valley Substation which is owned by Consolidated Edison.

3.9.14 Status of Permits

No permits or certificates for the ED-NS/NS-LD-PV(R) Project have been received to date. Long lead permits include concurrent submittal and review for an Article VII Certificate and ACOE 404 Permit, and DPS EM&CP approval (post Article VII approval, staggered submissions over 19 months). A full list of permits is provided in Table ED-NS/NS-LD-PV(R)-4.

Table ED-NS/NS-LD-PV(R)-4: Permits/Certificates Required

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Federal Permits					
Sections 10 (Rivers and Harbors Act of 1899) and 404 (Clean Water Act Permit)	U.S. Army Corps of Engineers, Buffalo [ED-NS only] and NY Districts (ACOE) - in consultation with U.S. Fish & Wildlife Service (USFWS) and tribes	All areas impacting jurisdictional waters/wetlands (Tidally influenced waters and Waters of the U. S.)		1 year after submittal	Prior to impacting jurisdictional waters/wetlands and start of construction
Threatened & Endangered Species (Endangered Species Act)	U.S. Fish & Wildlife Service (USFWS)	Areas that could contain potential T&E species or their respective habitat	Occurs during the review and approval by the ACOE		Prior to impacting areas that could contain potential T&E species or their respective habitat
US Coast Guard Approval for work within navigable waters (Section 9 of the Rivers and Harbors Act of 1899)	US Coast Guard	Navigable waters	Concurrent with filing of EM&CP		
Federal Aviation Administration (FAA) Notification of Construction or Alteration	Regional FAA Office	Any portion of the project (permanent structures or cranes) potentially affecting navigable airspace (structures over 200' in height or are located within a certain distance of an airport)	Concurrent with filing of EM&CP		Prior to applying for other construction related permits
State Permits					
Article VII Certificate of Environmental Compatibility and Public Need (Certificate) Approval	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
State 401 Water Quality Certification	New York State Public Service Commission	All areas impacting jurisdictional waters/wetlands	Concurrent with Part B application		Concurrently with EM&CP Approval

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
State Permits, Continued					
Environmental Management and Construction Plan (EM&CP)	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
SPDES General Permit (GP) for Stormwater Discharges from Construction Activities and New York State-Regulated Wetlands and Protected Waters	New York State Department of Environmental Conservation (NYSDEC)	Entire Project (segments, substations, laydown areas, staging areas, etc.)	Concurrent with filing of EM&CP		Prior to initiating any land disturbing activities, including vegetation clearing
Municipal Stormwater (MS4) Review	Town, city or village	All components in MS4 jurisdictions (if applicable)	Prior to filing the EM&CP		
Cultural Resources Review (National Historical Preservation Act - NHPA)	New York State Parks (State Historic Preservation Officer [SHPO])	Entire project	Concurrent with filing of Part B application		Before starting construction in off-road areas or areas that have not been previously disturbed
Work Permit for Canal Crossing	New York State Canal Corporation	Where the Project crosses the Erie Canal	Coordination prior to construction (need final project design)		
Department of Transportation Utility Work Permit	NY DOT	Installation of utilities within or adjacent to state highway ROWs.	Coordination prior to construction (need final project design)		Construction

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Hudson River Crossing					
Coastal Management Program (CMP) and Local Waterfront Revitalization Program (LWRP)	New York Department of State	Hudson Riverfront	Concurrent with filing of 404 application		
Easement	State of New York Office of Parks, Recreation and Historic Preservation		Coordination prior to Part B application submittal		
Notification	Office of General Services		Coordination prior to Part B application submittal		
Municipal Permits (Article VII Certificate Approval Supersedes Most Municipal Environmental Related Permits)					
Municipal Consultation Filing	City/Town	Entire Project	Coordination prior to Part B application submittal		
Local Airport Operator Review		Airports and aviation facilities within 5 miles of the Project	Coordination prior to construction (need final project design)		
Railroad ROW Entry Permit	Railroad Company	ROW access for design purposes	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)
Railroad ROW Construction Authorization	Railroad Company	Activities located within railroad right-of-way (ROW)	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)

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Edic to New Scotland 345 kV Transmission Line Project and Hurley Avenue PARs Project (ED-NS/HA)

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EDIC TO NEW SCOTLAND 345 KV TRANSMISSION LINE PROJECT AND HURLEY AVENUE PARS PROJECT
(ED-NS/HA)

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3.10 Edic to New Scotland 345 kV Transmission Line and Hurley Avenue PARs Project (ED-NS/HA)

3.10.1 Project Description

The Edic to New Scotland 345 kV Transmission Line and Hurley Avenue PARs Project (ED-NS/HA) is comprised of two component parts, Edic to New Scotland and Hurley Avenue PARs.

The Edic to New Scotland 345 kV Transmission Line portion of the Project is comprised of three ROW segments, Edic to Princetown Junction (ED-PT), Princetown Junction to New Scotland (PT-NS), and Princetown Junction to Rotterdam (PT-RD). The Project includes the rebuild and expansion of the existing 230 kV Rotterdam Substation to include a 345 kV yard, and modifications to the existing 345 kV Edic and New Scotland Substations.

The Hurley Avenue Phase Angle Regulators (PARs) portion of the Project is designed to improve the flow of power across the UPNY/SENY transmission line interface. This project includes the installation of three 575 MW (+/- 30 degree) PARs and two 135 MVAr switched shunt capacitors and associated interconnection equipment at Central Hudson's Hurley Avenue Substation located in the Town of Ulster, Ulster County, NY.

The location of the ED-NS/HA Project is depicted in Figure ED-NS/HA-1.

3.10.2 Physical Description

The ED-PT segment starts at the existing 345 kV Edic Substation in the Town of Marcy, Oneida County. The scope of work consists of the removal of two existing 230 kV lines and the construction of a new 345 kV line along and within approximately 66.8 miles of existing ROW. For approximately 12.6 miles out of Edic Substation, this will involve the removal of one set of 230 kV wires and insulators from each of the two existing 230/345 kV double-circuit tubular steel monopoles and the installation of one set of 345 kV wires and insulators to one of them. For the remaining approximately 54.2 miles, the two existing 230 kV H-frame structure lines will be removed and replaced with one new 345 kV line consisting predominately of H-frame structures. New 345 kV compact monopole structures will be used intermittently through this segment for approximately 5.4 miles in total. All work at the existing 345 kV Edic Substation will be within the existing fenceline. This segment terminates at Princetown Junction in the Town of Princetown, Schenectady County. The ED-PT segment passes through the Towns of Marcy and Deerfield in Oneida County, the Towns of Schuyler, Frankfort, German Flatts, Little Falls, Stark, and Danube in Herkimer

County, the Towns of Minden, Canajoharie, Root, Glen, Charleston, and Florida, in Montgomery County, and the Towns of Duanesburg and Princetown in Schenectady County.

The PT-NS segment starts at Princetown Junction. The scope of work consists of the construction of new 345 kV structures along and within approximately 19.7 miles of existing ROW. This segment terminates at the existing 345 kV New Scotland Substation in the Town of New Scotland, Albany County. Work at the New Scotland Substation will require expansion of the existing fence line. This expansion can occur within the substation property currently owned by National Grid. The PT-NS segment passes through the Town of Princetown in Schenectady County, and the Towns of Guilderland and New Scotland, in Albany County.

The PT-RD segment also starts at the Princetown Junction. The scope of work consists of the removal of two existing 230 kV H-frame structure lines and the construction of two new 345 kV compact monopole structure lines along and within approximately 5.0 miles of existing ROW. This segment terminates at the rebuilt and expanded 345 kV Rotterdam Substation in the Town of Rotterdam, Schenectady County. The rebuilt 345 kV Rotterdam Substation allows for the retirement of the two existing 230 kV lines between the existing 230 kV Porter Substation in the Town of Marcy, Oneida County and the existing 230 kV Rotterdam Substation. The work at the rebuilt 345 kV Rotterdam Substation will require expansion of the existing fenceline. This expansion can occur within the substation property currently owed by National Grid.

The Hurley Avenue Phase Angle Regulators (PARs) portion of the Project will consist of the following equipment and components:

a. Three parallel 345 kV 575 MW (+/- 30 degree) PARs installed in series with the 301 Transmission Line to Leeds;

b. Two 345 kV 135 MVAr switched shunt capacitor banks;

c. One additional 345 kV circuit breaker for the interconnection of the PARs;

d. Two 345 kV circuit breakers for the interconnection of the shunt capacitor banks;

e. Six disconnect switches for the PARs;

f. Two disconnect switches for a bypass of the PARs;

g. Two disconnect switches for the shunt capacitor banks; and

Edic
(Existing 345 kV)

Princetown

Rotterdam
(Rebuilt 345 kV)

New Scotland
(Existing 345 kV)

Knickerbocker

Fraser

Athens

Leeds

Churchtown

Oakdale

Hurley Avenue
(Existing 345 kV)

Pleasant
Valley

Onondaga County
Madison County
Oneida County
Herkimer County
Fulton County
Montgomery County
Saratoga County
Washington County
Schenectady County
Rensselaer County
Albany County
Cortland County
Otsego County
Schoharie County
Chenango County
Tioga County
Broome County
Delaware County
Greene County
Columbia County
Ulster County
Dutchess County
Sullivan County

Syracuse
Utica

Legend

- New 345 kV Transmission Line (Central East)
- 345 kV Transmission Rebuild (Central East)
- Other Project Segment
- Other Project Station
- Project Junction
- Project Station
- County Boundary

nationalgrid

Burns & McDonnell SINCE 1898

People. Power. Possibilities. Central Hudson A FORTIS COMPANY

Figure ED-NS/HA-1

Edic to New Scotland and Hurley Avenue PARs

January 2015

N W E S

0 5 10 20 30 40 Miles

Sources: BMcD Engineering, ESRI

I:\National_Grid\National_Grid_MXD\Alternative_routes\NYISO\Alt_routes_ED_NS_HAPARs_Dec_2014.mxd

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h. Other appurtenances including substation bus work, relay protection equipment, and panels.

This portion of the Project also includes the replacement of station connections at both the Hurley Avenue and Leeds substations and replacement of two transmission line structures ½ mile south of Route 23A in the Town of Catskill, Greene County, NY on the 301 Hurley to Leeds 345kV transmission line all designed to maximize the rating of the existing transmission line.

This portion of the Project will require expansion of the current footprint of the Hurley Avenue Substation. This expansion can occur within the substation property currently owned by Central Hudson. The expansion of the Hurley Avenue Substation footprint will be approximately 255 feet to the west and 120 feet to the south.

3.10.3 Electrical Description

It is the Applicant's expectation that the NYISO will prepare the analysis for the interface transfer impact for the ED-NS Component Project. However, the Applicant has undertaken this analysis and believes the N-1 thermal Central-East transfer capability will be in the range of 0-100 MW and the N-1-1 thermal transfer capability on the UPNY-SENY interface by 400 MW.

Electrical single-line drawings of the 345 kV system, 115 kV system and individual switching stations and substations providing circuit-specific line and station data are contained in the confidential data provided in Section 1.0, Modeling Data. Details of the ED-NS Component Project line upgrades include:

a. Construct the new 345 kV ED-NS transmission line between the Edic Substation and the New Scotland Substation using 2-bundle 954 kcmil ACSS "Cardinal" conductor primarily on new 345 kV structures. The majority of proposed structures from ED-PT will be between 0 feet (no difference) and 20 feet taller than what exists today. For approximately 3.6 miles of this 66.8 mile segment, the proposed structures will be 65 feet taller than what exists today. The proposed structures from PT-NS will be between 45 feet and 100 feet shorter than what exists today. The proposed structures from PT-RD will be between 30 feet shorter and 15 feet taller than what exists today.

b. Remove the two existing 230 kV lines between the Porter Substation and the Rotterdam Substation.

c. Interconnect the existing 345 kV Edic to New Scotland #14 line into the rebuilt 345 kV Rotterdam Substation.

d. Rebuild two structures comprised of poles 108371/108372 and 108373/108374 ½ mile south of NYS Route 23 in Catskill, NY in Greene County to improve conductor clearance by less than 1 foot to increase the line ratings to the conductor thermal limit.

A summary of the substation modifications include:

a. Edic 345 kV Substation: Relocate the existing 345 kV Fraser line to the spare bay position and install a new circuit breaker. Terminate the new 345 kV New Scotland line to the bay position vacated by Fraser line. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

b. New Scotland 345 kV Substation: At the New Scotland Substation, new circuit breakers and a new line position will be added between the two existing bus sections. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. Rotterdam 345 kV Substation: Construct a new 345 kV yard on the existing 230 kV Rotterdam Substation site, connecting the existing 345 kV Edic to New Scotland #14 line, the existing 230 kV Rotterdam to Eastover Road #38 line, and to a rebuilt 115 kV yard.

d. Eastover Road 230 kV Substation: Existing relaying and equipment will need evaluation for fault duty and electrical rating.

e. Hurley Avenue Substation: Install three 345 kV, 575 MW PARs (+/- 30%) in series with the 301 transmission line from Hurley Avenue to Leeds substation. Install a parallel bypass for these PARs in the station as well.

f. Hurley Avenue Substation: Install two 345 kV 135 MVAr shunt capacitors on the 345 kV bus.

g. Hurley Avenue Substation: Install three 345 kV circuit breakers, one for each of the two shunt capacitors and one on the ring bus for the PARs.

h. Hurley Avenue Substation: Upgrade terminal equipment on the 301 - 345 kV line to increase the line ratings to the conductor thermal limit.

i. Leeds Substation: Upgrade terminal equipment on the 301 - 345 kV line to increase the line ratings to the conductor thermal limit.

3.10.4 Innovations Incorporated

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

[redacted]

[redacted]

3.10.5 Other Technologies and Methods Being Studied

[redacted]

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.10.6 Evidence of Commercially Viable Technology

The transmission facilities proposed for the ED-NS Component consist of materials that have been successfully used on transmission lines for decades, including transmission lines in New York.

Overhead Transmission Engineering

Structures will consist of tubular steel, natural wood, or laminated wood. Conductors used on the project will be aluminum and either steel reinforced (ACSR) or steel supported (ACSS). Although ACSS is less commonly used, both ACSR and ACSS have been used throughout the industry for 40 years. Hardware on the project will consist of traditional ceramic insulators and various metallic connectors. The latest composite core conductors, ACCR and ACCC, which have been in commercial operation for over 10 years, were also evaluated. It was determined that the proposed project can realize the same benefits with ACSS and ACSR for a fraction of the cost of using ACCR or ACCC. The latest composite core conductors, ACCR and ACCC, were also evaluated. It is estimated that the use of ACCR conductor would increase total project costs by approximately 30 percent.

Substation Engineering

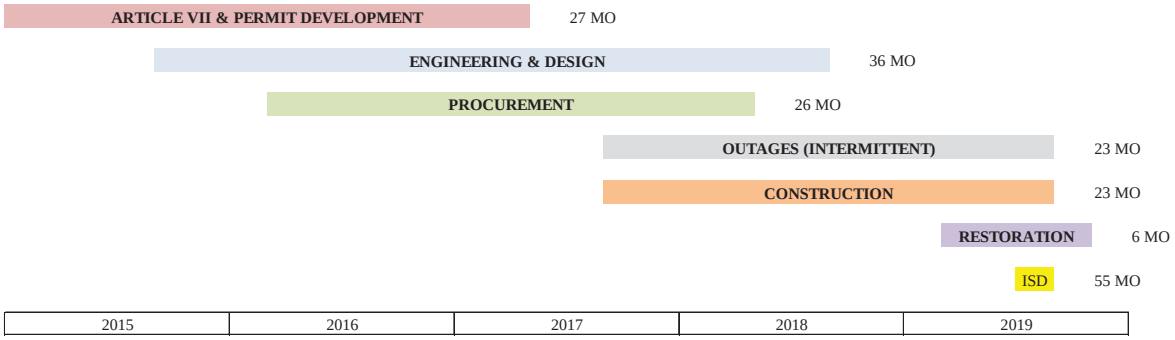
Structures will consist of tubular galvanized steel. The primary conductor used within the substations will be tubular rigid aluminum. Jumpers and strain conductors will consist of single and bundled steel reinforced aluminum conductor ACSR. Circuit breakers will be of the SF6 type, and shall be isolated with open air gang operated disconnect switches. Hardware within the stations will consist of traditional ceramic insulators and various metallic connectors. The structures, conductor equipment, and hardware used within the substations have been used throughout the industry for over 60 years. The application for these stations will utilize the latest manufacturing and operational technology based on this proven technology. All substations will be enclosed within an 8-foot high chain link security fence. Regarding the PARs, a similar project was recommended by NYISO Staff in 2009 as part of the Class Year 2008 Facilities Study. In that study, two 575 MW (+/- 30 deg) PARs were recommended as a system deliverability upgrade. Similarly sized and voltage class PARs are currently operating in New York at Ramapo, Goethals, East Garden City, and Farragut. This project utilizes commercially viable technology.

All material proposed for use on the project can be procured through traditional industry channels.

3.10.7 Schedule

The ED-NS Component is expected to take approximately 55 months to complete. Construction of substations and overhead lines is expected to take approximately 23 months. A high level schedule for the ED-NS Component is provided in Figure ED-NS/HA-2. Assumptions built into the project schedule include: commencement of Part B filing in September 2015; staggered EM&CP filing and approvals; procurement of long lead items begin prior to final EM&CP approval; and intermittent outage schedules that include consideration for summer reliability constraints.

Figure ED-NS/HA-2: Proposed Project Schedule



A conceptual construction sequencing plan developed for this project identifies outage requirements, as listed in Table ED-NS/HA-1 through Table ED-NS/HA-4, below. While developed to ensure a continual source of power to all affected substations, the construction sequence and outage plans are subject to change pending further load flow and system reliability studies. No long-term outages were scheduled during the summer peak load months of June through August. As most of the outages are to the 230 kV system and only a few to the bulk power system, it is not anticipated that there will be any appreciable congestion costs associated with this construction plan.

In addition to considering potential outage-related constraints, scheduling of construction activities to avoid or minimize impacts to sensitive environmental resources will need to be considered in developing the EM&CP and in developing the associated construction sequencing plan.

Table ED-NS/HA-1:
Long Term Outages with no Emergency Return to Service Restoration Ability (Hurley Avenue)

Line or Sectionalized Line Segment Out of Service	Duration (weeks)
301 Transmission Line between Hurley Avenue Substation and Leeds Substation	3 weeks
Hurley Avenue 345 kV to 115 kV spare transformer	2 weeks

Table ED-NS/HA-2:
Short Term Outages with no Emergency Return to Service Restoration Ability (Hurley Avenue)

Line or Sectionalized Line Segment Out of Service	Duration (days)
None	-

Table ED-NS/HA-3:
Long Term Outages with no Emergency Return to Service Restoration Ability (Edic-New Scotland)

Line Out of Service	Duration (weeks)	Approximate Time Frame
#13 Rotterdam-New Scotland 115 kV Line	3	Fall 2017
#31 Porter-Rotterdam 230 kV Line	10	Fall 2017
#30 Porter-Rotterdam 230 kV Line	10	Spring 2018
#30 Porter-Rotterdam 230 kV Line	6	Fall 2018

Table ED-NS/HA-4:
Short Term Outages with no Emergency Return to Service Restoration Ability[1] (Edic-New Scotland)

Line or Sectionalized Line Segment Out of Service	Duration (days)
Various lower voltage line crossings possible - yet to be determined	TBD
#14 Marcy-New Scotland 345 kV Line	2-3
(NYPA) Edic-Fraser 345 kV Line	1-2
(NYPA) #1 New Scotland-Gilboa 345 kV Line	3-4
#94 New Scotland-Leeds 345 kV Line	3-4

[1] Lines identified may be subjected to multiple short term outages as will be required for sectionalizing, station cut-overs and wire installation crossings.

3.10.8 Capital Cost Estimate

Please see Attachment 3 for capital cost estimate.

3.10.9 Risk Assessment

Permitting Risk

a. The proposed schedule includes 27 months to develop, file and obtain permits from state and federal agencies. A number of these approvals may lead to additional analysis or approvals. Schedule delays over the 27 months in the permit process can impact the project in-service date which will increase project costs. Complete permit filings along with efficient permit processes will minimize any potential schedule delays.

b. It is assumed that the Article VII development and Certificate approval process will not exceed 12 months.

c. Since a number of environmental field investigations must take place in order to produce state and federal permit applications, schedule delays that push the window for field investigations outside of the proper season could delay the permitting development process an additional year.

d. Although the Applicant is striving to address known environmental issues, unanticipated permit requirements imposed by regulatory agencies can extend construction schedules, impact the in-service date, and increase project costs. For example, there may be a limitation on when the trees can be cleared for protection measures associated with the Northern Long Eared Bat.

Procurement Risk

a. The proposed schedule provides for up to 26 months for the procurement of construction services and major equipment with long lead times (e.g. PARs, circuit breakers, disconnect switches). Risks can include raw material and manufacturing availability, quality and delivery logistics. Currently, the Applicant does not see fabrication and delivery problems with the major equipment needed for this project. However, if markets change, delays could impact the in-service date.

Construction Risk

a. During detailed design, subsurface core borings are performed in intervals along the project route. During construction, unforeseen field conditions (e.g. excessive ground water, shallow bedrock,

nested boulders, etc.) can be encountered. Typically, unforeseen field conditions result in an increased cost to the project. In more extreme cases, schedule impacts also occur.

b. Execution of a large construction project can include project management risks including securing a large number of labor resources, coordinating project activities, managing schedule, and keeping the project within budget.

c. The proposed schedule provides approximately 23 months for needed intermittent outage windows. If construction sequencing, outage sequencing plans, and commissioning sequencing are delayed due to system conditions and new outages take longer to schedule, the in-service date (as well as the overall Project cost) can be affected.

3.10.10 Status of NYISO Interconnection Studies

The Applicant has not yet filed with the NYISO for an interconnection request for this Project and plans to file the request shortly after the filing of this submission

3.10.11 Status of Equipment Availability and Procurement

Long lead items for the Edic, New Scotland, and Rotterdam Substations include circuit breakers, disconnect switches, support and bus structures, dead end structures, lightning arresters, lightning masts, capacitor coupled voltage transformers, and control enclosures. Typical lead times for these items range from 8 to 30 weeks. This equipment is currently not expected to cause schedule delays and are common station procurement items.

Long lead items for overhead construction include 345 kV structures (lead times of approximately 20 to 26 weeks) and overhead conductor (lead times of approximately 12 to 16 weeks). This equipment is not currently expected to cause schedule delays.

3.10.12 Status of Contracts

There are currently no contracts under negotiation or in place relative to this Project.

3.10.13 Demonstration of Site Control

The ED-NS/HA project will be constructed entirely within existing Applicant ROW on property either owned in fee by the Applicant or on property which the Applicant has easements for transmission construction. The Applicant has site control of all station locations.

3.10.14 Status of Permits

No permits or certificates for the ED-NS/HA project have been received to date. Long lead permits include concurrent submittal and review for an Article VII Certificate and ACOE 404 Permit, and DPS EM&CP approval (post Article VII approval, staggered submissions over 19 months). A full list of permits is provided in Table ED-NS/HA-5.

Table ED-NS/HA-5: Permits/Certificates Required

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Federal Permits					
Sections 10 (Rivers and Harbors Act of 1899) and 404 (Clean Water Act Permit)	U.S. Army Corps of Engineers, Buffalo [ED-NS only] and NY Districts (ACOE) - in consultation with U.S. Fish & Wildlife Service (USFWS) and tribes	All areas impacting jurisdictional waters/wetlands (Tidally influenced waters and Waters of the U. S.)		1 year after submittal	Prior to impacting jurisdictional waters/wetlands and start of construction
Threatened & Endangered Species (Endangered Species Act)	U.S. Fish & Wildlife Service (USFWS)	Areas that could contain potential T&E species or their respective habitat	Occurs during the review and approval by the ACOE		Prior to impacting areas that could contain potential T&E species or their respective habitat
Federal Aviation Administration (FAA) Notification of Construction or Alteration	Regional FAA Office	Any portion of the project (permanent structures or cranes) potentially affecting navigable airspace (structures over 200' in height or are located within a certain distance of an airport)	Concurrent with filing of EM&CP		Prior to applying for other construction related permits
State Permits					
Article VII Certificate of Environmental Compatibility and Public Need (Certificate) Approval	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
Environmental Management and Construction Plan (EM&CP)	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
State 401 Water Quality Certification	New York State Public Service Commission	All areas impacting jurisdictional waters/wetlands	Concurrent with Part B application		Concurrently with EM&CP Approval

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
State Permits, Continued					
SPDES General Permit (GP) for Stormwater Discharges from Construction Activities and New York State-Regulated Wetlands and Protected Waters	New York State Department of Environmental Conservation (NYSDEC)	Entire Project (segments, substations, laydown areas, staging areas, etc.)	Concurrent with filing of EM&CP		Prior to initiating any land disturbing activities, including vegetation clearing
Municipal Stormwater (MS4) Review	town, city or village	All components in MS4 jurisdictions (if applicable)	Prior to filing the EM&CP		
Cultural Resources Review (National Historical Preservation Act - NHPA)	New York State Parks (State Historic Preservation Officer [SHPO])	Entire project	Concurrent with filing of Part B application		Before starting construction in off-road areas or areas that have not been previously disturbed
Work Permit for Canal Crossing	New York State Canal Corporation	Where the Project crosses the Erie Canal	Coordination prior to construction (need final project design)		
Department of Transportation Utility Work Permit	NY DOT	Installation of utilities within or adjacent to state highway ROWs.	Coordination prior to construction (need final project design)		Construction
Hudson River Crossing					
Easement	State of New York Office of Parks, Recreation and Historic Preservation		Coordination prior to Part B application submittal		
Notification	Office of General Services		Coordination prior to Part B application submittal		

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Municipal Permits (Article VII Certificate Approval Supersedes Most Municipal Environmental Related Permits)					
Municipal Consultation Filing	City/Town	Entire Project	Coordination prior to Part B application submittal		
Local Airport Operator Review		Airports and aviation facilities within 5 miles of the Project	Coordination prior to construction (need final project design)		
Railroad ROW Entry Permit	Railroad Company	ROW access for design purposes	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)
Railroad ROW Construction Authorization	Railroad Company	Activities located within railroad right-of-way (ROW)	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)

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Edic to New Scotland 345 kV Transmission Line
and
New Scotland to Leeds 345 kV Transmission Line
Reconductoring
and
Leeds to Pleasant Valley 345 kV Transmission Line
Project
(ED-NS/NS-LD(R)/LD-PV)

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EDIC TO NEW SCOTLAND 345 KV TRANSMISSION LINE AND NEW SCOTLAND TO LEEDS 345 KV TRANSMISSION LINE RECONDUCTORING AND LEEDS TO PLEASANT VALLEY 345 KV TRANSMISSION LINE PROJECT (ED-NS/NS-LD(R)/LD-PV)

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3.11 Edic to New Scotland 345 kV Transmission Line and New Scotland to Leeds 345 kV Transmission Line Reconductoring and Leeds to Pleasant Valley 345 kV Transmission Line Project (ED-NS/NS-LD(R)/LD-PV)

3.11.1 Project Description

The Edic to New Scotland 345 kV Transmission Line and New Scotland to Leeds 345 kV Transmission Line Reconductoring and Leeds to Pleasant Valley 345 kV Transmission Line Project (ED-NS/NS-LD(R)/LD-PV) is comprised of six ROW segments, Edic to Princetown Junction (ED-PT), Princetown Junction to New Scotland (PT-NS), Princetown Junction to Rotterdam (PT-RD), New Scotland to Leeds (NS-LD), Leeds to Churchtown (LD-CT), and Churchtown to Pleasant Valley (CT-PV). The Project includes the rebuild and expansion of the existing 230 kV Rotterdam Substation to include a 345 kV yard, the rebuild and expansion of the existing Churchtown 115 kV Switching Station, modifications to the existing 345 kV Edic Substation, existing 345 kV New Scotland Substations and existing 345 kV Leeds Switching Station and minor modifications to the existing Consolidated Edison Pleasant Valley 345 kV Substation.

The location of the ED-NS/NS-LD(R)/LD-PV Project is depicted in Figure ED-NS/NS-LD(R)/LD-PV-1.

3.11.2 Physical Description

The ED-NS portion of the project consists of the ED-PT, PT-NS, and PT-RD segments, as described in further detail below.

The ED-PT segment starts at the existing 345 kV Edic Substation in the Town of Marcy, Oneida County. The scope of work consists of the removal of two existing 230 kV lines and the construction of a new 345 kV line within approximately 66.8 miles of existing ROW. For approximately 12.6 miles out of Edic Substation, this will involve the removal of one set of 230 kV wires and insulators from each of the two existing 230/345 kV double-circuit monopole structures and the installation of one set of 345 kV wires and insulators to one of them. For the remaining approximately 54.2 miles, the two existing 230 kV H-frame structure lines will be removed and replaced with one new 345 kV line consisting predominately of H-frame structures. New 345 kV monopole structures will be used intermittently through this 54.2-mile segment for approximately 5.4 miles in total. All work at the existing 345 kV Edic Substation will be within the existing fenceline. This segment terminates at Princetown Junction in the Town of Princetown, Schenectady County. The ED-PT segment passes through the Towns of Marcy and Deerfield in Oneida County, the Towns of Schuyler, Frankfort, German Flatts, Little Falls, Stark, and Danube in Herkimer

County, the Towns of Minden, Canajoharie, Root, Glen, Charleston, and Florida, in Montgomery County, and the Towns of Duanesburg and Princetown in Schenectady County.

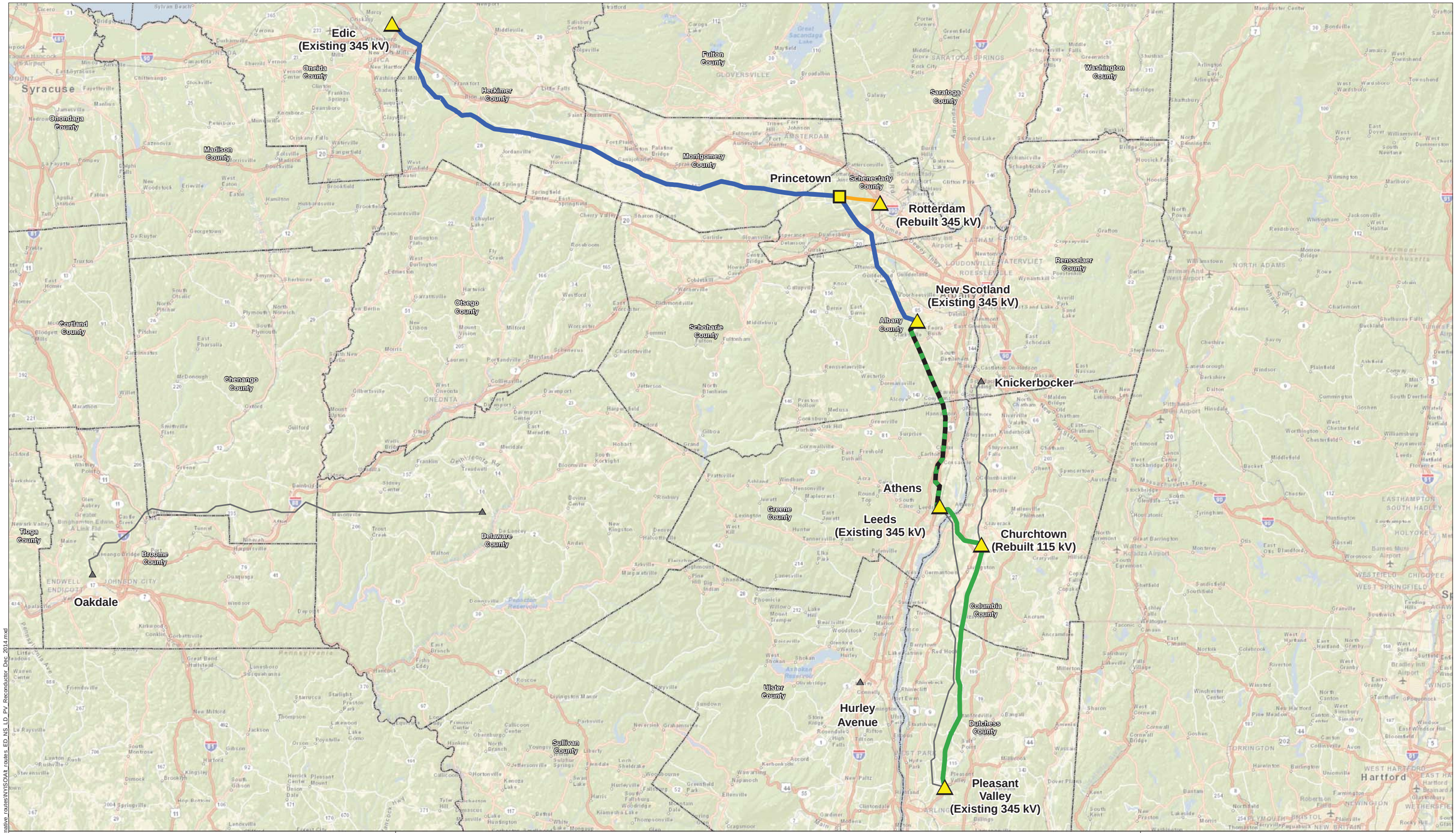
The PT-NS segment starts at Princetown Junction. The scope of work consists of the construction of a new 345 kV line within approximately 19.7 miles of existing ROW. This segment will utilize approximately 11.5 miles of H-frame structures, 6.3 miles of monopole structures and 1.9 miles of 115/345 kV double-circuit monopole structures. This segment terminates at the existing 345 kV New Scotland Substation in the Town of New Scotland, Albany County. Work at the New Scotland Substation will require expansion of the existing fenceline. The PT-NS segment passes through the Town of Princetown in Schenectady County, and the Towns of Guilderland and New Scotland, in Albany County.

The PT-RD segment also starts at the Princetown Junction. The scope of work consists of the removal of two existing 230 kV H-frame structure lines and the construction of two new 345 kV compact monopole structure lines within approximately 5.0 miles of existing ROW. This segment terminates at the existing 230 kV Rotterdam Substation in the Town of Rotterdam, Schenectady County. The addition of 345 kV lines to Rotterdam Substation will require the addition of a 345 kV yard and the expansion of the existing fenceline. The rebuilt 345 kV Rotterdam Substation allows for the retirement of the two existing 230 kV lines between the existing 230 kV Porter Substation in the Town of Marcy, Oneida County and the Rotterdam Substation.

The NS-LD(R) portion of the project consists of the NS-LD segment, as described in further detail below.

The NS-LD segment starts at the existing 345 kV New Scotland Substation in the Town of New Scotland, Albany County. The scope of work consists of the reconductoring of two existing 345 kV lines and replacement of certain structures for approximately 25.9 miles within an existing ROW. This segment terminates at the 345 kV Leeds Switching Station in the Town of Athens, Greene County. Work at the New Scotland Substation will require expansion of the existing fenceline. This expansion can occur within the substation property currently owned by National Grid. Work at the Leeds Switching Station will be within the existing fenceline. This segment passes through the Towns of New Scotland and Coeymans in Albany County, and the Towns of New Baltimore, Coxsackie, and Athens in Greene County.

The LD-PV portion of the project consists of the LD-CT and CT-PV segments, as described in further detail below.



Legend

- New 345 kV Transmission Line (UPNY/SENY)
- New 345 kV Transmission Line (Central East)
- Reconductored 345 kV Transmission Line (UPNY/SENY)
- 345 kV Transmission Rebuild (Central East)
- Other Project Segment
- Project Station
- Project Junction
- Other Project Station
- County Boundary

nationalgrid

Burns & McDonnell SINCE 1898

Figure ED-NS/NS-LD(R)/LD-PV-1

Edic to New Scotland and New Scotland to Leeds (Reconductor) and Leeds to Pleasant Valley

January 2015

N W E S

0 5 10 20 30 40 Miles

Sources: BMcD Engineering, ESRI

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The LD-CT segment starts at the Leeds Switching Station in the Town of Athens, Greene County. The scope of work consists of the removal of the existing 115 kV double-circuit lattice structure line and the construction of a new 345/115 kV double-circuit monopole structure line within approximately 8.9 miles of existing ROW. This segment includes an existing aerial crossing of the Hudson River and terminates at the rebuilt and expanded 115 kV Churchtown Switching Station in the Town of Claverack, Columbia County. The new Churchtown Switching Station will require an expansion of the existing fenceline. This expansion can occur within the substation property currently owned by NYSEG. All work at the 345 kV Leeds Switching Station will be within the existing fenceline. The LD-CT segment passes through the Town of Athens and the Village of Athens in Greene County and the Towns of Greenport and Claverack in Columbia County.

The CT-PV segment starts at the rebuilt and expanded Churchtown Switching Station. The scope of work consists of the removal of two existing 115 kV double-circuit lattice structure lines, and the construction of a new 115/345 kV double-circuit monopole structure line within approximately 32.3 miles of existing ROW. This segment terminates at the existing Consolidated Edison 345 kV Pleasant Valley Substation in the Town of Pleasant Valley, Dutchess County. All work at the Pleasant Valley Substation will be within the existing fenceline. The CT-PV segment passes through the Towns of Claverack, Livingston, Gallatin, and Clermont in Columbia County, and the Towns of Milan, Clinton, and Pleasant Valley in Dutchess County.

Additional ancillary work on other system facilities may be required depending on the results of the NYISO system impact studies.

3.11.3 Electrical Description

It is the Applicant's expectation that the NYISO will prepare the analysis for the interface transfer impact for the ED-NS/NS-LD(R)/LD-PV Project. However, the Applicant has undertaken this analysis and believes the N-1-1 transfer capability for UPNY-SENY to be increased in the range of 1,400 - 1,600 MW. In addition, this solution also increases the N-1 thermal Central-East transfer capability to be in the range of 300 - 500 MW.

Electrical single-line drawings of the 345 kV system, 115 kV system and individual switching stations and substations providing circuit-specific line and station data are contained in the confidential data provided in Section 1.0, Modeling Data.

Details of line upgrades for the ED-NS portion of the Project include:

a. Construct the new 345 kV ED-NS transmission line between the Edic Substation and the New Scotland Substation using 2-bundle 954 kcmil ACSS "Cardinal" conductor primarily on new 345 kV structures. The majority of proposed structures from ED-PT will be between 0 feet (no difference) and 20 feet taller than what exists today. For approximately 3.6 miles of this 66.8 mile segment, the proposed structures will be 65 feet taller than what exists today. The proposed structures from PT-NS will be between 45 feet and 100 feet shorter than what exists today. The proposed structures from PT-RD will be between 30 feet shorter and 15 feet taller than what exists today.

b. Remove the two existing 230 kV lines between the Porter Substation and the Rotterdam Substation.

c. Interconnect the existing 345 kV Edic to New Scotland line into the rebuilt 345 kV Rotterdam Substation using 2-bundle 954 kcmil ACSS "Cardinal" conductor on new 345 kV structures.

A summary of the substation modifications for the ED-NS portion of the Project includes:

a. Edic 345 kV Substation: Relocate the existing 345 kV Fraser line to the spare bay position and install a new circuit breaker. Terminate the new 345 kV New Scotland line to the bay position vacated by Fraser line. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

b. New Scotland 345 kV Substation: At the New Scotland Substation, new circuit breakers and a new line position will be added between the two existing bus sections. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. Rotterdam 345 kV Substation: Construct a new 345 kV yard on the existing 230 kV Rotterdam Substation site, connecting the existing 345 kV Edic to New Scotland line, the existing 230 kV Rotterdam to Eastover Road line, and to a rebuilt 115 kV yard. The expansion will be on National Grid fee-owned property.

Details of line upgrades for the NS-LD(R) and LD-PV portions of the Project include:

a. Reconductor two existing 345 kV circuits (i.e., replacing existing transmission wires with new higher capacity wires) between the existing New Scotland Substation and the existing Leeds Substation, using new higher capacity 2-bundle 795 kcmil "Drake" ACSS conductor on existing 345 kV structures.

b. Rebuild approximately 10% of the existing structures for ground clearance requirements due to the new conductor. New structures will consist of tubular steel H-frames with conductors remaining in a horizontal configuration. Most structures that are not replaced will receive structural reinforcement.

c. Construct the new 345 kV LD-PV transmission line between the existing 345 kV Leeds Switching Station and the existing 345 kV Pleasant Valley Substation using 2-bundle 954 kcmil ACSS "Cardinal" conductor on new double-circuit 115/345 kV structures. The proposed structures from LD-PV will be between 5 feet shorter to 10 feet taller than what exists today.

d. Remove the existing 115 kV double-circuit lattice structure line in the ROW between the existing 345 kV Leeds Switching Station and 115 kV Churchtown Switching Station and the two existing 115 kV double-circuit lattice structure lines in the ROW between the 115 kV Churchtown Switching Station and the existing 345 kV Pleasant Valley Substation.

e. Rebuild a single 115 kV line between the existing 345 kV Leeds Switching Station, Churchtown and the existing 345 kV Pleasant Valley Substation using single 954 kcmil ACSS "Cardinal" conductor on the new double-circuit 115/345 kV structures.

A summary of the substation and switching station modifications for the NS-LD and LD-PV portions of the Project includes:

a. New Scotland 345 kV Substation: Reconductor existing terminals for the 345 kV lines. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

b. Leeds 345 kV Switching Station: A new circuit breaker and line terminal will be added for the new 345 kV Leeds-Pleasant Valley line. Reconductor existing terminals for the 345 kV lines from the 345 kV New Scotland Substation. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

c. Pleasant Valley 345 kV Substation: Relocate the existing 345 kV Long Mountain line to the spare bay position and install a new circuit breaker. Terminate the new 345 kV Leeds line to the bay position vacated by the Long Mountain line. Existing relaying and equipment will need evaluation for fault duty and electrical rating.

d. Churchtown 115 kV Switching Station: Demolish and construct a new expanded 115 kV switching station at Churchtown on the existing Churchtown 115 kV Substation site.

3.11.4 Innovations Incorporated

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.11.5 Other Technologies and Methods Being Studied

[redacted]

[redacted]

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information.]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.11.6 Evidence of Commercially Viable Technology

The transmission facilities proposed for the ED-NS/NS-LD(R)/LD-PV Project consist of materials that have been successfully used on transmission lines for decades, including transmission lines in New York.

Overhead Transmission Engineering

Structures will consist of tubular steel, natural wood, or laminated wood. Conductors used on the project will be aluminum and either steel reinforced (ACSR) or steel supported (ACSS). Although ACSS is less commonly used, both ACSR and ACSS have been used throughout the industry for 40 years. Hardware on the project will consist of traditional ceramic insulators and various metallic connectors. The latest composite core conductors, ACCR and ACCC, were also evaluated. It was determined that the proposed project can realize the same benefits with ACSS for a fraction of the cost of using ACCR or ACCC. It is estimated that the use of ACCR conductor would increase total project costs by approximately 30 percent.

Substation Engineering

Structures will consist of tubular steel. The primary conductor used within the substations will be tubular rigid aluminum. Jumpers and strain conductors will consist of single and bundled steel reinforced aluminum conductor ACSR. Circuit breakers will be of the SF6 type, and shall be isolated with open air gang operated disconnect switches. Hardware within the stations will consist of traditional ceramic insulators and various metallic connectors. The structures, conductor equipment, and hardware used within the substations have been used throughout the industry for over 60 years. The application for these

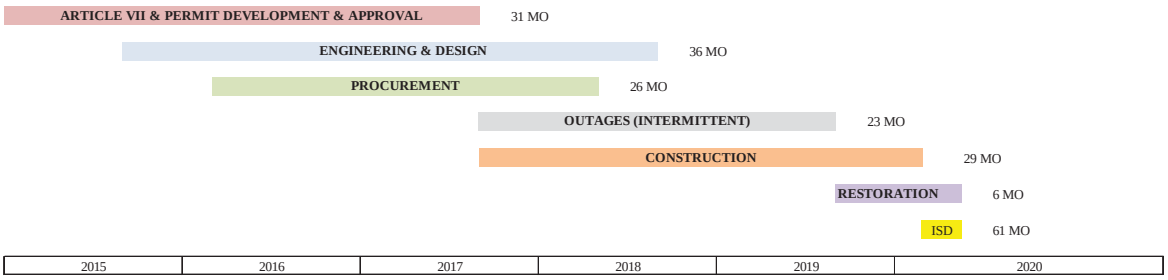
stations will utilize the latest manufacturing and operational technology based on this proven technology. All substations will be enclosed within an 8-foot high chain link security fence.

All material proposed for use on the project can be procured through traditional industry channels.

3.11.7 Schedule

The ED-NS/NS-LD(R)/LD-PV Project is expected to take approximately 61 months to complete. Construction of substations and overhead lines is expected to take approximately 29 months. A high level schedule for the ED-NS/NS-LD(R)/LD-PV Project is provided in Figure ED-NS/NS-LD(R)/LD-PV-2. Assumptions built into the project schedule include: commencement of Part B filing in September 2015; staggered EM&CP filing and approvals; procurement of long lead items begin prior to final EM&CP approval; and intermittent outage schedules that include consideration for summer reliability constraints.

Figure ED-NS/NS-LD(R)/LD-PV-2: Proposed Project Schedule



A conceptual construction sequencing plan developed for this Project identifies outage requirements, as listed in Table ED-NS/NS-LD(R)/LD-PV-1, Table ED-NS/NS-LD(R)/LD-PV-2 and Table ED-NS/NS-LD(R)/LD-PV-3, below. While developed to ensure a continual source of power to all affected substations, the construction sequence and outage plans are subject to change pending further load flow and system reliability studies. No long-term outages were scheduled during the summer peak load months of June through August. This Project requires continuous outage on 115 kV, 230 kV and 345 kV lines. It is not anticipated that there will be any appreciable congestion costs associated with scheduled 115 kV and 230 kV continuous line outages. However, the congestion costs associated with the scheduled 345 kV continuous line outages, which are required to reconductor the NS-LD(R) portion of the Project, could

become significant should an unplanned interruption to the system occur. To mitigate these impacts, the 345 kV transmission line reconductor work will be coordinated so that the existing 345 kV lines can be put back into service within 24 to 48 hours.

In addition to considering potential outage-related constraints, scheduling of construction activities to avoid or minimize impacts to sensitive environmental resources will need to be considered in developing the EM&CP and in developing the associated construction sequencing plan.

Table ED-NS/NS-LD(R)/LD-PV-1:
Long Term Outages with 24 to 48-hour Emergency Return to Service Restoration Ability

Line Out of Service	Duration (weeks)	Approximate Time Frame
#93 New Scotland-Leeds 345 kV Line	29	Fall 2017 to Spring 2018
#94 New Scotland-Leeds 345 kV Line	5	Spring 2018 & Fall 2018

Table ED-NS/NS-LD(R)/LD-PV-2:
Long Term Outages with no Emergency Return to Service Restoration Ability

Line or Sectionalized Line Segment Out of Service	Duration (weeks)	Approximate Time Frame
Long Lane-Buckley Corners Section of #8 Long Lane-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line	4	Fall 2017
Long Lane-Buckley Corners Section of #8 Long Lane-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line & T7 North Catskill-Milan 115 kV Line	8	Fall 2017
Buckley Corners-Blue Stores Section of #8 Long Lane-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line & T7 North Catskill-Milan 115 kV Line	7	Winter 2017 - 2018
T7 North Catskill-Milan 115 kV Line	6	Fall 2018
#13 Rotterdam-New Scotland 115 kV Line	3	Fall 2017
#31 Porter-Rotterdam 230 kV Line	10	Fall 2017
#30 Porter-Rotterdam 230 kV Line	10	Spring 2018
#30 Porter-Rotterdam 230 kV Line	6	Fall 2018

Table ED-NS/NS-LD(R)/LD-PV-3:
Short Term Outages with no Emergency Return to Service Restoration Ability[2]

Line Out of Service	Duration (days)
#8 Lafarge-Buckley Corners-Blue Stores-Pleasant Valley 115 kV Line	1
#10 Milan-Pleasant Valley 115 kV Line	1
#12 Hudson-ADM Milling-Pleasant Valley 115 kV Line &	1
#13 Churchtown-Pleasant Valley 115 kV Line	1
#14 Schodack-Valkin-Churchtown 115 kV Line	1
T7 North Catskill-Milan 115 kV Line	1
#984 Churchtown-Craryville 115 kV Line	1
#398 Pleasant Valley-Long Mt. 345 kV Line	1-2
#92 Leeds-Pleasant Valley 345 kV Line	1-2
#14 Marcy-New Scotland 345 kV Line	2-3
(NYPA) Edic - Fraser 345 kV Line	1-2
(NYPA) #1 New Scotland-Gilboa 345 kV Line	3-4
#94 New Scotland-Leeds 345 kV Line	3-4

3.11.8 Capital Cost Estimate

See Attachment 3 for capital cost estimate.

3.11.9 Risk Assessment

Permitting Risks

a. The proposed schedule includes 31 months to develop, file and obtain permits from state and federal agencies. A number of these approvals may lead to additional analysis or approvals. Schedule delays such as delay in commencing the Article VII Part B process and the ACOE permit can impact the project in-service date which will increase project costs. Complete permit filings along with efficient permit processes will minimize any potential schedule delays.

b. It is assumed that the Article VII development and Certificate approval process will not exceed 12 months.

[2] Lines identified may be subjected to multiple short term outages as will be required for sectionalizing, station cut-overs and wire installation crossings.

c. Since a number of environmental field investigations must take place in order to produce state and federal permit applications, schedule delays that push the window for field investigations outside of the proper season could delay the permitting development process an additional year.

d. Although the Applicant is striving to address known environmental issues, unanticipated permit requirements imposed by regulatory agencies can extend construction schedules, impact the in-service date, and increase project costs. For example, there may be a limitation on when the trees can be cleared for protection measures associated with the Northern Long Eared Bat.

e. The Cricket Valley Project is in the queue for utilizing the spare bay position at the Consolidated Edison Pleasant Valley 345 kV Substation. If the Cricket Valley Project should get approved before this project, a bay addition would be required, which could increase the permitting schedule and will increase project costs.

Procurement Risk

a. The proposed schedule provides for up to 26 months for the procurement of construction services and major equipment with long lead times (e.g. circuit breakers, disconnect switches). Risks can include raw material and manufacturing availability, quality and delivery logistics. Currently, the Applicant does not see fabrication and delivery problems with the major equipment needed for this Project. However, if markets change, delays could impact the in-service date.

Construction Risk

a. During detailed design, subsurface core borings are performed in intervals along the Project route. During construction, unforeseen field conditions (e.g. excessive ground water, shallow bedrock, nested boulders, etc.) can be encountered. Typically, unforeseen field conditions result in an increased cost to the project. In more extreme cases, schedule impacts also occur.

b. Execution of a large construction project can include project management risks including securing a large number of labor resources, coordinating project activities, managing schedule, and keeping the project within budget.

c. The proposed schedule provides approximately 23 months for needed intermittent outage windows. If construction sequencing, outage sequencing plans, and commissioning sequencing are delayed due to system conditions and new outages take longer to schedule, the in-service date (as well as the overall Project cost) can be affected.

3.11.10 Status of NYISO Interconnection Studies

The Applicant has not yet filed with the NYISO for an interconnection request for this Project and plans to file the request shortly after the filing of this submission.

3.11.11 Status of Equipment Availability and Procurement

No equipment has yet been procured for the Project.

Long lead items for the Leeds and Churchtown Switching Stations, and the Edic, New Scotland, Rotterdam, and Pleasant Valley Substations, include circuit breakers, disconnect switches, support and bus structures, dead end structures, lightning arresters, lightning masts, capacitor coupled voltage transformers, and control enclosures. Typical lead times for these items range from 8 to 30 weeks. This equipment is currently not expected to cause schedule delays and are common station procurement items.

Long lead items for overhead construction include 345 kV structures (lead times of approximately 20 to 26 weeks) and overhead conductor (lead times of approximately 12 to 16 weeks). This equipment is not currently expected to cause schedule delays.

3.11.12 Status of Contracts

There are currently no contracts under negotiation or in place relative to this Project.

3.11.13 Demonstration of Site Control

The Project will be constructed entirely within existing Applicant ROW on property either owned in fee by the Applicant or on property which the Applicant has easements for transmission construction. The Applicant has site control of all station locations with the exception of the 345 kV Pleasant Valley Substation which is owned by Consolidated Edison.

3.11.14 Status of Permits

No permits or certificates for the ED-NS/NS-LD(R)/LD-PV Project have been received to date. Long lead permits include concurrent submittal and review for an Article VII Certificate and ACOE 404 Permit, and DPS EM&CP approval (post Article VII approval, staggered submissions over 19 months). A full list of permits is provided in Table ED-NS/NS-LD(R)/LD-PV-4.

Table ED-NS/NS-LD(R)/LD-PV-4: Permits/Certificates Required

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Federal Permits					
Sections 10 (Rivers and Harbors Act of 1899) and 404 (Clean Water Act Permit)	U.S. Army Corps of Engineers, Buffalo [ED-NS only] and NY Districts (ACOE) - in consultation with U.S. Fish & Wildlife Service (USFWS) and tribes	All areas impacting jurisdictional waters/wetlands (Tidally influenced waters and Waters of the U. S.)		1 year after submittal	Prior to impacting jurisdictional waters/wetlands and start of construction
Threatened & Endangered Species (Endangered Species Act)	U.S. Fish & Wildlife Service (USFWS)	Areas that could contain potential T&E species or their respective habitat	Occurs during the review and approval by the ACOE		Prior to impacting areas that could contain potential T&E species or their respective habitat
US Coast Guard Approval for work within navigable waters (Section 9 of the Rivers and Harbors Act of 1899)	US Coast Guard	Navigable waters	Concurrent with filing of EM&CP		
Federal Aviation Administration (FAA) Notification of Construction or Alteration	Regional FAA Office	Any portion of the project (permanent structures or cranes) potentially affecting navigable airspace (structures over 200' in height or are located within a certain distance of an airport)	Concurrent with filing of EM&CP		Prior to applying for other construction related permits
State Permits					
Article VII Certificate of Environmental Compatibility and Public Need (Certificate) Approval	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
State 401 Water Quality Certification	New York State Public Service Commission	All areas impacting jurisdictional waters/wetlands	Concurrent with Part B application		Concurrently with EM&CP Approval

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
State Permits, Continued					
Environmental Management and Construction Plan (EM&CP)	New York State Public Service Commission	Transmission lines and associated substations			Prior to starting construction
SPDES General Permit (GP) for Stormwater Discharges from Construction Activities and New York State-Regulated Wetlands and Protected Waters	New York State Department of Environmental Conservation (NYSDEC)	Entire Project (segments, substations, laydown areas, staging areas, etc.)	Concurrent with filing of EM&CP		Prior to initiating any land disturbing activities, including vegetation clearing
Municipal Stormwater (MS4) Review	town, city or village	All components in MS4 jurisdictions (if applicable)	Prior to filing the EM&CP		
Cultural Resources Review (National Historical Preservation Act - NHPA)	New York State Parks (State Historic Preservation Officer [SHPO])	Entire project	Concurrent with filing of Part B application		Before starting construction in off-road areas or areas that have not been previously disturbed
Work Permit for Canal Crossing	New York State Canal Corporation	Where the Project crosses the Erie Canal	Coordination prior to construction (need final project design)		
Department of Transportation Utility Work Permit	NY DOT	Installation of utilities within or adjacent to state highway ROWs.	Coordination prior to construction (need final project design)		Construction

Permit/Certificate	Administering Agency	Affected Project Component	Submittal Date	Anticipated Receipt Date	Needed by Date
Hudson River Crossing					
Coastal Management Program (CMP) and Local Waterfront Revitalization Program (LWRP)	New York Department of State	Hudson Riverfront	Concurrent with filing of 404 application		
Easement	State of New York Office of Parks, Recreation and Historic Preservation		Coordination prior to Part B application submittal		
Notification	Office of General Services		Coordination prior to Part B application submittal		
Municipal Permits (Article VII Certificate Approval Supersedes Most Municipal Environmental Related Permits) Continued					
Municipal Consultation Filing	City/Town	Entire Project	Coordination prior to Part B application submittal		
Local Airport Operator Review		Airports and aviation facilities within 5 miles of the Project	Coordination prior to construction (need final project design)		
Railroad ROW Entry Permit	Railroad Company	ROW access for design purposes	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)
Railroad ROW Construction Authorization	Railroad Company	Activities located within railroad right-of-way (ROW)	Coordination prior to construction (need final project design)		Prior to conducting any on-site activities (design or construction)

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Submission of Indicated New York Transmission Owners
For Authority to Construct and Operate Electric Transmission Facilities in Multiple Counties in New York

ATTACHMENT 1

Modeling Data

[Submitted under separate cover to the ALJs for confidential treatment because it contains critical infrastructure information]

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Submission of Indicated New York Transmission Owners
For Authority to Construct and Operate Electric Transmission Facilities in Multiple Counties in New York

ATTACHMENT 2

Developer Qualifications

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information]

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Submission of Indicated New York Transmission Owners
For Authority to Construct and Operate Electric Transmission Facilities in Multiple Counties in New York

ATTACHMENT 3

Capital Cost Estimates

[Submitted under separate cover to the ALJs for confidential treatment because it contains confidential information]

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