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March 27, 2015

Hon. Kathleen H. Burgess
Secretary
New York State Public Service Commission
Three Empire State Plaza
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

Dear Secretary Burgess:

On January 7, 2015 and January 20, 2015 Central Hudson Gas and Electric Corporation (“Central Hudson”), Consolidated Edison Company of New York, Inc. (“Con Edison”), Niagara Mohawk Power Corporation d/b/a National Grid (“National Grid”), New York State Electric & Gas Corporation (“NYSEG”), and the New York Transco LLC (“NY Transco”), all entities hereinafter identified as “Indicated NYTOs” for ease of reference, submitted a request to exempt from disclosure as Critical Infrastructure Information and trade secret and/or confidential commercial information certain information from the Indicated NYTOs January 7th and 20th Part A filings in the above referenced proceeding. On February 10, 2015 at the request of Donna Giliberto, the Records Access Officer, the Indicated NYTOs submitted a Statement of Necessity and supporting affidavits in support of their request for confidential treatment of certain information in the January 7th and 20th filings.¹

On February 24, 2015, Ms. Giliberto issued two letters granting in part and denying in part the Indicated NYTOs’ request for confidential treatment and exception from disclosure with regard to the January 7th and 20th filings (Determinations 15-05 and 15-06).² On February 27, 2015 the Indicated NYTOs’ submitted a request for clarification regarding the determinations, which Ms. Giliberto provided on March 6, 2015. Accordingly, at the direction of Ms. Giliberto,

¹ At the time they submitted the Statement of Necessity the Indicated NYTOs withdrew their request for confidential treatment with respect to some of the information they had previously redacted from the January 7th and January 20th filings, and filed that information publicly.

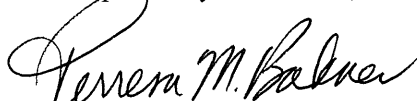
² Ms. Giliberto granted the request with respect to all information for which the Indicated NYTOs had requested confidential treatment as CII. Ms. Giliberto did not make a determination as to certain other information submitted with the January 7th filing which the Indicated NYTOs had previously withdrawn as inadvertently filed.

NYTO Response
March 26, 2015

enclosed please find for filing public, unredacted, versions of the information Ms. Giliberto determined was not entitled to confidential treatment in Determinations 15-05 and 15-06, specifically the: (1) Innovations Incorporated and New Technologies and Methods Being Studied sections from the January 7th filing; (2) Attachment 2 to the January 7th filing; and (3) sections 2.0 and 3.0 of the Additional Filing Information submitted with the January 20th filing.

Please do not hesitate to contact me with any questions regarding this filing.

Respectfully submitted,



Terresa M. Bakner
Partner
Whiteman Osterman & Hanna LLP
Counsel to the Indicated NYTOs

Enclosures

cc: Donna Giliberto, RAO
Administrative Law Judges Prestemon and Phillips
Active Party List for Case13-M-0457

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

Case 13-M-0457

Additional Filing Information

*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)*

1.0 Factual evidence showing how the Project utilizes existing ROW and what additional land rights will need to be acquired

The Project will be constructed entirely within existing Applicant ROWs 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.

2.0 Information on the use of any advanced technologies that are proposed to apply to facility design, construction or operations

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering, ROW, forestry, and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows to reconfigure the 115 kV system in the Hudson Valley corridor and utilize a compact double-circuit delta structure which efficiently uses existing ROW. This reconfiguration and more efficient use of existing assets allow the O-F/ED-PV Project to avoid expanding the existing ROW while mitigating environmental and visual impacts.

Reconfiguration of the 115 kV System in the Hudson Valley Corridor

The existing 115 kV ROW corridor is approximately 125 to 150 feet wide with some stretches of corridor up to 400 feet in width. The initial design provided in October 2013 showed that the construction of a new 345 kV transmission line in this existing ROW could be co-located with two of the existing 115 kV lines without requiring expansion of the ROW. However, this design required much taller structures than existing or required ROW expansion to reduce the height of the new structures. During the past year, extensive analysis was performed to determine whether the existing corridor could be more efficiently used by further reconfiguring the 115 kV system, thereby freeing corridor space to allow the new 345 kV transmission line to be added without expanding the ROW nor using much taller structures. This analysis required the Applicant to challenge their existing standards and practices to find innovative solutions. Connecting all the 115 kV lines at a new expanded Churchtown Switching Station provided the strong source of power needed to remove one of the two 115 kV lines between Greenbush and Churchtown, and

three of the four 115 kV lines between Churchtown and Pleasant Valley. With minimal upgrades¹⁵ to the remaining 115 kV network in the area, the local area will still be able to meet all required NERC reliability standards and allow room for the proposed new 115/345 kV double-circuit structure in the corridor without the need for additional ROW or much taller structures.

Compact Monopole Structures

To meet the electrical requirements of the Project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height. In response, the Project team developed a “compact double-circuit delta structure” to be utilized within the KB-PV portion of the Project. This structure design, not found in the Northeast, holds both a 345 kV line and a 115 kV line, each in a delta configuration. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase.

The compact double-circuit delta design approach meets the Project objective with a single new structure at minimal height increase, no additional ROW, and allows for the retirement of the aged existing lattice structures.

Similarly, the Project team will develop a “compact” design for all of the monopole structures proposed to be constructed within the ED-NS portion of this Project, effectively reducing their heights by approximately 10 feet compared with traditional overhead shield wire attachment designs.

High Temperature Conductors

The ED-NS and KB-PV components of the Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

¹⁵ According to preliminary internal system studies, final upgrades will be determined during the NYISO System Impact Studies.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.0 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites. Detailed access road/work site design will take place as part of the Environmental Management & Construction Plan (“EM&CP”) development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement to existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and keep in place. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity

and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Compact H-Frame Structures

The Project team will investigate the feasibility of developing a “compact” design for the new H-frame structures by lowering the point of attachment of the overhead shield wires, which may result in reduction of the overall structure height when compared with traditional overhead shield wire attachment designs.

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

Case 13-M-0457

***Hurley Avenue PARs Project
(HA)***

the additional interface transfer capability and the replacement or upgrade of aging infrastructure. Economic benefits will be realized by the increase in jobs, increase in local tax revenue, and congestion reduction. By reducing transmission constraints, the Project will also facilitate development of renewable generation throughout the State, reducing air pollution and greenhouse gas emissions. Other significant environmental benefits will result from the Project's minimal impact on land through the use of existing rights of way.

(8) Factual evidence showing how the project utilizes existing ROW

An orthophoto map is provided as Figure 1-1 that shows this Project fits within the current substation property owned by Central Hudson.

(9) Information on the use of advanced technologies

“Smart Grid” can be defined as getting the power to the customer the smartest way possible with the least amount of losses. Regulating flows over transmission lines is one component of the Smart Grid. One of the ways to control the power flow over the transmission line is to insert a phase angle regulating transformer (PAR) in the line, which is a component used to regulating these flows. PAR's, by virtue of their ability to dynamically adjust the impedance of the transmission line, can be very effective in controlling power flows. PARs have been a part of the planner's arsenal for years.

In power systems, power does not always flow the way we desire it to flow. Rather, it flows based on the impedances in the network, following the path of least impedance. To change the power flow one can either lower the impedance of the line, or increase the angle between the sending and receiving voltages. Lowering the impedance is often done by applying series capacitors to the line. Phase angle regulators change the angle between the sending and receiving ends by introducing a voltage that is in quadrature to the sending end voltage. The power flow is directly proportional to the angle change.

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

Case 13-M-0457

Additional Filing Information

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

1.0 Factual evidence showing how the Project utilizes existing ROW and what additional land rights will need to be acquired

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.

2.0 Information on the use of any advanced technologies that are proposed to apply to facility design construction or operations

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering, ROW, forestry, and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows to reconfigure the 115 kV system in the Hudson Valley corridor and utilize a compact double-circuit delta structure which efficiently uses existing ROW. This reconfiguration and more efficient use of existing assets allowed the Project to avoid expanding the existing ROW while mitigating environmental and visual impacts.

Reconfiguration of the 115 kV System in the Hudson Valley Corridor

The existing 115 kV ROW corridor is approximately 125 to 150 feet wide with some stretches of corridor up to 400 feet in width. The initial design provided in October 2013 showed that the construction of a new 345 kV transmission line in this existing ROW could be co-located with two of the existing 115 kV lines without requiring expansion of the ROW. However, this design required much taller structures than existing or required ROW expansion to reduce the height of the new structures. During the past year, extensive analysis was performed to determine whether the existing corridor could be more efficiently used by further reconfiguring the 115 kV system, thereby freeing corridor space to allow the new 345 kV transmission line to be added without expanding the ROW nor using much taller structures. This analysis required the Applicant to challenge their existing standards and practices to find innovative solutions. Connecting all the 115 kV lines at rebuilt and expanded Churchtown Switching Station provided the strong source of power needed to remove one of the two 115 kV lines between Greenbush and Churchtown, and three of the four 115 kV lines between Churchtown and Pleasant Valley. With minimal

upgrades¹⁴ to the remaining 115 kV network in the area, the local area will still be able to meet all required NERC reliability standards and allow room for the proposed new 115/345 kV double-circuit structure in the corridor without the need for additional ROW or much taller structures.

Compact Monopole Structures

To meet the electrical requirements of the Project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height. In response, the Project team developed a “compact double-circuit delta structure”. This structure design, not found in the Northeast, holds both a 345 kV line and a 115 kV line, each in a delta configuration. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase.

The compact double-circuit delta design approach meets the Project objective with a single new structure at minimal height increase, no additional ROW, and allows for the retirement of the aged existing lattice structures.

High Temperature Conductors

The Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote

¹⁴ According to preliminary internal system studies, final upgrades will be determined during the NYISO System Impact Studies.

staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.0 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites.

Detailed access road/work site design will take place as part of the Environmental Management and Construction Plan (“EM&CP”) development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement the existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and keep in place. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

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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**

Case 13-M-0457

Additional Filing Information

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

1.0 Factual evidence showing how the Project utilizes existing ROW and what additional land rights will need to be acquired

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.

2.0 Information on the use of any advanced technologies that are proposed to apply to facility design, construction or operations

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. The reconductoring approach utilized for the Project lessens overall environmental and visual impacts, compared to new transmission line construction, while still increasing the UPNY/SENY transfer capacity.

High Temperature Conductors

The Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than the traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile

applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.0 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or pulling sites. Detailed access road/work site design will take place as part of the Environmental Management and Construction Plan ("EM&CP") development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The

equipment and construction management techniques outlined below would supplement the existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Construction projects frequently use wooden mats. Heavy and awkward, these mats are difficult to set and remove. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles

nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Helicopter Line Reconductoring

Reconductoring projects typically require heavy equipment only at the wire pulling sites, which are typically one to two miles apart, and at the limited number of structures that may need to be replaced. However, access roads with extensive matting will still be required to provide access for the construction crews, stringing equipment and materials at every structure. Helicopters can be used to efficiently transport crews, equipment and materials to and from each structure location which may prove to be more cost efficient than matting.

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Case 13-M-0457

Additional Filing Information

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

1.0 Factual evidence showing how the Project utilizes existing ROW and what additional land rights will need to be acquired

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 exceptions of (a) the 345 kV Pleasant Valley Substation which is owned by Consolidated Edison, and (b) the Churchtown Switching Station which is owned by NYSEG.

2.0 Information on the use of any advanced technologies that are proposed to apply to facility design, construction or operations

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering, ROW, forestry, and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows to reconfigure the 115 kV system in the Hudson Valley corridor and utilize a compact double-circuit delta structure which efficiently uses existing ROW. This reconfiguration and more efficient use of existing assets allowed the Project to avoid expanding the existing ROW while mitigating environmental and visual impacts.

Reconfiguration of the 115 kV System in the Hudson Valley Corridor

The existing 115 kV ROW corridor between Leeds Substation and Pleasant Valley Substation is approximately 125 to 150 feet wide with some stretches of corridor up to 400 feet in width. The initial design provided in October 2013 showed that the construction of a new 345 kV transmission line in this existing ROW could be co-located with two of the existing 115 kV lines without requiring expansion of the ROW. However, this design required much taller structures than existing or required ROW expansion to reduce the height of the new structures. During the past year, extensive analysis was performed to determine whether the existing corridor could be more efficiently used by further reconfiguring the 115 kV system, thereby freeing corridor space to allow the new 345 kV transmission line to be added without expanding the ROW nor using much taller structures. This analysis required the Applicant to challenge their existing standards and practices to find innovative solutions. Connecting all the 115 kV lines at a new expanded Churchtown Switching Station provided the strong source of power needed to remove one

of the two 115 kV lines between Leeds and Churchtown, and three of the four 115 kV lines between Churchtown and Pleasant Valley. With minimal upgrades¹⁴ to the remaining 115 kV network in the area, the local area will still be able to meet all required NERC reliability standards and allow room for the proposed new 115/345 kV double-circuit structure in the corridor without the need for additional ROW or much taller structures.

Compact Monopole Structures

To meet the electrical requirements of the Project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height. In response, the Project team developed a “compact double-circuit delta structure.” This structure design, not found in the Northeast, holds both a 345 kV line and a 115 kV line, each in a delta configuration. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase.

The compact double-circuit delta design approach meets the Project objective with a single new structure at minimal height increase, no additional ROW, and allows for the retirement of the aged existing lattice structures.

High Temperature Conductors

The Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile

¹⁴ According to preliminary internal system studies, final upgrades will be determined during the NYISO System Impact Studies.

applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.0 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites. Detailed access road/work site design will take place as part of the Environmental Management and Construction Plan ("EM&CP") development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The

equipment and construction management techniques outlined below would supplement existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and remove. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of

raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Helicopter Line Reconductoring

Reconductoring projects typically require heavy equipment only at the wire pulling sites, which are typically one to two miles apart, and at the limited number of structures that may need to be replaced. However, access roads with extensive matting will still be required to provide access for the construction crews, stringing equipment and materials at every structure. Helicopters can be used to efficiently transport crews, equipment and materials to and from each structure location which may prove to be more cost efficient than matting.

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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**

Case 13-M-0457

Additional Filing Information

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

1.0 Factual evidence showing how the Project utilizes existing ROW and what additional land rights will need to be acquired

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.

2.0 Information on the Use of Advanced Technologies

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering, ROW, forestry, and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows to reconfigure the 115 kV system in the Hudson Valley corridor and utilize a compact double-circuit delta structure which efficiently uses existing ROW. This reconfiguration and more efficient use of existing assets allow the Project to avoid expanding the existing ROW while mitigating environmental and visual impacts.

Reconfiguration of the 115 kV System in the Hudson Valley Corridor

The existing 115 kV ROW corridor is approximately 125 to 150 feet wide with some stretches of corridor up to 400 feet in width. The initial design provided in October 2013 showed that the construction of a new 345 kV transmission line in this existing ROW could be co-located with two of the existing 115 kV lines without requiring expansion of the ROW. However, this design required much taller structures than existing or required ROW expansion to reduce the height of the new structures. During the past year, extensive analysis was performed to determine whether the existing corridor could be more efficiently used by further reconfiguring the 115 kV system, thereby freeing corridor space to allow the new 345 kV transmission line to be added without expanding the ROW nor using much taller structures. This analysis required the Applicant to challenge their existing standards and practices to find innovative solutions. Connecting all the 115 kV lines at a new expanded Churchtown Switching Station provided the strong source of power needed to remove one of the two 115 kV lines between Greenbush and Churchtown, and three of the four 115 kV lines between Churchtown and Pleasant Valley. With minimal upgrades¹⁴ to the remaining 115 kV network in the area, the local area will still be able to meet all required NERC

¹⁴ According to preliminary internal system studies, final upgrades will be determined during the NYISO System Impact Studies.

reliability standards and allow room for the proposed new 115/345 kV double-circuit structure in the corridor without the need for additional ROW or much taller structures.

Compact Monopole Structures

To meet the electrical requirements of the Project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height. In response, the Project team developed a “compact double-circuit delta structure” to be utilized within the KB-PV portion of the Project. This structure design, not found in the Northeast, holds both a 345 kV line and a 115 kV line, each in a delta configuration. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase.

The compact double-circuit delta design approach meets the Project objective with a single new structure at minimal height increase, no additional ROW, and allows for the retirement of the aged existing lattice structures.

Similarly, the Project team will develop a “compact” design for all of the monopole structures proposed to be constructed within the ED-NS portion of this Project, effectively reducing their heights by approximately 10 feet compared with traditional overhead shield wire attachment designs.

High Temperature Conductors

The Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also

allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.0 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites.

Detailed access road/work site design will take place as part of the Environmental Management & Construction Plan (“EM&CP”) development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement to existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and keep in place. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Compact H-Frame Structures

The Project team will investigate the feasibility of developing a “compact” design for the new H-frame structures by lowering the point of attachment of the overhead shield wires, which may result in reduction of the overall structure height when compared with traditional overhead shield wire attachment designs.

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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**

Case 13-M-0457

Additional Filing Information

*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))*

1.0 Factual evidence showing how the Project utilizes existing ROW and what additional land rights will need to be acquired

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.

2.0 Information on the use of any advanced technologies that are proposed to apply to facility design, construction or operations

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. The reconductoring approach utilized for the NS-LD-PV portion of the Project lessens overall environmental and visual impacts, compared to new transmission line construction, while still increasing the UPNY/SENY transfer capacity. For the ED-NS portion of the Project, two aged existing 230 kV H-frame structure lines were replaced with one new 345 kV H-frame line, lessening overall environmental and visual impacts.

High Temperature Conductors

The Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. The latest composite core conductors, ACCR and ACCC, which have been in commercial operation for over 10 year, 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote

staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.0 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites. Detailed access road/work site design will take place as part of the Environmental Management and

Construction Plan (“EM&CP”) development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and management outlined below would supplement the existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and remove. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Helicopter Line Reconductoring

Reconductoring projects typically require heavy equipment only at the wire pulling sites, which are typically one to two miles apart, and at the limited number of structures that may need to be replaced. However, access roads with extensive matting will still be required to provide access for the construction crews, stringing equipment and materials at every structure. Helicopters can be used to efficiently transport crews, equipment and materials to and from each structure location which may prove to be more cost efficient than matting.

Compact H-Frame Structures

The Project team will investigate the feasibility of developing a “compact” design for the new H-frame structures by lowering the point of attachment of the overhead shield wires, which may result in reduction of the overall structure height when compared with traditional overhead shield wire attachment designs.

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

Case 13-M-0457

Additional Filing Information

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

1.0 Factual evidence showing how the Project utilizes existing ROW and what additional land rights will need to be acquired

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.

2.0 Information on the use of any advanced technologies that are proposed to apply to facility design, construction or operations

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows, allowing the ED-NS Component to avoid the need to expand the existing ROW while mitigating environmental and visual impacts. Regarding the PARs, this is an improvement over the use of series capacitors and reactors to attempt to achieve improvements in transfer capability. While these projects are able to “fine tune” the 345 kV transmission system under some dispatch scenarios, under other scenarios the projects failed to achieve the desired transfer capability improvements. Through the use of the innovative technology afforded by the PARs, the transfer capability of the system can be maximized over a wide range of dispatch scenarios, improving congestion and lowering system costs.

Compact Monopole Structures

To meet the electrical requirements of the Project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height in several locations along the Project ROW. In response, the Project team developed a “compact monopole structure” to be utilized within the ED-NS portion of the Project. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase, effectively reducing their heights by approximately 10 feet when compared with traditional overhead shield wire attachment designs.

High Temperature Conductors

The ED-NS component of the Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing

operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.0 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This

can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Compact H-Frame Structures

The Project team will investigate the feasibility of developing a "compact" design for the new H-frame structures by lowering the point of attachment of the overhead shield wires, which may result in reduction of the overall structure height when compared with traditional overhead shield wire attachment designs.

Environmental Impact Minimization

Final design will minimize impacts to wetlands, farmland, and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas, or for pulling sites. Detailed access road and work site design will take place as part of the Environmental Management and Construction ("EM&CP") development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations due to being screwed, instead of driven, into the ground. Compared to traditional structures, they require less excavation, generate fewer foundation-drilling spoils, and can require a smaller footprint at each structure site, therefore requiring less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Construction projects frequently used wooden mats. Heavy and awkward, these mats are difficult to set and remove. Moreover, repeated cycling of this matting is

necessary on long, linear projects, forcing frequent resetting and washing of matting (to prevent invasive species transport) and possible schedule delays. Composite interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands, and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

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

Case 13-M-0457

Additional Filing Information

*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)*

1.0 Factual evidence showing how the Project utilizes existing ROW and what additional land rights will need to be acquired

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 exceptions of (a) the 345 kV Pleasant Valley Substation which is owned by Consolidated Edison and (b) the Churchtown Switching Station which is owned by NYSEG.

2.0 Information on the use of any advanced technologies that are proposed to apply to facility design construction or operations

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering, ROW, forestry, and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows to reconfigure the 115 kV system in the Hudson Valley corridor and utilize a compact double-circuit delta structure which efficiently uses existing ROW. This reconfiguration and more efficient use of existing assets allowed the Project to avoid expanding the existing ROW while mitigating environmental and visual impacts.

Reconfiguration of the 115 kV System in the Hudson Valley Corridor

The existing 115 kV ROW corridor between Leeds Substation and Pleasant Valley Substation is approximately 125 to 150 feet wide with some stretches of corridor up to 400 feet in width. The initial design provided in October 2013 showed that the construction of a new 345 kV transmission line in this existing ROW could be co-located with two of the existing 115 kV lines without requiring expansion of the ROW. However, this design required much taller structures than existing or required ROW expansion to reduce the height of the new structures. During the past year, extensive analysis was performed to determine whether the existing corridor could be more efficiently used by further reconfiguring the 115 kV system, thereby freeing corridor space to allow the new 345 kV transmission line to be added without expanding the ROW nor using much taller structures. This analysis required the Applicant to challenge their existing standards and practices to find innovative solutions. Connecting all the 115 kV lines at a new expanded Churchtown Switching Station provided the strong source of power needed to remove one of the two 115 kV lines between Leeds and Churchtown, and three of the four 115 kV lines between

Churchtown and Pleasant Valley. With minimal upgrades¹⁴ to the remaining 115 kV network in the area, the local area will still be able to meet all required NERC reliability standards and allow room for the proposed new 115/345 kV double-circuit structure in the corridor without the need for additional ROW or much taller structures.

Compact Monopole Structures

To meet the electrical requirements of the Project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height. In response, the Project team developed a “compact double-circuit delta structure.” This structure design, not found in the Northeast, holds both a 345 kV line and a 115 kV line, each in a delta configuration. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase.

The compact double-circuit delta design approach meets the Project objective with a single new structure at minimal height increase, no additional ROW, and allows for the retirement of the aged existing lattice structures.

High Temperature Conductors

The Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also

¹⁴ According to preliminary internal system studies, final upgrades will be determined during the NYISO System Impact Studies.

allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.0 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites.

Detailed access road/work site design will take place as part of the Environmental Management and Construction Plan (“EM&CP”) development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and remove. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Helicopter Line Reconductoring

Reconductoring projects typically require heavy equipment only at the wire pulling sites, which are typically one to two miles apart, and at the limited number of structures that may need to be replaced. However, access roads with extensive matting will still be required to provide access for the construction crews, stringing equipment and materials at every structure. Helicopters can be used to efficiently transport crews, equipment and materials to and from each structure location which may prove to be more cost efficient than matting.

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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**

**Information Required for NYISO Analysis
at the Order of the PSC**

January 7, 2015 Submittal

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)*

3.3.4 Innovations Incorporated

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering, ROW, forestry, and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows to reconfigure the 115 kV system in the Hudson Valley corridor and utilize a compact double circuit delta structure which efficiently uses existing ROW. This reconfiguration and more efficient use of existing assets allow the O-F/ED-PV Project to avoid expanding the existing ROW while mitigating environmental and visual impacts.

Reconfiguration of the 115 kV System in the Hudson Valley Corridor

The existing 115 kV ROW corridor is predominately 125 to 150 feet wide with some stretches of corridor up to 400 feet in width. The initial design provided in October 2013 showed that the construction of a new 345 kV transmission line in this existing ROW could be co-located with two of the existing 115 kV lines without requiring expansion of the ROW. However, this design required much taller structures than existing or required ROW expansion to reduce the height of the new structures. During the past year, extensive analysis was performed to determine whether the existing corridor could be more efficiently used by further reconfiguring the 115 kV system, thereby freeing corridor space to allow the new 345 kV transmission line to be added without expanding the ROW nor using much taller structures. This analysis required the Applicant to challenge their existing standards and practices to find innovative solutions. Connecting all the 115 kV lines at a new expanded Churchtown Switching Station provided the strong source of power needed to remove one of the two 115 kV lines between Greenbush and Churchtown, and three of the four 115 kV lines between Churchtown and Pleasant Valley. With minimal upgrades¹ to the remaining 115 kV network in the area, the local area will still be able to meet all required NERC reliability standards and allow room for the proposed new 115/345 kV double circuit structure in the corridor without the need for additional ROW or much taller structures.

Compact Monopole Structures

To meet the electrical requirements of the project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height. In response, the project team developed a “compact double-circuit delta structure” to be utilized within

¹ According to preliminary internal system studies, final upgrades will be determined during the NYISO System Impact Studies.

the KB-PV portion of the project. This structure design, not found in the Northeast, holds both a 345 kV line and a 115 kV line, each in a delta configuration. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase.

The compact double circuit delta design approach meets the project objective with a single new structure at minimal height increase, no additional ROW, and allows for the retirement of the aged existing lattice structures.

Similarly, the project team will develop a “compact” design for all of the monopole structures proposed to be constructed within the ED-NS portion of this project, effectively reducing their heights by approximately 10’ compared with traditional overhead shield wire attachment designs.

High Temperature Conductors

The ED-NS and KB-PV portions of the Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.3.5 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites. Detailed access road/work site design will take place as part of the EM&CP development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more

quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and remove. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Compact H-Frame Structures

The Project team will investigate the feasibility of developing a “compact” design for the new H-frame structures by lowering the point of attachment of the overhead shield wires, which may result in reduction of the overall structure height when compared with traditional overhead shield wire attachment designs.

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

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

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering, ROW, forestry, and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows to reconfigure the 115 kV system in the Hudson Valley corridor and utilize a compact double-circuit delta structure which efficiently uses existing ROW. This reconfiguration and more efficient use of existing assets allowed the KB-PV Project to avoid expanding the existing ROW while mitigating environmental and visual impacts.

Reconfiguration of the 115 kV System in the Hudson Valley Corridor

The existing 115 kV ROW corridor is predominately 125 to 150 feet wide with some stretches of corridor up to 400 feet in width. The initial design provided in October 2013 showed that the construction of a new 345 kV transmission line in this existing ROW could be co-located with two of the existing 115 kV lines without requiring expansion of the ROW. However, this design required much taller structures than existing or required ROW expansion to reduce the height of the new structures. During the past year, extensive analysis was performed to determine whether the existing corridor could be more efficiently used by further reconfiguring the 115 kV system, thereby freeing corridor space to allow the new 345 kV transmission line to be added without expanding the ROW nor using much taller structures. This analysis required the Applicant to challenge their existing standards and practices to find innovative solutions. Connecting all the 115 kV lines at rebuilt and expanded Churchtown Switching Station provided the strong source of power needed to remove one of the two 115 kV lines between Greenbush and Churchtown, and three of the four 115 kV lines between Churchtown and Pleasant Valley. With minimal upgrades¹ to the remaining 115 kV network in the area, the local area will still be able to meet all required NERC reliability standards and allow room for the proposed new 115/345 kV double circuit structure in the corridor without the need for additional ROW or much taller structures.

¹ According to preliminary internal system studies, final upgrades will be determined during the NYISO System Impact Studies.

Compact Monopole Structures

To meet the electrical requirements of the project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height. In response, the project team developed a “compact double-circuit delta structure”. This structure design, not found in the Northeast, holds both a 345 kV line and a 115 kV line, each in a delta configuration. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase.

The compact double-circuit delta design approach meets the project objective with a single new structure at minimal height increase, no additional ROW, and allows for the retirement of the aged existing lattice structures.

High Temperature Conductors

The project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.4.5 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites. Detailed access road/work site design will take place as part of the Environmental Management and Construction Plan (EM&CP) development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement the existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the

environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and keep in place. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

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.

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

- 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

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. The reconductoring approach utilized for the LD-PV(R) Project lessens overall environmental and visual impacts, compared to new transmission line construction, while still increasing the UPNY/SENY transfer capacity.

High Temperature Conductors

The Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.5.5 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites. Detailed access road/work site design will take place as part of the EM&CP development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement the existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and remove. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be

used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Helicopter Line Reconductoring

Reconductoring projects typically require heavy equipment only at the wire pulling sites, which are typically one to two miles apart, and at the limited number of structures that may need to be replaced. However, access roads with extensive matting will still be required to provide access for the construction crews, stringing equipment and materials at every structure. Helicopters can be used to efficiently transport crews, equipment and materials to and from each structure location which may prove to be more cost efficient than matting.

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.

***Hurley Avenue PARs Project
(HA)***

3.6.4 Innovations Incorporated

The HA Project was developed under guidelines of staying within the existing transmission ROW and incurring the lowest possible cost. This required the use of both innovative technology and innovative design. This is an improvement over the use of series capacitors and reactors to attempt to achieve improvements in transfer capability. While these projects are able to “fine tune” the 345 kV transmission system under some dispatch scenarios, under other scenarios the projects failed to achieve the desired transfer capability improvements. Through the use of the innovative technology afforded by the PARs, the transfer capability of the system can be maximized over a wide range of dispatch scenarios, reducing congestion and lowering system costs.

The Applicant studied two other configurations to balance the improvement in transfer capability to the costs of the project. The project was studied with three 625 MW PARs and two 750 MW PARs. When compared to these two alternate approaches, the Applicant believes the proposed HA PARs project as defined is the solution that best balances the guidelines identified above.

3.6.5 Evidence of Commercially Viable Technology

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.

Overhead Transmission Engineering

Structures will consist of tubular steel and steel members utilizing an innovative design that will allow the replacement of the existing rainbow arm structures with a packaged steel structure. Hardware on the project will consist of traditional ceramic insulators and various metallic connectors.

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 Breaker 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 substation have been used throughout the industry for over 60 years. 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)***

3.7.4 Innovations Incorporated

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering, ROW, forestry, and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows to reconfigure the 115 kV system in the Hudson Valley corridor and utilize a compact double circuit delta structure which efficiently uses existing ROW. This reconfiguration and more efficient use of existing assets allowed the NS-LD(R)/LD-PV Project to avoid expanding the existing ROW while mitigating environmental and visual impacts.

Reconfiguration of the 115 kV System in the Hudson Valley Corridor

The existing 115 kV ROW corridor between Leeds Substation and Pleasant Valley Substation is predominately 125 to 150 feet wide with some stretches of corridor up to 400 feet in width. The initial design provided in October 2013 showed that the construction of a new 345 kV transmission line in this existing ROW could be co-located with two of the existing 115 kV lines without requiring expansion of the ROW. However, this design required much taller structures than existing or required ROW expansion to reduce the height of the new structures. During the past year, extensive analysis was performed to determine whether the existing corridor could be more efficiently used by further reconfiguring the 115 kV system, thereby freeing corridor space to allow the new 345 kV transmission line to be added without expanding the ROW nor using much taller structures. This analysis required the Applicant to challenge their existing standards and practices to find innovative solutions. Connecting all the 115 kV lines at a new expanded Churchtown Switching Station provided the strong source of power needed to remove one of the two 115 kV lines between Leeds and Churchtown, and three of the four 115 kV lines between Churchtown and Pleasant Valley. With minimal upgrades¹ to the remaining 115 kV network in the area, the local area will still be able to meet all required NERC reliability standards and allow room for the proposed new 115/345 kV double circuit structure in the corridor without the need for additional ROW or much taller structures.

Compact Monopole Structures

To meet the electrical requirements of the Project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height. In response, the project team developed a “compact double-circuit delta structure.” This structure design,

¹ According to preliminary internal system studies, final upgrades will be determined during the NYISO System Impact Studies.

not found in the Northeast, holds both a 345 kV line and a 115 kV line, each in a delta configuration. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase.

The compact double circuit delta design approach meets the Project objective with a single new structure at minimal height increase, no additional ROW, and allows for the retirement of the aged existing lattice structures.

High Temperature Conductors

The project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.7.5 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites. Detailed access road/work site design will take place as part of the Environmental Management and Construction Plan development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to

set and remove. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Helicopter Line Reconductoring

Reconductoring projects typically require heavy equipment only at the wire pulling sites, which are typically one to two miles apart, and at the limited number of structures that may need to be replaced. However, access roads with extensive matting will still be required to provide access for the construction crews, stringing equipment and materials at every structure. Helicopters can be used to efficiently transport crews, equipment and materials to and from each structure location which may prove to be more cost efficient than matting.

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

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

- 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

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering, ROW, forestry, and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows to reconfigure the 115 kV system in the Hudson Valley corridor and utilize a compact double-circuit delta structure which efficiently uses existing ROW. This reconfiguration and more efficient use of existing assets allow the ED-NS/KB-PV Project to avoid expanding the existing ROW while mitigating environmental and visual impacts.

Reconfiguration of the 115 kV System in the Hudson Valley Corridor

The existing 115 kV ROW corridor is predominately 125 to 150 feet wide with some stretches of corridor up to 400 feet in width. The initial design provided in October 2013 showed that the construction of a new 345 kV transmission line in this existing ROW could be co-located with two of the existing 115 kV lines without requiring expansion of the ROW. However, this design required much taller structures than existing or required ROW expansion to reduce the height of the new structures. During the past year, extensive analysis was performed to determine whether the existing corridor could be more efficiently used by further reconfiguring the 115 kV system, thereby freeing corridor space to allow the new 345 kV transmission line to be added without expanding the ROW nor using much taller structures. This analysis

required the Applicant to challenge their existing standards and practices to find innovative solutions. Connecting all the 115 kV lines at a new expanded Churchtown Switching Station provided the strong source of power needed to remove one of the two 115 kV lines between Greenbush and Churchtown, and three of the four 115 kV lines between Churchtown and Pleasant Valley. With minimal upgrades¹ to the remaining 115 kV network in the area, the local area will still be able to meet all required NERC reliability standards and allow room for the proposed new 115/345 kV double circuit structure in the corridor without the need for additional ROW or much taller structures.

Compact Monopole Structures

To meet the electrical requirements of the project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height. In response, the project team developed a “compact double-circuit delta structure” to be utilized within the KB-PV portion of the project. This structure design, not found in the Northeast, holds both a 345 kV line and a 115 kV line, each in a delta configuration. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase.

The compact double circuit delta design approach meets the project objective with a single new structure at minimal height increase, no additional ROW, and allows for the retirement of the aged existing lattice structures.

Similarly, the project team will develop a “compact” design for all of the monopole structures proposed to be constructed within the ED-NS portion of this project, effectively reducing their heights by approximately 10 feet compared with traditional overhead shield wire attachment designs.

High Temperature Conductors

The Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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

¹ According to preliminary internal system studies, final upgrades will be determined during the NYISO System Impact Studies.

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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.8.5 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites. Detailed access road/work site design will take place as part of the Environmental Management & Construction Plan (EM&CP) development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement to existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and keep in place. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be

used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Compact H-Frame Structures

The Project team will investigate the feasibility of developing a “compact” design for the new H-frame structures by lowering the point of attachment of the overhead shield wires, which may result in reduction of the overall structure height when compared with traditional overhead shield wire attachment designs.

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

***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))***

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

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. The reconductoring approach utilized for the NS-LD-PV portion of the project lessens overall environmental and visual impacts, compared to new transmission line construction, while still increasing the UPNY/SENY transfer capacity. For the ED-NS portion of the Project, two aged existing 230 kV H-frame structure lines were replaced with one new 345 kV H-frame line, lessening overall environmental and visual impacts. .

High Temperature Conductors

The Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.9.5 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles

and temporary work sites will be created for work at structures, as laydown areas or for pulling sites. Detailed access road/work site design will take place as part of the Environmental Management and Construction Plan (EM&CP) development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and management outlined below would supplement the existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and remove. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Helicopter Line Reconductoring

Reconductoring projects typically require heavy equipment only at the wire pulling sites, which are typically one to two miles apart, and at the limited number of structures that may need to be replaced. However, access roads with extensive matting will still be required to provide access for the construction crews, stringing equipment and materials at every structure. Helicopters can be used to efficiently transport crews, equipment and materials to and from each structure location which may prove to be more cost efficient than matting.

Compact H-Frame Structures

The Project team will investigate the feasibility of developing a “compact” design for the new H-frame structures by lowering the point of attachment of the overhead shield wires, which may result in reduction of the overall structure height when compared with traditional overhead shield wire attachment designs.

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.

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

3.10.4 Innovations Incorporated

In designing this project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering and system planners to meet these goals, the project team utilized creative solutions and system planning data to effectively redesign circuit power flows, allowing the ED-NS Component to avoid the need to expand the existing ROW while mitigating environmental and visual impacts. Regarding the PARs, this is an improvement over the use of series capacitors and reactors to attempt to achieve improvements in transfer capability. While these projects are able to “fine tune” the 345 kV transmission system under some dispatch scenarios, under other scenarios the projects failed to achieve the desired transfer capability improvements. Through the use of the innovative technology afforded by the PARs, the transfer capability of the system can be maximized over a wide range of dispatch scenarios, improving congestion and lowering system costs.

Compact Monopole Structures

To meet the electrical requirements of the project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height in several locations along the project ROW. In response, the project team developed a “compact monopole structure” to be utilized within the ED-NS portion of the project. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase, effectively reducing their heights by approximately 10 feet when compared with traditional overhead shield wire attachment designs.

High Temperature Conductors

The ED-NS Component will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.10.5 Other Technologies and Methods Being Studied

In addition, the engineering and design team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Compact H-Frame Structures

The project team will investigate the feasibility of developing a "compact" design for the new H-frame structures by lowering the point of attachment of the overhead shield wires, which may result in reduction of the overall structure height when compared with traditional overhead shield wire attachment designs.

Environmental Impact Minimization

Final design will minimize impacts to wetlands, farmland, and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas, or for pulling sites. Detailed access road and work site design will take place as part of the EM&CP development. The current project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement existing Best Management Practices and be used only after project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations due to being screwed, instead of driven, into the ground. Compared to traditional structures, they require less excavation, generate fewer foundation-drilling spoils, and can require a smaller footprint at each structure site, therefore requiring less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Construction projects frequently used wooden mats. Heavy and awkward, these mats are difficult to set and remove. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing of matting (to prevent invasive species transport) and possible schedule delays. Composite interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands, and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

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.

***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)***

3.11.4 Innovations Incorporated

In designing this Project, the Applicant had the simultaneous goals of (1) staying within the existing ROW, and (2) keeping new structure heights as close as possible to existing structure heights. This required the use of both innovative technology and innovative design. By bringing together transmission line engineering and system planners to meet these goals, the Project team utilized creative solutions and system planning data to effectively redesign circuit power flows, allowing the ED-NS/NS-LD(R)/LD-PV Project to avoid the need to expand the existing ROW, while mitigating environmental and visual impacts. For the ED-NS portion of the project, two aged existing 230 kV H-frame structure lines were replaced with one new 345 kV H-frame line, lessening overall environmental and visual impacts. The reconductoring approach utilized for the NS-LD(R) portion of the project lessens overall environmental and visual impacts, compared to new transmission line construction. Finally, the LD-PV portion of the project replaces multiple aged existing 115 kV double-circuit lattice structure lines with a compact 115/345 kV double-circuit delta structure that avoids the need to expand the ROW while keeping structure heights to a minimum.

Reconfiguration of the 115 kV System in the Hudson Valley Corridor

The existing 115 kV ROW corridor is predominately 125 to 150 feet wide with some stretches of corridor up to 400 feet in width. The initial design provided in October 2013 showed that the construction of a new 345 kV transmission line in this existing ROW could be co-located with the existing double circuit 115 kV lines without requiring expansion of the ROW. However, this design required much taller structures than existing or required ROW expansion to reduce the height of the new structures. During the past year, extensive analysis was performed to determine whether the existing corridor could be more efficiently used by further reconfiguring the 115 kV system, thereby freeing corridor space to allow the new 345 kV transmission line to be added without expanding the ROW nor using much taller structures. This analysis required the Applicant to challenge their existing standards and practices to find innovative solutions. Connecting all the 115 kV lines at a new expanded Churchtown Switching Station provided the strong source of power needed to remove one of the two 115 kV lines between Leeds and Churchtown, and three of the four 115 kV lines between Churchtown and Pleasant Valley. With minimal upgrades¹ to the remaining 115 kV network in the area, the local area will still be able to meet all required NERC reliability standards and allow room for the proposed new 115/345 kV double circuit structure in the corridor without the need for additional ROW or much taller structures.

¹ According to preliminary internal system studies, final upgrades will be determined during the NYISO System Impact Studies.

Compact Monopole Structures

To meet the electrical requirements of the project, traditional structures would need to be significantly taller than the existing structures or additional ROW would be required to maintain a comparable height. In response, the project team developed a “compact double-circuit delta structure” to be utilized within the LD-PV portion of the project. This structure design, not found in the Northeast, holds both a 345 kV line and a 115 kV line, each in a delta configuration. The structure is made more compact than traditional designs (including the designs of existing structures to be replaced) by attaching the overhead shield wire to the same arm as the top phase.

The compact double-circuit delta design approach meets the project objective with a single new structure at minimal height increase, no additional ROW, and allows for the retirement of the aged existing lattice structures.

Similarly, the project team will develop a “compact” design for all of the monopole structures proposed to be constructed within the ED-NS portion of this project, effectively reducing their heights by approximately 10’ compared with traditional overhead shield wire attachment designs.

High Temperature Conductors

The Project will use high temperature ACSS conductor. This non-standard transmission conductor will allow for smaller diameter conductor to transfer more current by allowing operation at higher temperatures than traditional ACSR conductor. The smaller conductors used will require less tension than larger conductors to achieve the same sag. Lower tensions reduce loads on structures and foundations resulting in lighter structures, smaller foundations, and cost savings. 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.

Project Mobile Applications

Use of on-site data collection and automated reporting built into mobile applications can ensure that field staff has customized information about environmentally sensitive areas. Mobile applications can also allow field environmental crews to provide real-time updates to both on-site team members and remote staff. Applications such as this can display seasonal and species-specific environmental restrictions and monitoring requirements while also tracking construction progress and compliance. Moreover, mobile applications can assist with rapid response to incidents, such as equipment leaks or spills by providing accurate GIS locations and the specific details of the event.

3.11.5 Other Technologies and Methods Being Studied

In addition, the Project team continues to study the application of other new technologies.

Smart Wire

Smart Wire is a technology that adjusts transmission line impedance on an existing line such that the flow of the system can be changed. This technology provides the transfer limit increase by shifting the power on to less loaded parallel paths allowing the overall transfer to increase. Increasing the impedance on a certain line has to be assessed to analyze the system impacts and voltages. The transfer limit between one region and another region can be increased with this technology as long as the shift in power flows doesn't cause voltage issues at the increased transfer level. This technology may provide an interim solution to marginally increase the limit on an interface until long term solutions are introduced.

Dynamic Load Monitoring

Dynamic Load Monitoring of a transmission line rating can increase the normal and emergency rating on the transmission line. The device monitors the transmission line rating in real time and provides the information to the operation control center. Based on the rating increase with monitoring the real-time rating, the system operator directs more flow on the line without violating the line operation limit. This can relieve the congestion in a certain time frame and in a certain congested area. This technology can provide a short term congestion relief until a permanent solution is completed. After installing the dynamic line rating device, on-going monitoring and operator's action are required to apply the dynamic rating into the congestion relief.

Environmental Impact Minimization

Final design of the Project will minimize impacts to wetlands, farmland and other sensitive resources to the maximum extent practicable. Overall wetland and farmland disturbance will be reduced through the use of existing ROW. However, existing access roads may need to be improved for construction vehicles and temporary work sites will be created for work at structures, as laydown areas or for pulling sites. In addition, some limited, off-right-of-way access may need to be proposed in developing the EM&CP, to avoid or minimize impacts to sensitive environmental resources that occur on the existing ROW. Detailed access road/work site design will take place as part of the Environmental Management and Construction Plan development. The current Project schedule incorporates the time necessary to adopt this voluntary high-level of planning, including field constructability review. The equipment and construction management techniques outlined below would supplement existing Best Management Practices and be used only after Project consultation with the DPS and natural resource management agencies about their use.

Helical Foundations

Steel helical foundations differ from typical concrete foundations because they screw into the ground. They require little excavation, generate few foundation-drilling spoils and could require a smaller footprint at each structure site which would require less matting and impacts to the environment. Overall, this type of design may be more cost effective and may be installed more quickly than traditional concrete structures. The feasibility of using helical pier foundations will be evaluated and considered during development of the EM&CP based on proposed structure site core boring results and associated structural design considerations.

Composite Mats

Worksite and construction roads in wetlands and farmlands will likely be constructed with temporary matting networks. Many transmission line construction projects have constructed temporary access through use of wooden mats. Heavy and awkward, these mats are difficult to set and keep in place. Moreover, repeated cycling of this matting is necessary on long, linear projects, forcing frequent resetting and washing (to prevent invasive species transport) of matting and possible schedule delays. Composite, interlocking mats form a continuous work surface while protecting the soil beneath them. These mats could be easier to clean than wooden mats and may be more efficiently moved from site-to-site.

Low Ground Pressure Equipment

Soil compaction and rutting typically occurs when the soil is wet and/or unstable and equipment weights exceed 10 tons per axle; such soil impacts may pose long-term threats to soil productivity and ecological health. Low ground pressure vehicles (sometimes called marsh buggies) can be used in wetlands, croplands and other areas of wet and/or unstable soil conditions. Because of their wide tracks, these vehicles exert very low ground pressure.

Migratory Bird and Raptor Protection

Bird flight diverters make shield wire more visible, increasing the likelihood that birds will see the wire and adjust their flight pattern to avoid it. The bird flight diverters can be used in areas of raptor or other sensitive species migration or near water bodies, where ospreys and bald eagles nest on power line structures because they resemble tall, dead trees which are their natural nesting structures.

Helicopter Line Reconductoring

Reconductoring projects typically require heavy equipment only at the wire pulling sites, which are typically one to two miles apart, and at the limited number of structures that may need to be replaced. However, access roads with extensive matting will still be required to provide access for the construction crews, stringing equipment and materials at every structure. Helicopters can be used to efficiently transport crews, equipment and materials to and from each structure location which may prove to be more cost efficient than matting.

Compact H-Frame Structures

The Project team will investigate the feasibility of developing a “compact” design for the new H-frame structures by lowering the point of attachment of the overhead shield wires, which may result in reduction of the overall structure height when compared with traditional overhead shield wire attachment designs.

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

**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

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***Niagara Mohawk Power Corporation d/b/a National
Grid***

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NYISO Developer Qualification Form

(Completed application should be sent to DeveloperQual@nyiso.com)

Name of Company: National Grid USA (including subsidiaries)

Mailing Address:

40 Sylvan Road
Waltham, Massachusetts 02451

Street Address:

40 Sylvan Road
Waltham, Massachusetts 02451

Contact Person: Stanley J. Blazewicz

Telephone: (781) 907-2010

Fax: (781) 522-1058

Email Address: Stanley.blazewicz@nationalgrid.com

The following information is required by the NYISO OATT Attachment Y Section 31.2.4.1. You may provide the information by inserting it into the box provided, or as attachments numbered to correspond to each of the requested information items.

1. Please provide the ISO a description of transmission facilities (not to exceed ten) that the Developer has previously developed, constructed, maintained or operated and the status of those facilities, including whether the construction was completed, whether and when the facility entered into commercial operations, whether the facility has been suspended or terminated for any reason, and evidence demonstrating the ability of the Developer to address and timely remedy any operational failure, if any, of the facilities.

National Grid USA and its subsidiaries (collectively, "National Grid") have completed billions of dollars of transmission projects across New York and New England. The following are a few such projects that have been completed or are in construction:

Lockport-Mortimer- 115kV Transmission Line Rebuild

National Grid completely rebuilt this 56 mile, 115kV line in western NY, starting in 2011 and completing in December 2012. Many of the structures on the line dated back to the early 1900s and the conductor to the 1940s. The project scope included the replacement of 559 structures, conductor and shield wire replacement for the 56 circuit miles; the refurbishment of 50 structures; associated civil improvements, increased tree clearing and involved significant siting and permitting efforts in NY

Northeast Region Reinforcement Project

The Saratoga/Warren County areas of NY State have experienced significant load growth in the past five years as part of the State efforts in economic development for the Region that have been met with great success. National Grid is playing a key role supporting the efforts through the planning, development and expansion of its transmission system with new 115kV transmission line installations and the addition of a new 230-115kV substation, currently under construction, known as Eastover Road. This substation consists of two 230kV incoming transmission lines and a 230-

115kV 450MVA transformer supplying four 115kV transmission lines. In addition, National Grid constructed a new 33 mile 115kV single circuit line between Rotterdam and Spier Falls, bussed 33 circuit miles of existing double circuit 115kV lines and rebuilt four circuit miles of 115kV single circuit lines. This project required NYS Article VII permitting and was placed in-service in October 2013. The last component of the overall project is the rebuild of the 15 mile double circuit 115kV transmission line between Mohican and Battenkill substations. The new line will consist of steel double circuit structures with new conductor and shield wire to improve the capability of the local transmission system. This project also required NYS Article VII permitting and is expected to be in service by summer 2016.

115kV Gardenville - Homer Hill #151 and #152:

National Grid recognized condition issues on this double circuit line and initiated a project to refurbish it in order to improve its performance. The project consisted of re-conductoring 42 circuit miles of 4/0 copper conductor with 795 ACSR and the replacement of 160 deteriorated structures. This project required NYS Article VII permitting and was placed in-service on May 2011.

Wakefield Junction Substation:

In 2009, National Grid made a major investment in New England reliability involving seven integrated transmission lines and substation projects, including multiple new 345-115kV gas-insulated substations with 345kV and 115kV circuit breakers. The new substation was designed to help meet the long-term energy delivery needs of the greater Boston area and, by removing obsolete equipment, reduced sulphur hexafluoride (SF₆) emissions.

New England East-West Solution (NEEWS):

National Grid, along with Northeast Utilities and the Independent System Operator New England (ISO-NE), was part of a working group that undertook one of the largest planning studies in New England to date in order to identify solutions to solve identified electric transmission constraints and deficiencies, provide stronger interconnections across Massachusetts, Rhode Island, and Connecticut and allow more power to be moved between the east and west interface in New England. The project is known as NEEWS, which consists of four related transmission sub-regional projects. National Grid has responsibility for delivering several major components of the NEEWS Plan:

- “Advanced” NEEWS Projects; a collection of projects which lay the foundation for the larger regional solution, and include the construction of a new 345 kV/115 kV substation in Massachusetts, numerous 115 kV substation upgrades and the re-conductoring of an existing 115 kV transmission line in Massachusetts and Rhode Island. These projects were completed and placed in commercial operation between 2008 to 2012;
- The Rhode Island Reliability Project (RIRP); a collection of projects aimed at improving the reliability and performance of the Rhode Island transmission network which include the construction of a new 345 kV transmission line, relocation and re-conductoring of existing 115 kV transmission lines, autotransformer and GIS substation additions and miscellaneous substation upgrades in Rhode Island. These projects were completed and placed in commercial operation between 2009 to 2014;
- The Interstate Reliability Project (IRP); a collection of projects aimed at improving regional network reliability and relieving power transfer constraints in the southern New England

states of Massachusetts, Rhode Island and Connecticut with National Grid being responsible for the MA and RI components of the IRP. The major elements of the IRP include construction of a new 20-mile 345 kV transmission line in Massachusetts and Rhode Island, construction of a new 55-mile 345 kV transmission line in Rhode Island and Connecticut, re-conductoring and reconstruction of existing transmission lines, autotransformer installation and reconstruction of an existing 345 kV GIS substation. These projects were or will be placed in commercial operation between 2013 and 2015.

Evidence Demonstrating Ability to Remedy Operational Failure:

National Grid USA, through its indirect, wholly owned subsidiary, Niagara Mohawk Power Corporation (NMPC), is an incumbent transmission owner in upstate New York with extensive experience responding to operational needs, including failures. National Grid owns and operates a transmission control center and multiple distribution control centers across New York with back-up facilities. Upstate New York regularly experiences major weather events, such as Hurricane Irene and Tropical Storm Lee, which have caused significant damage to the electric transmission and distribution infrastructure. Successfully responding to such widespread devastation or smaller isolated system failures, National Grid has earned a strong reputation for restoring the electric system to normal operating conditions in a timely and safe manner.

At the core of this success are the workforce and processes National Grid has in place including a well-qualified and dedicated field operations workforce trained to repair and replace damaged electric facilities. The internal workforce is supplemented with qualified contract construction crews. In the event of a major storm response, National Grid can mobilize resources from regions of the Company located both inside and outside New York and has mutual aid assistance agreements with utilities throughout the country.

Emergency response plans and coordination is provided by a dedicated Emergency Management and Planning department & staff reporting to the Chief Operating Officer (COO). The group is responsible for planning employees' emergency assignments, training, emergency table-top exercise, external coordination, and coordination with local, state, regional and national agencies.

- 2. Please provide the technical and engineering qualifications and experience of the Developer relevant to the development, construction, operation and maintenance of a transmission facility, including evidence of the Developer's demonstrated capability to adhere to standardized construction, maintenance, and operating practices and to contract with third parties, to develop, construct, maintain, and/or operate transmission facilities. Also include a detailed plan describing the extent to which the Developer would rely on the technical expertise and experience of an affiliate or third-party contractor(s) to develop, construct, operate, and maintain a transmission facility, including a description of the technical and engineering qualifications and experience and capabilities of the affiliate or any third parties with which you will contract for these purposes, in the absence of your own previous experience developing, constructing, operating, or maintaining transmission facilities.**

National Grid USA, through NMPC, owns and operates electric transmission and distribution facilities across upstate New York. The electric system is composed of approximately 4,800 circuit miles of 115kV lines, 500 miles of 230kV, and 700 miles of 345kV. These facilities are extensively interconnected with facilities owned by other transmission owners in New York, surrounding states, and Canada. Additionally, there are 733 substations in New York providing service to customers. National Grid works collaboratively with and ceded operations and control of specific high voltage facilities to the New York Independent System Operator and New England Independent System Operator. As such, National Grid is well qualified in the development, construction, maintenance and operation of transmission facilities in the Northeast.

National Grid has a long history of developing, constructing and operating electric transmission facilities in New York and New England. These facilities were developed by National Grid personnel with extensive utility project experience and many of them are professionally certified including transmission planning engineers, transmission line design engineers, environmental specialists and many other internally staffed disciplines. The field operations workforce is well trained and has a proven track record of constructing, operating and maintaining all types of electric equipment and infrastructure. National Grid also employs and manages contractors to supplement the internal workforce and enhance project team capabilities. A small list of the capital projects National Grid has developed can be found in the response to question 1.

National Grid consistently develops and operates to standard practices. Standard engineering designs and materials are commonly applied to projects. Best Management Practices developed through the course of siting and permitting major projects are followed by the construction and operations personnel. Extensive safety procedures and processes have been developed which apply to all project personnel. Contractors hired to support a project are required to comply with all of National Grid's standards and practices.

As of today, National Grid plans to develop future capital projects using the same development model that has been used to develop past capital projects. National Grid personnel will lead the project development and will supplement with contractors, as needed. The contractors that are employed by National Grid undergo an extensive screening process to assess their capabilities, safety performance, and ability to comply with National Grid standards. Most of these contractors have long term relationships with National Grid and all are completely knowledgeable of the Company's standards and practices.

- 3. Please provide evidence of demonstrated experience financing or arranging financing for transmission facilities, if any, including a description of such projects (not to exceed ten) 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 or a state regulatory agency, the financing closing date of such projects, and whether any of the projects (not limited to just the projects described) in the last ten years are in default. Also include a detailed plan describing the extent to which the Developer would rely on the financial resources, financial expertise, or experience of an affiliate or third-party contractor(s) to finance or develop the project including a description of the financial qualifications and experience and capabilities of the affiliate or any third parties with which you will contract for these purposes, in the absence of your own previous experience financing and developing transmission facilities.**

National Grid USA provides electricity distribution and transmission and gas distribution services to customers in New York, Massachusetts and Rhode Island. We also own and operate an electricity transmission network spanning upstate New York, Massachusetts, Rhode Island, New Hampshire and Vermont.

In New York, Niagara Mohawk Power Corporation is the main operating subsidiary that provides electric transmission and distribution to customers in the state. Most assets of Niagara Mohawk Power are regulated assets included in rate base for which the company earns revenue.

The Companies have historically financed construction expenditures through the raising of capital in the capital markets. The Companies have not undertaken specific project financing for transmission projects in NY. Transmission project costs are included in our annual and long-term capital budgets and financed collectively as part of our overall capital market funding strategy.

For each of items four through seven below, please provide all applicable information for the Developer and for any affiliate or third party already selected by the Developer to assist with financing of any potential project(s).

- 4. Please attach copies of audited annual financial statements from the most recent three years and the most recent quarterly financial statement, or equivalent information.**

Financial Statements for the most recent three years are attached separately.

- 5. Please provide the senior long term unsecured debt rating from Moody's Investor Services, Standard & Poor's, Fitch or equivalent information, if available. If the senior long term unsecured debt rating is unavailable, provide the issuer rating.**

National Grid USA's long term unsecured debt rating from Moody's and S&P is Baa1/BBB+.

Niagara Mohawk Power Corporations long term unsecured debt rating from Moody's and S&P is A2/A-.

- 6. Please provide a description of any prior bankruptcy declarations, material defaults, dissolution, merger, or acquisition by the Developer or its predecessors or subsidiaries occurring within the previous five years.**

National Grid USA has not been subject to any bankruptcy or other adverse financial proceedings in the last five years that would materially adversely impact its ability to own or to execute a proposed Project.

- 7. Please provide such other evidence that demonstrates your current and expected capability to finance a project to solve a Reliability Need.**

Over the longer term National Grid USA will evaluate the capital project(s) in conjunction with other capital expenditures (net of our internally generated cash flows) to determine whether longer term external financing is needed and contributes to maintaining the subsidiary capital structures in line with Regulatory and Ratings requirements.

In the event long term financing is pursued, National Grid has a strong track record of funding a broad range of projects and capital expenditure programs across the spectrum of capital and credit markets. National Grid USA has Euro Medium Note program in place under which it has the ability to issue debt instruments up to the equivalent of 4 billion euros.

Central Hudson Gas and Electric Corporation

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NYISO Developer Qualification Form

Name of company: Central Hudson Gas & Electric Corporation

Mailing Address: 284 South Avenue

City: Poughkeepsie State: NY Zip: 12601

Street Address: 284 South Avenue

City: Poughkeepsie State: NY Zip: 12601

Contact Person: John J. Borchert, Senior Director Energy Policy and Transmission Development

Telephone: (845) 486-5327 Fax: (845) 486-5697

Email Address: jborchert@cenhud.com

The following information is required by the NYISO OATT Attachment Y Section 31.4.4.1.

31.4.4.1.1 Please provide the technical and engineering qualifications and experience of the Developer relevant to the development, construction, operation and maintenance of a transmission facility, including evidence of the Developer’s demonstrated capability to adhere to standardized construction, maintenance, and operating practices and to contract with third parties to develop, construct, maintain, and/or operate transmission facilities.

31.2.4.1.1.2 Please provide the 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 purposes of this criteria, the Developer shall provide the ISO a description of transmission facilities (not to exceed ten) that the Developer has previously developed, constructed, maintained or operated and the status of those facilities, including whether the construction was completed, whether the facility entered into commercial operations, whether the facility has been suspended or terminated for any reason, and evidence demonstrating the ability of the Developer to address and timely remedy any operational failure of the facilities; and

- (1) Please provide the ISO a description of transmission facilities (not to exceed ten) that the Developer has previously developed, constructed, maintained or operated and the status of those facilities, including whether the construction was completed, whether and when the facility entered into commercial operations, whether the facility has been suspended or terminated for any reason, and evidence demonstrating the ability of the Developer to address and timely remedy any operational failure, if any, of the facilities.

Central Hudson Gas & Electric is a regulated transmission and distribution utility serving approximately 300,000 electric and about 77,000 natural gas customers in eight counties of New York State's Mid-Hudson River Valley in a 2,600 square-mile service territory extending from the suburbs of metropolitan New York City north to the capital district at Albany.

Central Hudson owns and operates approximately 700 miles of high voltage transmission lines and approximately 80 substations with voltages ranging from 69kV to 345kV. Central Hudson currently employs approximately 940 employees and a significant number of full time contracted employees. This highly skilled and qualified work force has the ability to respond to any operating needs and remedy in a timely fashion any operational failures of Central Hudson's Transmission Facilities.

Central Hudson is a registered Transmission Owner with the NYISO, NERC, and FERC.

Central Hudson has extensive experience developing, constructing, maintaining, and operating transmission and substation facilities. Please see below for three recent examples of projects that we have developed or are in the process of developing. Descriptions of additional transmission projects can be provided upon request.

WM Transmission Line. In 2006, the WM Transmission Line – an 10.4 mile 69 kV line connecting the East Walden and Rock Tavern substations, was recommended to be rebuilt. This line serves load from the Maybrook, Montgomery & Walden (NYSEG) Substations and acts as an emergency supply to Orange and Rockland Utilities, Inc. ("O&R") Blooming Grove Substation and a future interconnection for the Taylor Biomass (Q#349) facility. At the time of the rebuild recommendation it was forecasted that following loss of one of the two inputs the remaining input would exceed its LTE rating during peak periods resulting in a need to shed load . There also were infrastructure needs on the WM Line since the line was a 1930's vintage wood pole line and Central Hudson primarily had only pole rights on the line. The original project estimate was \$13.6 million and it was scheduled to be complete by December 2012.

Central Hudson designed, engineered, procured and constructed all stages of the project through a combination of internal forces and qualified contracted construction resources. The project was completed in January 2013 for a cost of \$13.4 million.

Saugerties Substation project - The original Saugerties Substation was constructed in 1919. Two of the five substation distribution transformers were manufactured in 1951 and two in 1959. These transformers also posed operational limitations since they did not phase with each other. Several circuit breakers in the station were over 65 years old. Due to the physical limitations of this original site, and much of the equipment reaching the end of its useful life including the structural steel, construction of a new substation was identified in 2007.

The new substation initially consist of two Power Transformers (115kV x 69kV – 13.8kV, 22.4 MVA), four high voltage circuit breakers, a 69kV Capacitor Bank, and a Power Control Center with provisions for eight 13.8kV distribution circuits. Initially operated at 69kV but built for 115kV to accommodate future upgrade of the existing 69kV transmission system to 115kV. In addition, with recent discussions regarding an anticipated future build out of Winston Farm, the new Saugerties Substation will put Central Hudson in a position to supply future load growth in the Saugerties Area. Provisions have been included in the substation design to add a future (3rd) Power Transformer if/when future load materializes, providing for a firm 100MVA substation.

Central Hudson designed, procured, and constructed all aspects of this station through the use of internal forces and qualified contractors. This project was completed in June 2013 for a cost of \$11 million.

Ramapo to Rock Tavern Interconnection Project. The Developer, Consolidated Edison, is planning the installation of a 345 kV transmission line that is expected to be in commercial operation by June, 2016. This new transmission line will provide a second electrical connection between Central Hudson's 345 kV Rock Tavern substation and Consolidated Edison's 345 kV Ramapo Substation via O&R's Sugarloaf Substation. The interconnection at the Rock Tavern 345 kV substation will be done via the addition of two new 345 kV breakers and a new bay, which enables the swap of existing Feeder 77 to the new bay; Feeder 76, will connect to the existing bay between breakers 37751 (to be renamed 376523) and 37752 (to be renamed 376512). Central Hudson will design, engineer, procure and construct the Rock Tavern 345 kV facilities necessary for this interconnection project through its own forces or using qualified contractors. The construction phase of this project has begun. The interconnection costs (Central Hudson's part of the project) currently are estimated to be \$19 million.

- (2) Please provide the current and technical and engineering qualifications and experience of the Developer relevant to the development, construction, operation and maintenance of a transmission facility, including evidence of the Developer's demonstrated capability to adhere to standardized construction, maintenance, and operating practices and to contract with third parties, to develop, construct, maintain, and/or operate transmission facilities. Also include a detailed plan describing the extent to which the Developer would rely on the technical expertise and experience of an affiliate or third-party contractor(s) to develop, construct, operate, and

maintain a transmission facility, including a description of the technical and engineering qualifications and experience and capabilities of the affiliate or any third parties with which you will contract for these purposes, in the absence of your own previous experience developing, constructing, operating, or maintaining transmission facilities.

Central Hudson has over 100 years of experience in siting, designing, constructing, operating, and maintaining transmission systems in New York State. Central Hudson's team of engineers, project managers, skilled craftsmen, and business professionals have a long history of constructing, operating, and maintaining large-scale transmission facilities. The following list highlights Central Hudson's technical and engineering qualifications:

- Transmission planning
- 24x7 control center
- Transmission design
- Substation design
- Emergency response and restoration
- Real estate acquisition
- Transmission operations
- NERC certified operators
- Transmission Construction and maintenance
- Substation Construction and maintenance
- Project management
- Spare equipment inventory

Central Hudson does not rely on the technical expertise and experience of third-party contractors to develop, construct, operate, or maintain substation or transmission facilities as the requisite expertise is maintained in-house. However, as part of our normal course of business, Central Hudson does contract out these services when the need arises due to economics or as the work load requires. Central Hudson maintains a list of approved contractors that will provide their qualifications at the time of the project bid. Also, Central Hudson inspects and reviews the construction work because such facilities will become company equipment and an integral part of its transmission system, pursuant to the NYISO tariff.

31.4.4.1.3 The Developers current and expected capability to finance, or its experience in arranging financing for, transmission facilities. For purposes of the ISO's determination, the Developer shall provide the ISO:

- (1) evidence of its demonstrated experience financing or arranging financing for transmission facilities, including a description of such projects (not to exceed ten) 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 or a state regulatory agency, the financing closing date of such projects, and whether any of the projects are in default;

(2) its audited annual financial statements from the most recent three years and its most recent quarterly financial statement or equivalent information, if available;

(3) its credit rating from Moody's Investor Services, Standard & Poor's, or Fitch or equivalent information, if available;

(4) a description of any prior bankruptcy declarations, material defaults, dissolution, merger or acquisition by the Developer or its predecessors or subsidiaries occurring within the previous five years; and

(5) such other evidence that demonstrates its current and expected capability to finance a project to solve a Public Policy Transmission Need.

(1) Please provide evidence of demonstrated experience financing or arranging financing for transmission facilities, if any, including a description of such projects (not to exceed ten) 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 or a state regulatory agency, the financing closing date of such projects, and whether any of the projects (not limited to just the projects described) in the last ten years are in default.

Central Hudson is a regulated transmission and distribution utility serving approximately 300,000 electric and 77,000 natural gas customers. Its franchise areas are located entirely within New York State in the Hudson Valley region. Central Hudson is a subsidiary of Fortis Inc, which is the largest investor-owned gas and electric distribution utility company in Canada.

As a New York transmission and distribution utility, Central Hudson derives its earnings primarily from revenue it generates from energy delivery to its customers using rates approved by the New York State Public Service Commission. All of the Company's investments in utility plant are part of its rate base.

Over the past three years, Central Hudson's annual capital investment in utility plant has averaged approximately \$100 million. Central Hudson finances its utility plant in a manner consistent with its objective of maintaining credit ratings on its long-term debt in the "A" range. The Company does not finance its projects discretely; rather it seeks to maintain a target capitalization that reflects not less than 48% common equity. The three aforementioned projects either were fully funded and financed through Central Hudson regulatory rate process or will be funded through agreement with the interconnecting developer.

While a subsidiary of Fortis Inc., Central Hudson operates independently, including maintaining its own credit ratings, raising long-term debt, and maintaining credit facilities to bolster its day-to-day liquidity needs. Common equity typically is provided by retained

earnings; any shortfall required to maintain its capitalization target would be provided by its parent company.

- (2) Please attach copies of audited annual financial statements from the most recent three years and the most recent quarterly financial statement, or equivalent information.

Central Hudson's periodic financial reports are reported jointly with its immediate parent, CH Energy Group, Inc. and posted to its website

at: <http://www.chenergygroup.com/financialinformation/index.html>

Second Quarter 2014 Financial Report:

http://www.chenergygroup.com/financialinformation/CHEnergyGroup_2014_Q2.pdf

2013 Annual Financial Report:

http://www.chenergygroup.com/financialinformation/CHEnergyGroup_2013_AR_r.pdf

2012 Annual Financial Report:

http://www.chenergygroup.com/financialinformation/CHEnergyGroup_2012_AR.pdf

2011 Annual Financial Report:

http://www.chenergygroup.com/financialinformation/CHEnergyGroup_2011_AR.pdf

- (3) Please provide the senior long term unsecured debt rating from Moody's Investor Services, Standard & Poor's, Fitch or equivalent information, if available. If the senior long term unsecured debt rating is unavailable, provide the issuer rating.

Long term senior unsecured debt ratings:

Moody's A2

S&P A

Fitch A

- (4) Please provide a description of any prior bankruptcy declarations, material defaults, dissolution, merger, or acquisition by the Developer or its predecessors or subsidiaries occurring within the previous five years.

Central Hudson was acquired by Fortis Inc. in June 2013 when Fortis Inc. purchased all of the common shares of Central Hudson's immediate parent, CH Energy Group, Inc. At that time, CH Energy Group, Inc. ceased trading as a public company on the NYSE and both CH Energy Group, Inc. and Central Hudson ceased being SEC registrants. Central Hudson continues to operate independently, with no shared services with Fortis Inc. or affiliates.

- (5) Please provide such other evidence that demonstrates your current and expected capability to finance a project to solve a Public Policy Need.

Central Hudson expects to finance future infrastructure investments in the same manner as it has in recent years. Day-to-day liquidity needs are supported by \$150 million of committed bank credit and senior unsecured long-term debt is issued periodically through private placements.

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New York State Electric & Gas Corporation

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Reliability Planning Process Manual Attachments

Attachment A **NYISO Developer Qualification Form**
09/22/2014

This document was prepared by:
System & Resource Planning

New York Independent System Operator
10 Krey Blvd
Rensselaer, NY 12144
(518) 356-6060
www.nyiso.com

NYISO Developer Qualification Form

(Completed application should be sent to DeveloperQual@nyiso.com)

Name of company: _____

Mailing Address: _____

City: _____ State: _____ Zip: _____

Street Address: _____

City: _____ State: _____ Zip: _____

Contact Person: _____

Telephone: (_____) _____ Fax: (_____) _____

Email Address: _____

The following information is required by the NYISO OATT Attachment Y Section 31.2.4.1. You may provide the information by inserting it into the box provided, or as attachments numbered to correspond to each of the requested information items.

1. Please provide the ISO a description of transmission facilities (not to exceed ten) that the Developer has previously developed, constructed, maintained or operated and the status of those facilities, including whether the construction was completed, whether and when the facility entered into commercial operations, whether the facility has been suspended or terminated for any reason, and evidence demonstrating the ability of the Developer to address and timely remedy any operational failure, if any, of the facilities.

2. Please provide the technical and engineering qualifications and experience of the Developer relevant to the development, construction, operation and maintenance of a transmission facility, including evidence of the Developer's demonstrated capability to adhere to standardized construction, maintenance, and operating practices and to contract with third parties, to develop, construct, maintain, and/or operate transmission facilities. Also include a detailed plan describing the extent to which the Developer would rely on the technical expertise and experience of an affiliate or third-party contractor(s) to develop, construct, operate, and maintain a transmission facility, including a description of the technical and engineering qualifications and experience and capabilities of the affiliate or any third parties with which you will contract for these purposes, in the absence of your own previous experience developing, constructing, operating, or maintaining transmission facilities.

3. Please provide evidence of demonstrated experience financing or arranging financing for transmission facilities, if any, including a description of such projects (not to exceed ten) 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 or a state regulatory agency, the financing closing date of such projects, and whether any of the projects (not limited to just the projects described) in the last ten years are in default. Also include a detailed plan describing the extent to which the Developer would rely on the financial resources, financial expertise, or experience of an affiliate or third-party contractor(s) to finance or develop the project including a description of the financial qualifications and experience and capabilities of the affiliate or any third parties with which you will contract for these purposes, in the absence of your own previous experience financing and developing transmission facilities.

For each of items four through seven below, please provide all applicable information for the Developer and for any affiliate or third party already selected by the Developer to assist with financing of any potential project(s).

4. Please attach copies of audited annual financial statements from the most recent three years and the most recent quarterly financial statement, or equivalent information.

5. Please provide the senior long term unsecured debt rating from Moody's Investor Services, Standard & Poor's, Fitch or equivalent information, if available. If the senior long term unsecured debt rating is unavailable, provide the issuer rating.

6. Please provide a description of any prior bankruptcy declarations, material defaults, dissolution, merger, or acquisition by the Developer or its predecessors or subsidiaries occurring within the previous five years.

7. Please provide such other evidence that demonstrates your current and expected capability to finance a project to solve a Reliability Need.

A large, empty rectangular box with a thin black border, intended for the user to provide evidence demonstrating their current and expected capability to finance a project to solve a Reliability Need.