Western New York Public Policy Transmission Planning Report: Appendices

A Report by the
New York Independent System Operator

Final Report

October 17, 2017

Appendix A – Glossary

Appendix A – Western New York Public Policy Transmission Planning Report Glossary

Term	Definition
Adequacy	Encompassing both generation and transmission, adequacy refers to the ability of the bulk power system to supply the aggregate requirements of consumers at all times, accounting for scheduled and unscheduled outages of system components.
Article VII	Article VII of the New York State Public Service Law for the siting of major electric transmission facilities in the State of New York.
Congestion Assessment and Resource Integration Study (CARIS)	The Congestion Assessment and Resource Integration Study for economic planning developed by the NYISO in consultation with the Market Participants and other interested parties pursuant to Section 31.3 of Attachment Y.
Comprehensive System Planning Process (CSPP)	The Comprehensive System Planning Process set forth in Attachment Y, and in the Interregional Planning Protocol, which covers reliability planning, economic planning, Public Policy Requirements planning, cost allocation and cost recovery, and the interregional planning process.
Congestion	Congestion on the transmission system results from physical limits on how much power transmission equipment can carry without exceeding thermal, voltage and/or stability limits determined to maintain system reliability.
Contingencies	Contingencies are individual electrical system events (including disturbances and equipment failures) that may occur under certain system conditions.
Developer	A person or entity, including a Transmission Owner, sponsoring or proposing a project pursuant to Attachment Y.

Term	Definition
Electric System Planning Work Group (ESPWG)	A NYISO governance working group for Market Participants designated to fulfill the planning functions assigned to it and that advises the NYISO Operating Committee. The ESPWG provides a forum for stakeholders, Market Participants, and all interested parties to provide input into the NYISO's Comprehensive System Planning Process (CSPP), the NYISO's response to FERC reliability-related Orders and other directives, other system planning activities, policies regarding cost allocation and recovery for regulated reliability, economic, and/or public policy projects, and related matters.
Federal Energy Regulatory Commission (FERC)	The federal energy regulatory agency within the U.S. Department of Energy that approves the NYISO's tariffs and regulates its operation of the bulk electricity grid, wholesale power markets, and planning and interconnection processes.
FERC 715	Annual report that is required by transmitting utilities operating grid facilities that are rated at or above 100 kilovolts. The report consists of transmission systems maps, a detailed description of transmission planning Reliability Criteria, detailed descriptions of transmission planning assessment practices, and detailed evaluation of anticipated system performance as measured against Reliability Criteria.
Installed Capacity (ICAP)	A Generator or Load facility that complies with the requirements in the Reliability Rules and is capable of supplying and/or reducing the demand for Energy in the NYCA for the purpose of ensuring that sufficient Energy and Capacity are available to meet the Reliability Rules. The Installed Capacity requirement, established by the New York State Reliability Council (NYSRC), includes a margin of reserve in accordance with the Reliability Rules.
Installed Reserve Margin (IRM)	The amount of installed electric generation capacity above 100% of the forecasted peak electric demand that is required to meet NYSRC resource adequacy criteria. Most studies in recent years have indicated a need for a 15-20% reserve margin for adequate reliability in the State of New York.
Interregional Planning Protocol	The Amended and Restated Northeastern ISO/RTO Planning Coordination Protocol, or any successor protocol.
Local Transmission Plan (LTP)	The Local Transmission Owner Plan, developed by each Transmission Owner, which describes its respective plans that may be under consideration or finalized for its own Transmission District.
Local Transmission Owner Planning Process (LTPP)	The first step in the Comprehensive System Planning Process (CSPP), under which transmission owners in New York's electricity markets provide their local transmission plans for consideration and comment by interested parties.

Term	Definition
Load and Capacity Report (Gold Book)	The annual NYISO survey of power demand and supply in New York State that is published pursuant to Article 6 of the Energy Law of New York State.
Loss of load expectation (LOLE)	LOLE establishes the amount of generation and demand-side resources needed—subject to the level of the availability of those resources, load uncertainty, available transmission system transfer capability and emergency operating procedures—to minimize the probability of an involuntary loss of firm electric load on the bulk electricity grid. The state's bulk electricity grid is designed to meet an LOLE that is not greater than one occurrence of an involuntary load disconnection in 10 years, expressed mathematically as 0.1 days per year.
Market Monitoring Unit	A consulting or other professional services firm, or other similar entity, retained by the NYISO Board pursuant to ISO Services Tariff Section 30.4.6.8.1 of Attachment O – Market Monitoring Plan.
Market Participant	An entity, excluding the ISO, that produces, transmits, sells, and/or purchases for resale Capacity, Energy and Ancillary Services in the Wholesale Market. Market Participants include: Transmission Customers under the NYISO OATT, Customers under the NYISO Services Tariff, Power Exchanges, Transmission Owners, Primary Holders, LSEs, Suppliers and their designated agents. Market Participants also include entities buying or selling TCCs.
New York State Bulk Power Transmission Facility (BPTF)	The facilities identified as the New York State Bulk Power Transmission Facilities in the annual Area Transmission Review submitted to NPCC by the NYISO pursuant to NPCC requirements.
New York Control Area (NYCA)	The area under the electrical control of the NYISO. It includes the entire State of New York, and is divided into 11 zones.
New York State Department of Environmental Conservation (NYSDEC)	The agency that implements New York State environmental conservation law, with some programs also governed by federal law.
New York Independent System Operator (NYISO)	Formed in 1997 and commencing operations in 1999, the NYISO is a not-for-profit organization that manages New York's bulk electricity grid a network of over 11,000 miles of high voltage lines that carry electricity throughout the state. The NYISO also oversees the state's wholesale electricity markets. The organization is governed by an independent Board of Directors and a governance structure made up of committees with Market Participants and stakeholders as members.

Term	Definition
New York State Department of Public Service (DPS)	As defined in the New York Public Service Law, it serves as the staff for the New York State Public Service Commission.
New York State Public Service Commission (PSC)	The New York State Public Service Commission is the decision making body of the New York State Department of Public Service. The PSC regulates the state's electric, gas, steam, telecommunications, and water utilities and oversees the cable industry. The Commission has the responsibility for setting rates and ensuring that safe and adequate service is provided by New York's utilities. In addition, the Commission exercises jurisdiction over the siting of major gas and electric transmission facilities.
New York State Reliability Council (NYSRC)	A not-for-profit entity that develops, maintains, and, from time-to-time, updates the Reliability Rules which shall be complied with by the New York Independent System Operator (NYISO) and all entities engaging in electric transmission, ancillary services, and capacity and energy transactions on the New York State Power System.
North American Electric Reliability Corporation (NERC)	A not-for-profit organization that develops and enforces reliability standards; assesses reliability annually via 10-year and seasonal forecasts; monitors the bulk power system; and educates, trains, and certifies industry personnel. NERC is subject to oversight by the FERC and governmental authorities in Canada.
Northeast Power Coordinating Council (NPCC)	A not-for-profit corporation responsible for promoting and improving the reliability of the international, interconnected bulk power system in Northeastern North America.
Open Access Transmission Tariff (OATT)	Document of Rates, Terms and Conditions, regulated by the FERC, under which the NYISO provides transmission service. The OATT is a dynamic document to which revisions are made on a collaborative basis by the NYISO, New York's Electricity Market Stakeholders, and the FERC.
Order No. 1000	Order No. 1000 is a Final Rule that reforms the FERC electric transmission planning and cost allocation requirements for public utility transmission providers. The rule builds on the reforms of Order No. 890 and provides for transmission planning to meet transmission needs driven by Public Policy Requirements, interregional planning, opens transmission development for new transmission needs to non-incumbent developers, and provides for cost allocation and recovery of transmission upgrades.
Other Developer	Developer, other than a Transmission Owner, sponsoring or proposing to sponsor a regulated economic project, a Public Policy Transmission Project, an Other Public Policy Project, or a regulated solution to a Reliability Need.

Term	Definition
Other Public Policy Project	A non-transmission project or a portfolio of transmission and non-transmission projects proposed by a Developer to satisfy an identified Public Policy Transmission Need.
Outage	The forced or scheduled removal of generating capacity or a transmission line from service.
Peak Demand	The maximum instantaneous power demand, measured in megawatts (MW), and also known as peak load, that is usually measured and averaged over an hourly interval.
Public Policy Transmission Planning Process	The process by which the NYISO solicits needs for transmission driven by Public Policy Requirements, evaluates all proposed Public Policy Transmission Projects and Other Public Policy Projects on a comparable basis, and selects the more efficient or cost effective Public Policy Transmission Project, if any, for eligibility for cost allocation under the NYISO Tariffs.
Public Policy Transmission Need	A transmission need that is driven by a Public Policy Requirement and identified by the PSC in the NYISO's Public Policy Transmission Planning Process.
Public Policy Requirement	A federal or New York State statute or regulation, including a PSC order adopting a rule or regulation subject to and in accordance with the State Administrative Procedure Act, any successor statute, or any duly enacted law or regulation passed by a local governmental entity in New York State, that may relate to transmission planning on the BPTFs.
Public Policy Transmission Project	A transmission project or a portfolio of transmission projects proposed by Developer(s) to satisfy an identified Public Policy Transmission Need and for which the Developer(s) seek to be selected by the NYISO for purposes of allocating and recovering the project's costs under the NYISO OATT.
Reliability Criteria	The electric power system planning and operating policies, standards, criteria, guidelines, procedures, and rules promulgated by the North American Electric Reliability Corporation (NERC), Northeast Power Coordinating Council (NPCC), and the New York State Reliability Council (NYSRC), as they may be amended from time to time.
Reliability Need	A condition identified by the NYISO as a violation or potential violation of Reliability Criteria.
Reliability Needs Assessment (RNA)	A biennial study which evaluates the resource adequacy and transmission system adequacy and security of the New York bulk power system over a ten year Study Period. Through this evaluation, the NYISO identifies Reliability Needs in accordance with applicable Reliability Criteria.

Term	Definition
Reliability Planning Process (RPP)	The biennial process that includes evaluation of resource adequacy and transmission system security of the state's bulk electricity grid over a 10-year period and evaluates solutions to meet those needs. The RPP consists of two studies: the RNA, which identifies potential problems, and the CRP, which evaluates specific solutions to those problems.
Reliability Rules	Those rules, standards, procedures and protocols developed and promulgated by the NYSRC, including Local Reliability Rules, in accordance with NERC, NPCC, FERC, PSC and NRC standards, rules and regulations, and other criteria and pursuant to the NYSRC Agreement.
State Environmental Quality Review Act (SEQRA)	New York State law requiring the sponsoring or approving governmental body to identify and mitigate the significant environmental impacts of the activity/project it is proposing or permitting.
Site Control	Documentation reasonably demonstrating: (1) ownership of, a leasehold interest in, or a right to develop a site or right of way for the purpose of constructing a proposed project; (2) an option to purchase or acquire a leasehold site or right of way for such purpose; or (3) an exclusivity or other business relationship between the Transmission Owner, or Other Developer, and the entity having the right to sell, lease, or grant the Transmission Owner, or Other Developer, the right to possess or occupy a site or right of way for such purpose.
Study Period	The time period evaluated for the Western New York Public Policy Transmission Need from 2016 through 2045.
Transfer Capability	The measure of the ability of interconnected electrical systems to reliably move or transfer power from one area to another over all transmission facilities (or paths) between those areas under specified system conditions.
Transmission Constraints	Limitations on the ability of a transmission system to transfer electricity during normal or emergency system conditions.
Transmission District	The geographic area in which a Transmission Owner, including LIPA, is obligated to serve Load, as well as the customers directly interconnected with the transmission facilities of the Power Authority of the State of New York.
Transmission Expansion and Interconnection Process	The NYISO's processes under its Open Access Transmission Tariff (OATT) for parties to pursue construction and interconnection of new and materially modified generation, transmission, and load facilities to the New York State Transmission System or Distribution System.

Term	Definition
Transmission Owner (TO)	A public utility or authority that owns transmission facilities and provides Transmission Service under the NYISO's tariffs.
Transmission Planning Advisory Subcommittee (TPAS)	An identified group of Market Participants that advises the NYISO Operating Committee and provides support to the NYISO Staff in regard to transmission planning matters including transmission system reliability, expansion, and interconnection.
Viability and Sufficiency Assessment	The results of the NYISO's assessment of the viability and sufficiency of proposed solutions to a Public Policy Transmission need under Section 31.4.6 of the NYISO OATT.
Zone	One of the eleven regions in the NYCA connected to each other by identified transmission interfaces and designated as Load Zones A-K.

Appendix B – Western New York Public Policy Transmission Need Viability & Sufficiency Assessment

Western New York
Public Policy Transmission Need
Viability & Sufficiency Assessment

A report from the New York Independent System Operator

May 31, 2016

Caution and Disclaimer

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Executive Summary

The New York Independent System Operator (NYISO) is implementing for the first time its Public Policy Transmission Planning Process, the new component of the overall Comprehensive System Planning Process. The Public Policy Transmission Planning Process supports the Federal Energy Regulatory Commission (FERC) Order No. 1000 directive requiring public utility transmission providers to consider in their planning processes transmission needs driven by Public Policy Requirements. The NYISO conducted this Viability and Sufficiency Assessment for the Western New York Public Policy Transmission Need to determine whether each Developer-submitted proposal is complete, viable, and sufficient to satisfy the public policy transmission need.

The NYISO initiated its first Public Policy Transmission Planning Process by soliciting proposed transmission needs that stakeholders or interested parties believe are driven by Public Policy Requirements. The NYISO filed for consideration by the New York Public Service Commission (NYPSC) the proposed transmission needs and the NYPSC published the proposed needs for comments. Upon considering the various comments submitted, the NYPSC issued an order that found "significant environmental, economic, and reliability benefits could be achieved by relieving the transmission congestion identified in Western New York" and therefore adopted the Western New York Public Policy Transmission Need.

The NYISO established sufficiency criteria in accordance with the criteria set forth by the NYPSC order and developed baseline models and associated power flow results to aid interested parties in developing project proposals. The transmission security analysis of the baseline system conditions identified overloads on the Niagara to Gardenville 230 kV and 115 kV transmission corridors primarily as a result of the contingency loss of one, two, or three 230 kV transmission lines. These overloads are aggravated for increased levels of Ontario imports. These results confirm that there is insufficient transmission capability out of the Niagara area.

The NYISO issued a solicitation for solutions to address the Western New York Public Policy Transmission Need and received 15 proposals from eight developers. The NYISO conducted a comparable transmission security analysis of each project in the same manner as the baseline analysis. In general, each project addresses at least some portion of the baseline transmission security issues, but not all projects addressed all of the bulk power transmission security issues. Out of the 15 proposed projects, the NYISO identifies ten viable and sufficient projects to address the Western New York Public Policy Transmission Need and also recommends certain non-bulk transmission upgrades to fulfill the objectives of the transmission need identified by the NYPSC.

As the next step in the process, the NYPSC will review this Viability and Sufficiency Assessment and will issue an order explaining whether the NYISO should continue to evaluate and rank the viable and sufficient transmission solutions as part of the Public Policy Transmission Planning Report.

1. Introduction

The NYISO's planning process, known as the Comprehensive System Planning Process (CSPP), is comprised of four components: (1) the Local Transmission Owner Planning Process, (2) the Reliability Planning Process, (3) the Economic Planning Process, and (4) the Public Policy Transmission Planning Process (PPTPP). The NYISO also conducts interregional planning with its neighboring control areas under the Northeast Coordinated System Planning Protocol. The PPTPP supports the FERC Order No. 1000 directive requiring public utility transmission providers to consider in their planning processes transmission needs driven by Public Policy Requirements (Public Policy Transmission Needs). Section 31.4 of Attachment Y of the NYISO Open Access Transmission Tariff (OATT, or the Tariff) describes the planning process that the NYISO, and all interested parties, shall follow to consider Public Policy Requirements[1] that drive the need for expansions or upgrades to Bulk Power Transmission Facilities (BPTFs).[2] Pursuant to the Tariff, the NYISO conducted this Viability and Sufficiency Assessment for the Western New York Public Policy Transmission Need to determine whether each Developer-submitted proposal is complete, viable, and sufficient to satisfy the Public Policy Transmission Need.

The PPTPP consists of four main steps: (1) the identification of Public Policy Transmission Needs, (2) the proposal of solutions to identified Public Policy Transmission Needs, (3) the evaluation of the viability and sufficiency of proposed transmission and non-transmission solutions to a Public Policy Transmission Need, and (4) upon confirmation of the transmission need by the NYPSC, the evaluation and selection of the more efficient or cost effective Public Policy Transmission Project to satisfy a Public Policy Transmission Need.

For each two-year CSPP cycle, the NYISO initiates the first step of the PPTPP after the draft Reliability Needs Assessment (RNA) results are released in the Reliability Planning Process. In the identification step, the NYISO solicits proposals for transmission needs driven by Public Policy Requirements, and the NYPSC or Long Island Power Authority (LIPA) considers the proposals in order to identify the Public Policy Transmission Needs and determines for which of those the NYISO should solicit solutions. Subsequent to the identification of Public Policy Transmission Needs, the NYISO solicits proposed solutions, and Developers submit Public Policy Transmission Projects and Other Public Policy Projects to satisfy the identified Public Policy Transmission Needs. All submissions, regardless of project type, are evaluated for their viability and sufficiency to meet the Public Policy Transmission Needs.

[1] A Public Policy Requirement is a federal or New York State statute or regulation, including a New York State Public Service Commission (NYPSC) order adopting a rule or regulation subject to and in accordance with the State Administrative Procedure Act, any successor statute, or any duly enacted law or regulation passed by a local governmental entity in New York State, that may relate to transmission planning on the BPTFs.

[2] The BPTFs include all of the facilities designated by the NYISO as a Bulk Power System (BPS) element as defined by the NYSRC and NPCC, as well as other transmission facilities that are relevant to planning the New York State transmission system. The current BPTF list is provided in Appendix B of the 2014 NYISO Area Transmission Review, posted at: http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Documents_and_Resources/Reliability-Compliance/2014%20ATR%20non-ceii%20Appendix.zip

A Public Policy Transmission Project is a transmission project or a portfolio of transmission projects proposed by Developer(s) to satisfy an identified Public Policy Transmission Need and for which the Developer(s) seek to be selected by the NYISO for purposes of allocating and recovering the project's costs under the NYISO OATT.

An Other Public Policy Project is a non-transmission project or a portfolio of transmission and non-transmission projects proposed by a Developer to satisfy an identified Public Policy Transmission Need. An Other Public Policy Project may consist of transmission, generation, and/or demand-side projects.

Following the NYISO's presentation of the Viability and Sufficiency Assessment, the NYPSC reviews the Viability and Sufficiency Assessment and issues an order explaining whether there continues to be a transmission need driven by a Public Policy Requirement and, if so, that the NYISO should continue to evaluate transmission solutions to a Public Policy Transmission Need.[3] If the NYPSC concludes that non-transmission solutions should be pursued, the NYPSC will indicate in its order that there is no longer a transmission need driven by a Public Policy Requirement that requires the NYISO's evaluation of potential transmission solutions. In such case, the NYISO would not perform an evaluation, or make a selection of, a more efficient or cost-effective transmission solution for that planning cycle.

Upon a confirmation by the NYPSC that there is a need for a transmission solution, the NYISO evaluates the proposed Public Policy Transmission Projects that have satisfied the viability and sufficiency requirements and ranks them based on the quality of their satisfaction of numerous metrics. Based on this evaluation, the NYISO may select the more efficient or cost effective Public Policy Transmission Project to satisfy the Public Policy Transmission Need. A selected project is eligible for cost allocation and recovery under the NYISO OATT. The assumptions, inputs, methodologies, and results of the NYISO's analysis are published in the Public Policy Transmission Planning Report.

2. Summary of the Public Policy Transmission Need

On August 1, 2014, the NYISO initiated its first Public Policy Transmission Planning Process by soliciting proposed transmission needs that stakeholders or interested parties believe are driven by Public Policy Requirements. On October 3, 2014, the NYISO filed for consideration by the NYPSC the proposed transmission needs it received from eight entities. On November 12, 2014, the NYPSC published the proposed needs in the State Register in accordance with the State Administrative Procedure Act for comments. Following its receipt and review of comments, the NYPSC sought supplemental comments on April 3, 2015, relating specifically to transmission capability in Western New York. Upon considering the

[3] The focus of the NYPSC's review is upon whether there continues to be a need for transmission. Comments regarding the technical merits of this Viability and Sufficiency Assessment should be directed to the NYISO through its stakeholder process.

various comments submitted, the NYPSC issued an order on July 20, 2015 ("NYPSC Order")[4] that found "significant environmental, economic, and reliability benefits could be achieved by relieving the transmission congestion identified in Western New York"[5] and therefore adopted a Public Policy Requirement concerning transmission congestion in Western New York.[6] The NYPSC referred the Western New York Public Policy Transmission Need to the NYISO for the solicitation and evaluation of potential solutions.[7] The NYPSC Order directed the NYISO:

> to consider solutions for increasing Western New York transmission capability sufficient to ensure the full output from New York Power Authority's Niagara hydroelectric generating facility (i.e., 2,700 MW including Lewiston Pumped Storage), as well as certain levels of simultaneous imports from Ontario across the Niagara tie lines (i.e., maximize Ontario imports under normal operating conditions and a least 1,000 MW under emergency operating conditions). This increased capability should maximize transfers out of Load Zone A and into the rest of the State.
>
> The NYISO's analysis should ensure no transmission security violations, thermal, voltage or stability, would result under normal and emergency operating conditions. The analysis should also ensure the system would be maintained in a reliable manner with fossil-fueled generation in Western New York out-of-service, as well as in-service. The NYISO shall also consider other metrics in its evaluation of this Public Policy Requirement, including: changes in production costs; Load-Based Marginal Prices; transmission losses; emissions; Installed Capacity costs; Transmission Congestion Contract revenues: transmission congestion; impacts on transfer limits; and resource deliverability.[8]

2.1. Sufficiency Criteria

The NYISO established sufficiency criteria in accordance with the criteria set forth by the NYPSC Order, and developed baseline models and associated power flow results to aid interested parties in developing project proposals. The NYISO made presentations at combined meetings of the Transmission Planning Advisory Subcommittee and Electric System Planning Work Group on July 30, 2015, August 27, 2015, and October 29, 2015 to review the NYPSC's determination of a Public Policy Requirement, the nature of the resulting Western New York Public Policy Transmission Need, and the associated models and assumptions to be used in NYISO's evaluations.[9]

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[4] NYPSC Case No. 14-E-0454 – In the Matter of New York Independent System Operator, Inc.'s Proposed Public Policy Transmission Needs for Consideration, *Order Addressing Public Policy Requirements for Transmission Planning Process* (July 20, 2015).
[5] *Id.* at p. 27.
[6] *Id.* at p. 28.
[7] *Id.* at p. 33.
[8] *Id.* at 27-28.
[9] The NYISO's presentations are posted on its website under meeting materials at the following link: http://www.nyiso.com/public/markets_operations/committees/meeting_materials/index.jsp?com=bic_espwg.

In order to achieve the environmental, economic, and reliability benefits associated with the Public Policy Requirement as identified by the NYPSC, a sufficient Public Policy Transmission Project or Other Public Policy Project shall obtain full output from Niagara and Lewiston plants while maintaining certain levels of simultaneous imports from Ontario and meeting applicable North American Electric Reliability Corporation (NERC), Northeast Power Coordinating Council (NPCC) and New York State Reliability Council (NYSRC) reliability criteria, and local Transmission Owner planning criteria. Appendix A provides the details of the sufficiency criteria that the NYISO applied to establish baseline results and to determine the sufficiency of each proposed Public Policy Transmission Project and Other Public Policy Project to satisfy the Western New York Public Policy Transmission Need.

2.2. Sufficiency Assessment Methodology

The process for developing the study cases for the Viability and Sufficiency Assessment is described in Section 4 of the NYISO Public Policy Transmission Planning Process Manual. Based on the sufficiency criteria set forth by the NYPSC Order, the NYISO determined that a power flow model is the most applicable to evaluate the Western New York Public Policy Transmission Need. The baseline and project study cases are based on the NYISO 2014 Comprehensive Reliability Plan[10] base case system representation of 2024 summer peak load, with the following modifications:

- Niagara and Lewiston at full output of 2,700 MW, represented by two dispatch scenarios:
    - Dispatch 1
        a. Niagara 230 kV units (8-13) at full output total = 1,320 MW
        b. Niagara 115 kV units (1-7) dispatch total = 1,140 MW
        c. Lewiston Pumped Storage total = 240 MW
    - Dispatch 2
        a. Niagara 230 kV units (8-13) dispatch total = 920 MW
        b. Niagara 115 kV units (1-7) at full output total = 1,540 MW
        c. Lewiston Pumped Storage total = 240 MW
- Ontario Import to Zone A initially scheduled at 1,000 MW, allowed to reduce for conditions other than N-1 Emergency Transfer Criteria
- Huntley and Dunkirk generation plants out-of-service
- National Grid Local Transmission Plan (LTP) updates in Zone A:
    - Bypassable 1.532% series reactors on the Packard – Huntley 230 kV lines #77 and #78
    - Two 100 MVAr shunt capacitor banks at Huntley 230 kV station

The NYISO utilized these modified cases to conduct transmission security analysis of the Western New York system. Transmission security is the ability of the power system to withstand disturbances such as short circuits or unanticipated loss of system elements and continue to supply and deliver electricity. Security is assessed deterministically, with potential disturbances being

[10] The NYISO 2014 Comprehensive Reliability Plan is posted at: http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Planning_Studies/Reliability_Planning_Studies/Reliability_Assessment_Documents/2014CRP_Final_20150721.pdf

applied without concern for the likelihood of the disturbance in the assessment. These disturbances (single-element and multiple-element contingencies) are categorized as the design criteria contingencies, explicitly defined in the NYSRC Reliability Rules. The impacts when applying these design criteria contingencies are assessed to ensure no thermal loading, voltage, or stability violations will occur.

The NYISO conducted transmission security analysis of the BPTFs and non-BPTFs (115 kV and above) in accordance with applicable NERC Reliability Standards, NPCC Transmission Design Criteria, NYSRC Reliability Rules, and local Transmission Owner planning criteria. AC contingency analysis is performed to evaluate thermal and voltage performance under design contingency conditions using the Siemens PTI PSS®E and PowerGEM TARA programs. Generation is dispatched to match load plus system losses, while respecting transmission security, subject to the sufficiency criteria constraints described in Appendix A. Scheduled inter-area transfers modeled in the base case between the New York Control Area (NYCA) and neighboring systems are held constant, with the exception of Ontario imports.

To evaluate the impact of a single event from the normal system condition (N-1), all design criteria contingencies are evaluated including: single element, common structure, stuck breaker, generator, bus, and HVDC facilities contingencies. An N-1 violation occurs when the power flow on the monitored facility is greater than the applicable post-contingency rating. N-1-0 and N-1-1 analysis evaluates the ability of the system to meet design criteria after a critical element has already been lost. The process of N-1-0 and N-1-1 testing allows for corrective actions including generator redispatch, phase angle regulator (PAR) adjustments, and HVDC adjustments between the first and second contingency. These corrective actions prepare the system for the next contingency by reducing the flow to normal rating after the first contingency. An N-1-0 violation occurs when the flow cannot be reduced to below the normal rating following the first contingency. An N-1-1 violation occurs when the facility loading is reduced to below the normal rating following the first contingency, but the power flow following the second contingency is greater than the applicable post-contingency rating.

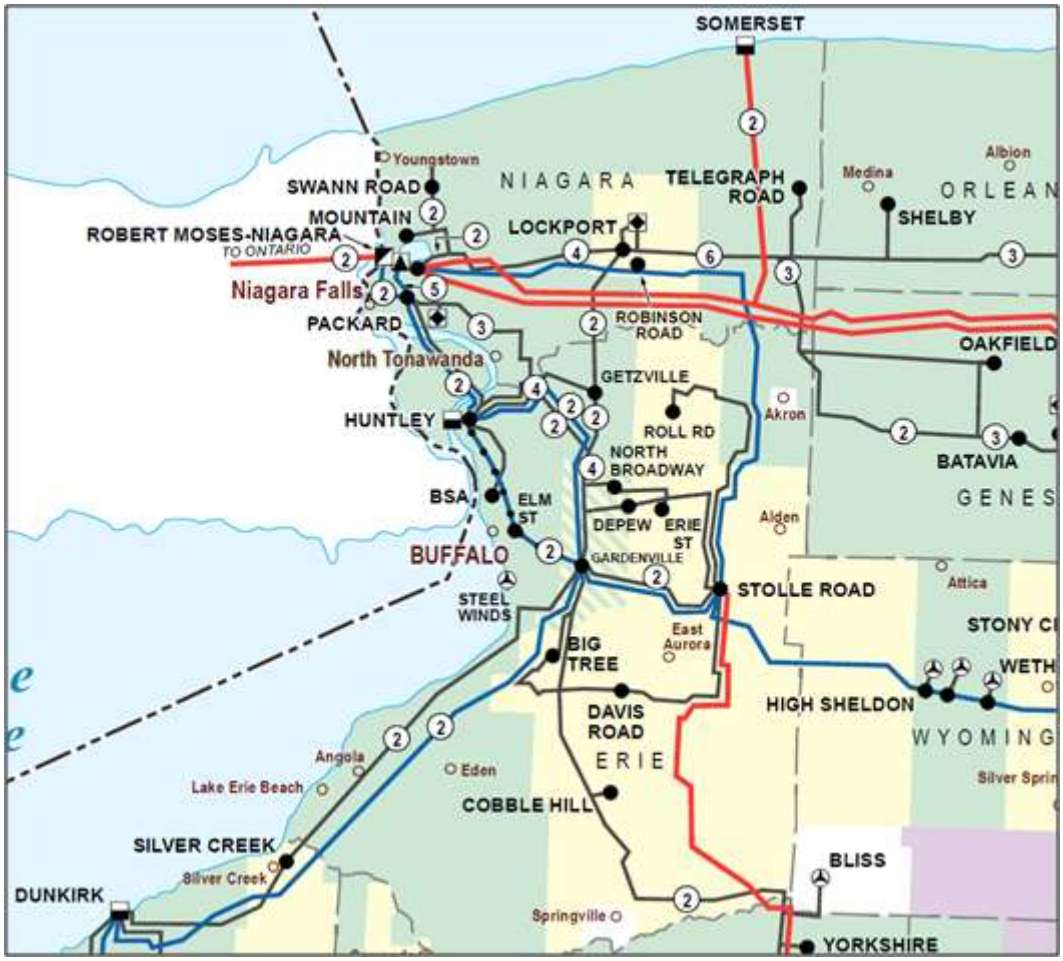
2.3. Baseline Results

The 230 kV system between Niagara and Gardenville includes two parallel 230 kV transmission lines from Niagara to Packard to Huntley to Gardenville, including a number of taps to serve load in the Buffalo area. A third parallel 230 kV transmission line also runs from Niagara to Robinson Rd. to Stolle Rd. to Gardenville. A 115 kV network also parallels the 230 kV network between Niagara and Gardenville. The transmission security analysis of the baseline system conditions identified overloads on these 230 kV and 115 kV transmission corridors primarily as a result of the contingency loss of one, two, or three 230 kV transmission lines. These overloads are aggravated for increased

levels of Ontario imports. These results confirm that there is insufficient transmission capability out of the Niagara area.

Figure 1 depicts the transmission system in Western New York. Table 1 and Table 2 list the overloaded transmission lines that were identified in the baseline and the maximum loading observed for the various categories of conditions evaluated, including emergency transfer criteria (ETC) and normal transfer criteria (NTC). Table 1 reports the line loadings observed when the Packard 230 kV #77 and #78 series reactors are bypassed and Table 2 reports the line loadings observed when the series reactors are in-service. Appendix B provides greater detail regarding the nature of the overloads.[11, 12]

Figure 1: Western New York Transmission Map



[11] The full results with the Packard series reactors bypassed are posted at: http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Planning_Studies/Public_Policy_Documents/Western_NY/Western_NY_PPTN_Baseline_Results_2015-10-27_SR-bypassed.xls

[12] The full results with the Packard series reactors in-service are posted at: http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Planning_Studies/Public_Policy_Documents/Western_NY/Western_NY_PPTN_Baseline_Results_2015-10-27_SR-in.xls

Table 1: Summary of Baseline Results with Packard Series Reactors Bypassed

Monitored Facility	Dispatch 1 (230 kV)				Dispatch 2 (115 kV)				Max
	ETC		NTC		ETC		NTC		
	N-1	N-1-1	N-1	N-1-1	N-1	N-1-1	N-1	N-1-1	
130762 GARDV230 230 130767 STOLE230 230 1		108%	112%	122%		103%	108%	123%	123%
130795 DEPEW115 115 130799 ERIE 115 115 1			101%				101%		101%
130847 ROLL 115 115 130857 STOLE115 115 1			103%				103%		103%
135303 SAWYER77 230 135414 HUNTLEY2 230 1	101%			103%					103%
135303 SAWYER77 230 135415 PACKARD2 230 1	117%	110%	108%	114%	111%	104%	102%	107%	117%
135304 SAWYER78 230 135414 HUNTLEY2 230 2	100%			104%					104%
135304 SAWYER78 230 135415 PACKARD2 230 2	110%	110%	108%	116%	105%	104%	102%	108%	116%
135415 PACKARD2 230 147842 NIAGAR2W 230 1		108%		108%					108%
135415 PACKARD2 230 147842 NIAGAR2W 230 2		108%	103%	108%					108%
135449 GR.I-182 115 135459 NI.B-182 115 1							101%		101%
135450 GRDNVL1 115 135453 LONG-180 115 1			101%				108%		108%
135458 NI.B-181 115 135460 PACK(N)E 115 1			114%				119%		119%
135460 PACK(N)E 115 135538 LONG-182 115 1							104%		104%
135460 PACK(N)E 115 147850 NIAG115E 115 2							111%		111%
135461 PACK(S)W 115 147851 NIAG115W 115 3			101%				121%		121%
135497 ZRMN-133 115 135562 S214-133 115 1								100%	100%
147850 NIAG115E 115 147842 NIAGAR2W 230 1				100%					100%

Table 2: Summary of Baseline Results with Packard Series Reactors In-Service

Monitored Facility	Dispatch 1 (230 kV)				Dispatch 2 (115 kV)				Max
	ETC		NTC		ETC		NTC		
	N-1	N-1-1	N-1	N-1-1	N-1	N-1-1	N-1	N-1-1	
130762 GARDV230 230 130767 STOLE230 230 1		111%	112%	121%		107%	107%	118%	121%
130795 DEPEW115 115 130799 ERIE 115 115 1		122%		118%		122%		118%	122%
130815 HINMN115 115 131611 HARIS115 115 1		100%							100%
130847 ROLL 115 115 130857 STOLE115 115 1			103%				103%		103%
135303 SAWYER77 230 135414 HUNTLEY2 230 1				100%					100%
135327 AM.S-54 115 135450 GRDNVL1 115 1		107%		107%		107%		108%	108%
135415 PACKARD2 230 147842 NIAGAR2W 230 1				100%					100%
135415 PACKARD2 230 147842 NIAGAR2W 230 2				101%					101%
135449 GR.I-182 115 135459 NI.B-182 115 1							101%		101%
135451 HUNTLEY1 115 135498 ZRMN-130 115 1						100%	102%	100%	102%
135451 HUNTLEY1 115 135562 S214-133 115 1							100%		100%
135452 LOCKPORT 115 135876 TELRDTP1 115 1						100%			100%
135454 MLPN-129 115 135461 PACK(S)W 115 1								100%	100%
135455 MLPN-130 115 135461 PACK(S)W 115 1						101%		101%	101%
135458 NI.B-181 115 135460 PACK(N)E 115 1		104%	112%			112%	122%	102%	122%
135460 PACK(N)E 115 135538 LONG-182 115 1							106%		106%
135460 PACK(N)E 115 147850 NIAG115E 115 2							112%		112%
135461 PACK(S)W 115 147851 NIAG115W 115 1		117%		109%		137%		135%	137%
135461 PACK(S)W 115 147851 NIAG115W 115 2		117%		109%		137%		135%	137%
135461 PACK(S)W 115 147851 NIAG115W 115 3		107%	103%	102%		127%	123%	125%	127%
135467 SHAW-103 115 135470 SWAN-103 115 1						101%			101%
135497 ZRMN-133 115 135562 S214-133 115 1						100%	101%	100%	101%
147850 NIAG115E 115 147842 NIAGAR2W 230 1		100%		123%				100%	123%

Following establishment of the baseline results and issuance of the project solicitation letter, the NYISO was informed of recently completed upgrades to the following three non-BPTF facilities: Niagara – Packard 115 kV #192 line, the Niagara – Packard 115 kV #195 line, and the Depew – Erie St. 115 kV #921 line. The baseline and project models were updated accordingly to reflect these upgrades.

3. Proposed Projects and Findings

On November 1, 2015, the NYISO issued a solicitation for Public Policy Transmission Projects and Other Public Policy Projects to address the Western New York Public Policy Transmission Need. Project proposals were due on or before December 31, 2015.[13] Following issuance of the solicitation letter, the NYISO received numerous clarifying questions from interested Developers. The NYISO summarized the questions and provided responses in a public Frequently Asked Questions (FAQ) document first posted on December 3, 2015, and updated on December 15, 2015.[14]

The NYISO received 12 Public Policy Transmission Projects and three Other Public Policy Projects. Subsequent to receipt of the project proposals, the NYISO requested additional project information from Developers to address missing information or to clarify the submitted information. The Developers of one Public Policy Transmission Project and two Other Public Policy Projects failed to submit a complete response within the timeframe provided by the Tariff; therefore, in accordance with Section 31.4.4.3 of the OATT, those three projects are not eligible for further consideration during this planning cycle. Accordingly, the NYISO evaluated the viability and sufficiency of 11 Public Policy Transmission Projects and one Other Public Policy Project.

In accordance with Section 31.4.15 of the NYISO OATT, the NYISO maintains the confidentiality of each proposed solution except for certain basic information until the NYISO determines that the proposed solution is viable and sufficient and the Developer consents to the NYISO's inclusion of its proposed solution in the Public Policy Transmission Planning Report. Table 3 provides the publicly available information for each of the proposed projects considered.

[13] The Western New York Public Policy Transmission Need Project Solicitation is posted at: http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Planning_Studies/Public_Policy_Documents/Public_Policy_Notices/Western_NY_PPTN_Solution_Solicitation_Letter_2015-11-01.pdf

[14] The Western New York Public Policy Transmission Need FAQ document is posted at: http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Planning_Studies/Public_Policy_Documents/Western_NY/Western_NY_PPTN_FAQ_2015-12-15.pdf

Table 3: Proposed Projects

Developer	Project Name	Category	Queue Position	Type	Location County/State	Size (MW)
NRG Dunkirk Power	Dunkirk Gas Addition	OPPP	523, 524	ST	Chautauqua, NY	435
North America Transmission	Proposal 1	PPTP	N/A	AC	Niagara-Erie, NY	N/A
North America Transmission	Proposal 2	PPTP	N/A	AC	Niagara-Erie, Wyoming, NY	N/A
North America Transmission	Proposal 3	PPTP	N/A	AC	Niagara-Erie, Wyoming, NY	N/A
North America Transmission	Proposal 4	PPTP	N/A	AC	Niagara-Erie, Wyoming, NY	N/A
ITC New York Development	15NYPP1-1 Western NY AC	PPTP	N/A	AC	Niagara-Erie, NY	N/A
National Grid	Moderate Power Transfer Solution	PPTP	528	AC	Niagara-Erie, NY	N/A
National Grid	High Power Transfer Solution	PPTP	529	AC	Niagara-Erie, NY	N/A
NYPA/NYSEG	Western NY Energy Link	PPTP	432, 525	AC	Niagara-Erie, Wyoming, NY	N/A
NextEra Energy Transmission New York	Empire State Line Proposal 1	PPTP	530	AC	Niagara-Erie, NY	N/A
NextEra Energy Transmission New York	Empire State Line Proposal 2	PPTP	530	AC	Niagara-Erie, NY	N/A
Exelon Transmission Company	Niagara Area Transmission Expansion	PPTP	N/A	AC	Niagara-Erie, NY	N/A

OPPP: Other Public Policy Project
PPTP: Public Policy Transmission Project
ST: Steam Turbine
AC: Alternating Current Transmission

The NYISO conducted a comparable transmission security analysis of each project in the same manner as the baseline analysis. The objective of this analysis is to identify any remaining transmission security issues following the addition of each project to the baseline case. The NYISO did not calculate the incremental Ontario import capability for each project as part of the viability and sufficiency assessment; that analysis will be part of the evaluation and selection phase of the process. In general, each project addresses at least some portion of the baseline transmission security issues, but not all projects addressed all of the BPTF transmission security issues. Table 4 lists the BPTF and non-BPTF findings for each proposed solution. Detailed results have been provided individually to each Developer.

Table 4: Project Findings

Developer	Project Name	BPTF Issues Resolved?	Non-BPTF Issues Resolved?	Sufficient?
NRG Dunkirk Power	Dunkirk Gas Addition	No	No	No
North America Transmission	Proposal 1	Yes	No	Yes
North America Transmission	Proposal 2	Yes	No	Yes
North America Transmission	Proposal 3	Yes	No	Yes
North America Transmission	Proposal 4	Yes	No	Yes
ITC New York Development	15NYPP1-1 Western NY AC	No	No	No
National Grid	Moderate Power Transfer Solution	Yes	Yes	Yes
National Grid	High Power Transfer Solution	Yes	Yes	Yes
NYPA/NYSEG	Western NY Energy Link	Yes	Yes	Yes
NextEra Energy Transmission New York	Empire State Line Proposal 1	Yes	No	Yes
NextEra Energy Transmission New York	Empire State Line Proposal 2	Yes	No	Yes
Exelon Transmission Company	Niagara Area Transmission Expansion	Yes	Yes	Yes

The projects that did not address the BPTF transmission security issues are not sufficient to meet the Western New York Public Policy Transmission Need. The non-BPTF transmission security issues that remain are common among many of the sufficient proposed projects. The full capability of each project to unbottle Niagara generation and Ontario imports may not be realized if these non-BPTF issues are left unaddressed. Table 5 lists the overloaded non-BPTF transmission lines that remain for the sufficient projects and the maximum percent loading observed for the various categories of conditions evaluated.

Table 5: Remaining Non-BPTF Overloads

Monitored Facility	Line ID	Dispatch 1 (230 kV)				Dispatch 2 (115 kV)			
		ETC		NTC		ETC		NTC	
		N-1	N-1-1	N-1	N-1-1	N-1	N-1-1	N-1	N-1-1
135327 AM.S-54 115 135450 GRDNVL1 115 1	54		101%		104%				101%
135461 PACK(S)W 115 147851 NIAG115W 115 1	193		102%		102%		122%		122%
135461 PACK(S)W 115 147851 NIAG115W 115 2	194		102%		102%		122%		122%

The Niagara – Packard 115 kV transmission corridor currently consists of five parallel 115 kV transmission lines (#191, #192, #193, #194, #195) each approximately 3.5 miles long. The analysis finds two of these lines can limit Niagara and Ontario output under certain contingency and outage conditions.

The Niagara – Packard 115 kV #193 and #194 lines would constrain Niagara and Ontario output under N-1-1 conditions when one of the #193, #194, or #195 lines is out of service followed by securing for loss of a second line. The analysis indicates an STE rating overload of up to 122% at a flow of 428 MVA.

The Gardenville – Depew 115 kV #54 line represents a part of three sources to the Erie St. 115 kV substation on the eastern outskirts of the Buffalo metropolitan area. The line may be overloaded under high transfer conditions when one of the other Erie St. sources is out of service. These issues would be addressed by replacing terminal equipment at the Gardenville 115 kV station to achieve a normal rating of at least 135 MVA.

4. Conclusions and Recommendations

The NYISO performed a comparable analysis of each proposed Public Policy Transmission Planning Project and Other Public Policy Project to confirm that the proposed solution independently satisfies the Western New York Public Policy Transmission Need to increase transfer capability on the BPTFs. The NYISO determined that the following projects meet the sufficiency criteria:

- North America Transmission – Proposal #1
- North America Transmission – Proposal #2
- North America Transmission – Proposal #3
- North America Transmission – Proposal #4
- National Grid – Moderate Power Transfer Solution
- National Grid – High Power Transfer Solution
- NYPA/NYSEG – Western NY Energy Link
- NextEra Energy Transmission New York – Empire State Line #1
- NextEra Energy Transmission New York – Empire State Line #2
- Exelon Transmission Company – Niagara Area Transmission Expansion

For each sufficient project, the Developer of the project is qualified, the solution is technically practicable, and the Developer has an approach for acquiring any necessary rights-of-way, property, and facilities. Therefore, each sufficient project is also viable.

To realize the full capability of the viable and sufficient projects and fulfill the objectives of the Western New York Public Policy Transmission Need, the NYISO recommends that any remaining non-BPTF issues also be addressed by the more efficient or cost effective Public Policy Transmission Project that is ultimately selected. Specifically, to the extent necessary to address remaining non-BPTF issues for the specific selected project, the NYISO recommends mitigation of the Niagara – Packard 115 kV #193 and #194 line overloads by reconductoring the lines or modification of the Niagara substation configuration, and the NYISO recommends the replacement of limiting terminal equipment for line #54 at the Gardenville 115 kV station.

5. Next Steps

The NYISO presented these findings at two meetings of the Electric System Planning Working Group (ESPWG) and Transmission Planning Advisory Subcommittee (TPAS) on May 5 and May 25, 2016. After the issuance of this final Viability and Sufficiency Assessment, the NYISO will submit the Viability and Sufficiency Assessment to the NYPSC for its review.[15] It is expected that, following applicable public notice and comment procedures under state law, the NYPSC will issue an order explaining whether there continues to be a transmission need driven by a Public Policy Requirement and, if so, that the NYISO should continue to evaluate transmission solutions to the Western New York Public Policy Transmission Need.

If the NYPSC concludes that transmission solutions should continue to be pursued to address the Western New York Public Policy Transmission Need, the NYISO will evaluate the viable and sufficient Public Policy Transmission Projects that have elected to proceed for purposes of selecting the more efficient or cost-effective Public Policy Transmission Project that is eligible for cost allocation and cost recovery under the NYISO's tariffs. The NYISO will rank these Public Policy Transmission Projects based on their satisfaction of the metrics set forth in the Tariff and in the NYPSC Order and document its findings in the Western New York Public Policy Transmission Planning Report.

[15] Within 30 Calendar Days of the first NYISO presentation of the Viability and Sufficiency Assessment to ESPWG and TPAS, the Developer of a proposed Public Policy Transmission Project that the NYISO has determined is viable and sufficient must notify the NYISO whether it intends for its project to proceed to be evaluated for purposes of the NYISO's selection of the more efficient or cost-effective Public Policy Transmission Project to satisfy the Western New York Public Policy Transmission Need. As part of this notification, the Developer must include its consent to the NYISO's disclosure of the details of its proposed Public Policy Transmission Project in the Western New York Public Policy Transmission Planning Report.

Appendix A – Study Cases and Sufficiency Criteria

Western NY Public Policy Transmission Need

Study Cases and Sufficiency Criteria

Study Cases

The baseline and project study cases for the Western NY Public Policy Transmission Need (PPTN) will be based on the NYISO 2014 Comprehensive Reliability Plan base case system representation of 2024 summer peak load, with the following modifications:

- Niagara and Lewiston at full output of 2,700 MW, represented by two dispatch scenarios:
    - Dispatch 1
        a. Niagara 230 kV units (8-13) at full output total = 1,320 MW
        b. Niagara 115 kV units (1-7) dispatch total = 1,140 MW
        c. Lewiston Pumped Storage total = 240 MW
    - Dispatch 2
        a. Niagara 230 kV units (8-13) dispatch total = 920 MW
        b. Niagara 115 kV units (1-7) at full output total = 1,540 MW
        c. Lewiston Pumped Storage total = 240 MW
- Ontario Import to Zone A scheduled at 1,000 MW
- Huntley and Dunkirk generation plants out-of-service
- National Grid Local Transmission Plan (LTP) updates in Zone A:
    - Bypassable 1.532% series reactors on the Packard – Huntley 230 kV lines #77 and #78
    - Two 100 MVAr shunt capacitor banks at Huntley 230 kV station

Sufficiency Criteria (Minimum Criteria)

In order to achieve the environmental, economic, and reliability benefits associated with the Public Policy Requirement as identified by the NYPSC, a sufficient Public Policy Transmission Project or Other Public Policy Project shall obtain full output from Niagara and Lewiston (both Dispatch 1 and Dispatch 2) while maintaining certain levels of simultaneous imports from Ontario and while meeting applicable North American Electric Reliability Corporation (NERC), Northeast Power Coordinating Council (NPCC) and New York State Reliability Council (NYSRC) reliability criteria, and local Transmission Owner planning criteria. Specifically:

- Emergency Transfer Criteria (ETC)
    - Per NYSRC, pre-contingency loading must not exceed normal ratings and post-contingency loading must not exceed short term emergency (STE) ratings for single element contingencies (e.g., loss of a transmission line, transformer, or generating unit). This will be applied to all facilities 115 kV and above.
    - N-1: Ontario import to Zone A of 1,000 MW must be maintained to secure 115 kV and above facilities to STE ratings for single element contingencies.
    - N-1-0 & N-1-1: Following the first contingency loss of a single element, Ontario Import may be reduced to no less than zero and generation, other than Niagara, may be redispatched to return the system to normal ratings (N-1-0) and to secure to STE ratings for single element contingency conditions (N-1-1).

- Normal Transfer Criteria (NTC)
    - Per NYSRC, pre-contingency loading must not exceed normal ratings and post-contingency loading must not exceed long term emergency (LTE) ratings for all design contingencies (e.g., loss of a transmission line, a transformer, a generating unit, two adjacent circuits on a common tower, or multiple circuits that share a common breaker), subject to NYSRC Reliability Rule Exceptions. This also applies following the loss of a critical transmission line, transformer, or generating unit (N-1-1), which will be applied to all facilities 230 kV and above.
    - Per local Transmission Owner planning criteria, 115 kV facilities shall be designed to meet NYSRC Normal Transfer Criteria for first contingency conditions (N-1), and shall be designed to meet NYSRC Emergency Transfer Criteria following the first contingency (N-1-0 & N-1-1).
    - N-1: Ontario import may be reduced to no less than zero to secure facilities 115 kV and above to LTE ratings for all design contingencies.
    - N-1-0 & N-1-1 for 230 kV and above facilities: Following the first contingency loss of a single element, Ontario may be reduced to no less than zero and generation, other than Niagara, may be redispatched to return the system to normal ratings (N-1-0) and to secure to LTE ratings for all design contingency conditions (N-1-1).
    - N-1-0 & N-1-1 for 115 kV facilities: Following the first contingency loss of a single element, Ontario may be reduced to no less than zero and generation, other than Niagara, may be redispatched to return the system to normal ratings (N-1-0) and to secure to STE ratings for single element contingency conditions (N-1-1).

PPTN-specific Project Information and Metrics

A Public Policy Transmission Project or Other Public Policy Project may meet the sufficiency criteria with the Packard – Huntley 230 kV series reactors in-service or bypassed. **For each Public Policy Transmission Project and Other Public Policy Project, the Developer must declare the desired status (in-service or bypassed) of the series reactors as part of the submission of project information.**

For purposes of evaluating the "Cost per MW" metric in the evaluation of Public Policy Transmission Projects, the NYISO will use the incremental Ontario Import capability (MW) that results from each Public Policy Transmission Project.

Baseline Study Results and Cases

Baseline study results are publicly available on the NYISO website at:

http://www.nyiso.com/public/markets_operations/services/planning/planning_studies/index.jsp

The baseline study cases are available, subject to a Critical Energy Infrastructure Information (CEII) request:

http://www.nyiso.com/public/webdocs/markets_operations/services/customer_relations/CEII_Request_Form/CEII_Request_Form_and_NDA_complete.pdf

Appendix B – Baseline Results

Baseline Results with Packard Series Reactors Bypassed

Monitored Facility	First Contingency	Second Contingency	Dispatch 1 (230 kV)				Dispatch 2 (115 kV)				Max
			ETC		NTC		ETC		NTC		
			N-1	N-1-1	N-1	N-1-1	N-1	N-1-1	N-1	N-1-1	
130762 GARDV230 230 130767 STOLE230 230 1	HUNTLEY - PACKARD 77 230	B:PACKT3		108%				103%			108%
	R:HC-SR_37&W-F_171	T:77&78				122%				123%	123%
	T:77&78	N/A			112%				108%		112%
130795 DEPEW115 115 130799 ERIE 115 115 1	SB:PK115 30+40	N/A			101%				101%		101%
130847 ROLL 115 115 130857 STOLE115 115 1	SB:181:ER	N/A			103%				103%		103%
135303 SAWYER77 230 135414 HUNTLEY2 230 1	B:PACKT3	N/A	101%								101%
	HUNTLEY - PACKARD 78 230	STOLLRD - GARDENVILL 66 230				103%					103%
135303 SAWYER77 230 135415 PACKARD2 230 1	B:PACKT3	N/A	117%								117%
	HUNTLEY - PACKARD 78 230	Base Case		110%		109%		104%		101%	110%
		STOLLRD - GARDENVILL 66 230				114%				107%	114%
	S:PA_HNTL78	N/A			108%		111%		102%		111%
	STOLLRD - GARDENVILL 66 230	S:PA_HNTL78		106%							106%
135304 SAWYER78 230 135414 HUNTLEY2 230 2	HUNTLEY - PACKARD 77 230	STOLLRD - GARDENVILL 66 230				104%					104%
	OE:PACK_77	N/A	100%								100%
135304 SAWYER78 230 135415 PACKARD2 230 2	HUNTLEY - PACKARD 77 230	Base Case		110%		110%		104%		102%	110%
		STOLLRD - GARDENVILL 66 230				116%					116%
	NIAGARA - ROBINSON 64 230	HUNTLEY - PACKARD 77 230								108%	108%
	S:PA_HNTL77	N/A	110%		108%		105%		102%		110%
135415 PACKARD2 230 147842 NIAGAR2W 230 1	NIAGARA - PACKARD 62 230	Base Case		108%		108%					108%
	NIAGARA - ROBINSON 64 230	T:62&BP76				100%					100%
135415 PACKARD2 230 147842 NIAGAR2W 230 2	NIAG - NEWROCH 1 345	T:61&64				100%					100%
	NIAGARA - PACKARD 61 230	Base Case		108%		108%					108%
	T:61&64	N/A			103%						103%
135449 GR.I-182 115 135459 NI.B-182 115 1	DCT:230:77+78+THR	N/A							101%		101%
135450 GRDNVL1 115 135453 LONG-180 115 1	DCT:230:77+78+THR	N/A			101%				108%		108%
135458 NI.B-181 115 135460 PACK(N)E 115 1	T:77&78	N/A			114%				119%		119%
135460 PACK(N)E 115 135538 LONG-182 115 1	DCT:230:77+78	N/A							104%		104%
135460 PACK(N)E 115 147850 NIAG115E 115 2	DCT:115:101+191	N/A							111%		111%
135461 PACK(S)W 115 147851 NIAG115W 115 3	DCT:115:193+194	N/A			101%				121%		121%
135497 ZRMN-133 115 135562 S214-133 115 1	PACKARD 230/115 4TR	NIAGARA 230/115 2TR								100%	100%
147850 NIAG115E 115 147842 NIAGAR2W 230 1	NIAGARA - PACKARD 61 230	SB:PA230_R506				100%					100%

Baseline Results with Packard Series Reactors In-Service

Monitored Facility	First Contingency	Second Contingency	Dispatch 1 (230 kV)				Dispatch 2 (115 kV)				Max
			ETC		NTC		ETC		NTC		
			N-1	N-1-1	N-1	N-1-1	N-1	N-1-1	N-1	N-1-1	
130762 GARDV230 230 130767 STOLE230 230 1	DCT:230:77+78+THR	N/A			112%				107%		112%
	HUNTLEY - PACKARD 77 230	HUNTLEY - PACKARD 78 230		111%				107%			111%
	LN:115:180	T:77&78				121%					121%
	WTHRS - MEYER 230	T:77&78								118%	118%
130795 DEPEW115 115 130799 ERIE 115 115 1	First:Lancaster_926B	LN:115:181/922				118%				118%	118%
	LN:115:705 NY	LN:115:181/922		122%				122%			122%
130815 HINMN115 115 131611 HARIS115 115 1	SOMERSET - NEWROCH 1 345	NIAG - NEWROCH 1 345		100%							100%
130847 ROLL 115 115 130857 STOLE115 115 1	SB:181:ER	N/A			103%				103%		103%
135303 SAWYER77 230 135414 HUNTLEY2 230 1	HUNTLEY - PACKARD 78 230	B:STOLE230				100%					100%
135327 AM.S-54 115 135450 GRDNVL1 115 1	LN:115:181/922	Base Case		107%		107%		107%		108%	108%
135415 PACKARD2 230 147842 NIAGAR2W 230 1	LN:115:192	T:62&BP76				100%					100%
135415 PACKARD2 230 147842 NIAGAR2W 230 2	NIAGARA 230/115 1TR	T:61&64				101%					101%
135449 GR.I-182 115 135459 NI.B-182 115 1	DCT:230:77+78	N/A							101%		101%
135451 HUNTLEY1 115 135498 ZRMN-130 115 1	NF:115:133 HT	N/A							102%		102%
	NIAGARA 230/115 2TR	LN:115:133						100%		100%	100%
135451 HUNTLEY1 115 135562 S214-133 115 1	SB:130:PK	N/A							100%		100%
135452 LOCKPORT 115 135876 TELRDTP1 115 1	SOMERSET - NEWROCH 1 345	NIAG - NEWROCH 1 345						100%			100%
135454 MLPN-129 115 135461 PACK(S)W 115 1	LN:115:130	Base Case								100%	100%
	NIAGARA 230/115 2TR	LN:115:130								100%	100%
135455 MLPN-130 115 135461 PACK(S)W 115 1	NIAGARA 230/115 2TR	LN:115:129						101%		101%	101%
135458 NI.B-181 115 135460 PACK(N)E 115 1	DCT:115:180+182N	N/A			112%				122%		122%
	LN:115:182S	Base Case		104%				112%		102%	112%
135460 PACK(N)E 115 135538 LONG-182 115 1	DCT:115:180+181/922	N/A							106%		106%
135460 PACK(N)E 115 147850 NIAG115E 115 2	DCT:115:101+191	N/A							112%		112%
135461 PACK(S)W 115 147851 NIAG115W 115 1	LN:115:194	LN:115:195		117%				137%			137%
	LN:115:195	LN:115:194				109%				135%	135%
135461 PACK(S)W 115 147851 NIAG115W 115 2	LN:115:193	LN:115:195		117%				137%		135%	137%
	LN:115:195	LN:115:193				109%					109%
135461 PACK(S)W 115 147851 NIAG115W 115 3	DCT:115:193+194	N/A			103%				123%		123%
	LN:115:193	LN:115:194		107%		102%		127%		125%	127%
135467 SHAW-103 115 135470 SWAN-103 115 1	LN:115:101	LN:115:102						101%			101%
135497 ZRMN-133 115 135562 S214-133 115 1	First:Lockport_104	LN:115:130						100%			100%
	HUNTLEY - PACKARD 78 230	LN:115:130								100%	100%
	SB:130:PK	N/A							101%		101%
147850 NIAG115E 115 147842 NIAGAR2W 230 1	HUNTLEY - GARDENVILL 79 230	Base Case		100%							100%
	NIAGARA - PACKARD 61 230	SB:PA230_R506				123%					123%
	PACKARD 230/115 3TR	T:77&78								100%	100%
	SOMERSET - NEWROCH 1 345	NIAG - NEWROCH 1 345		100%							100%

Appendix C – Western New York Public Policy Transmission Need Phase 2 Study Assumptions

Western NY PPTN Phase 2 Study Assumptions

Dawei Fan

Supervisor, Public Policy and Interregional Planning
NYISO

ESPWG/TPAS
December 7, 2016
KCC

DRAFT – FOR DISCUSSION PURPOSES ONLY

Public Policy Planning Process

- **Phase I: Identify Needs and Assess Solutions**
  - ***PSC identifies transmission needs driven by Public Policy Requirements and defines sufficiency criteria***
  - ***NYISO solicits solutions (transmission, generation, or EE/DR)***
  - ***NYISO evaluates viability and sufficiency of all solutions***
  - ***PSC reviews Viability and Sufficiency Assessment and confirms continued transmission need***
- **Phase II: Transmission Evaluation and Selection**
  - ***NYISO evaluates viable and sufficient transmission solutions to identify the more efficient or cost-effective solution***
  - ***NYISO issues draft Public Policy Transmission Planning Report***
  - ***NYISO Board may select a transmission solution for purposes of cost allocation and recovery under the NYISO Tariff***

Phase 2 Evaluation Metrics

- **OATT Attachment Y 31.4.8.1**
  - ***Capital Cost***
  - ***Cost per MW***
  - ***Expandability***
  - ***Operability***
  - ***Performance***
  - ***Property rights***
  - ***Schedules***
  - ***Criteria specified by NYPSC***
  - ***Other metrics (production cost saving, LBMP, demand congestion, load payment, generation payment, emission, TCC/congestion rent, ICAP)***

WNY PPTN Phase 2 Base Cases

- **Types: power flow, MAPS, and MARS**
- **Based on the WNY PPTN Phase 1 and the most recent reliability and economic planning databases**
- **Updated in accordance with NYISO procedures**
- **Extended by up to an additional 20 years, as appropriate**

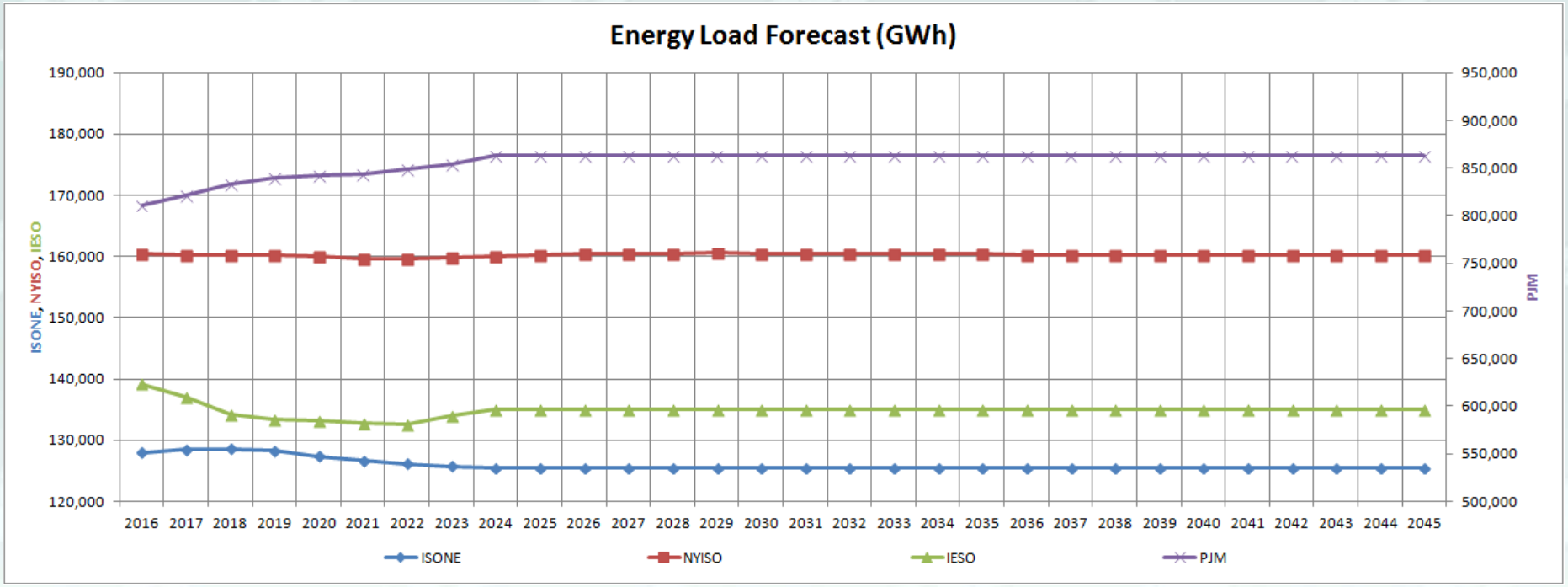
MAPS Base Case

- **Starting point**
  - ***2016 CARIS Phase 2 (2016 – 2034)***
- **Updates**
  - ***Generation***
    - **Potential updates on Niagara modeling in MAPS: rather than relying on historic generation data, utilize forecasted generation reflecting projected water flows**
    - **Shoreham GT3 &GT4, and Freeport GT1 out of service**

MAPS Base Case

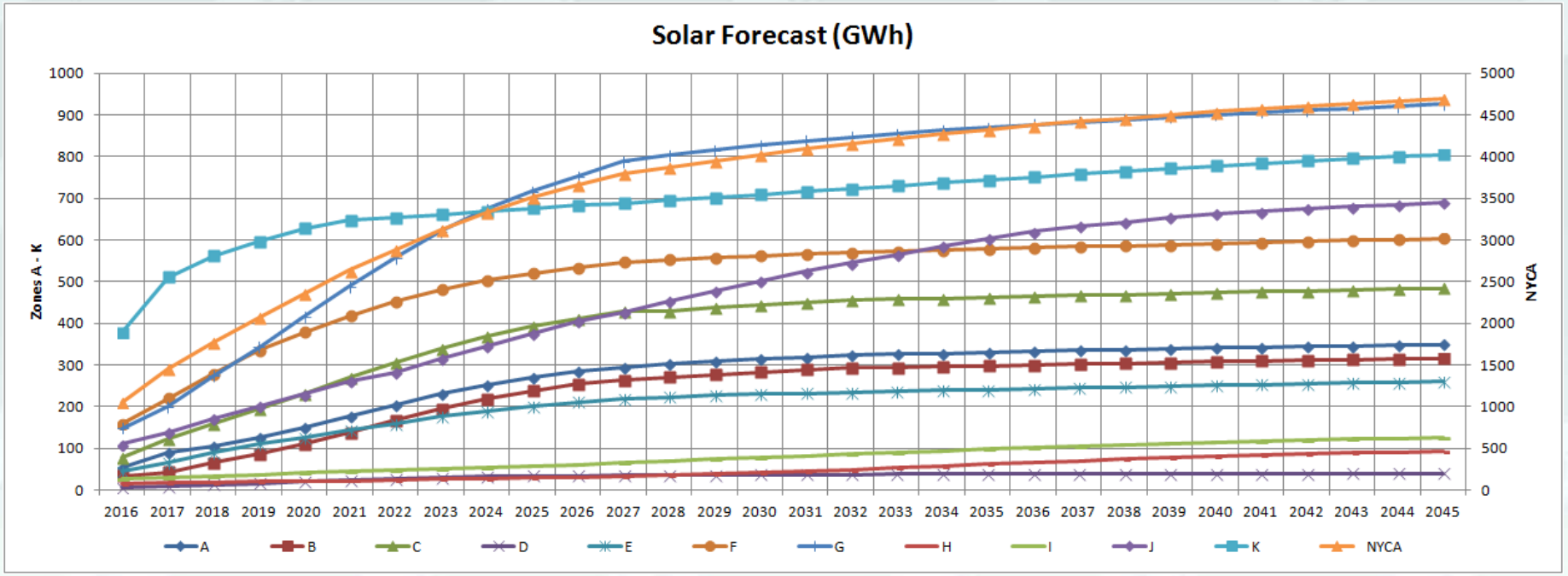
- ***Transmission***
  - **Stolle - Gardenville 230kV line #66 terminal upgrades – In service**
  - **Clay – Pannell 345kV lines PC1 and PC2 terminal upgrades – proposed in service in 2019**
  - **Oakdale 345/115kV transformer and 345kV bus reconfiguration in service in 2021**
- **Extensions**
  - ***Base case period: 2016 – 2045***
  - ***Compensatory MW to maintain a reliable system***
  - ***Load, fuel, and emissions***

Baseline Load Forecast

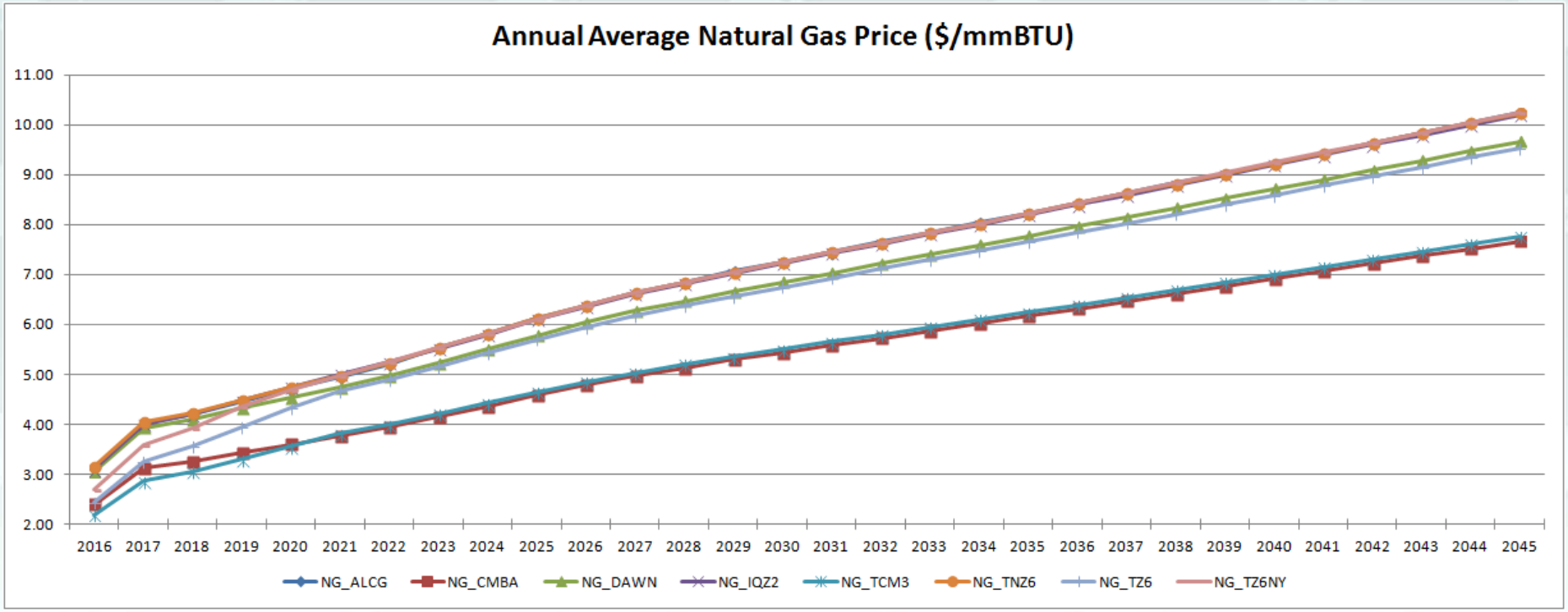


Note: External loads are frozen starting 2024.

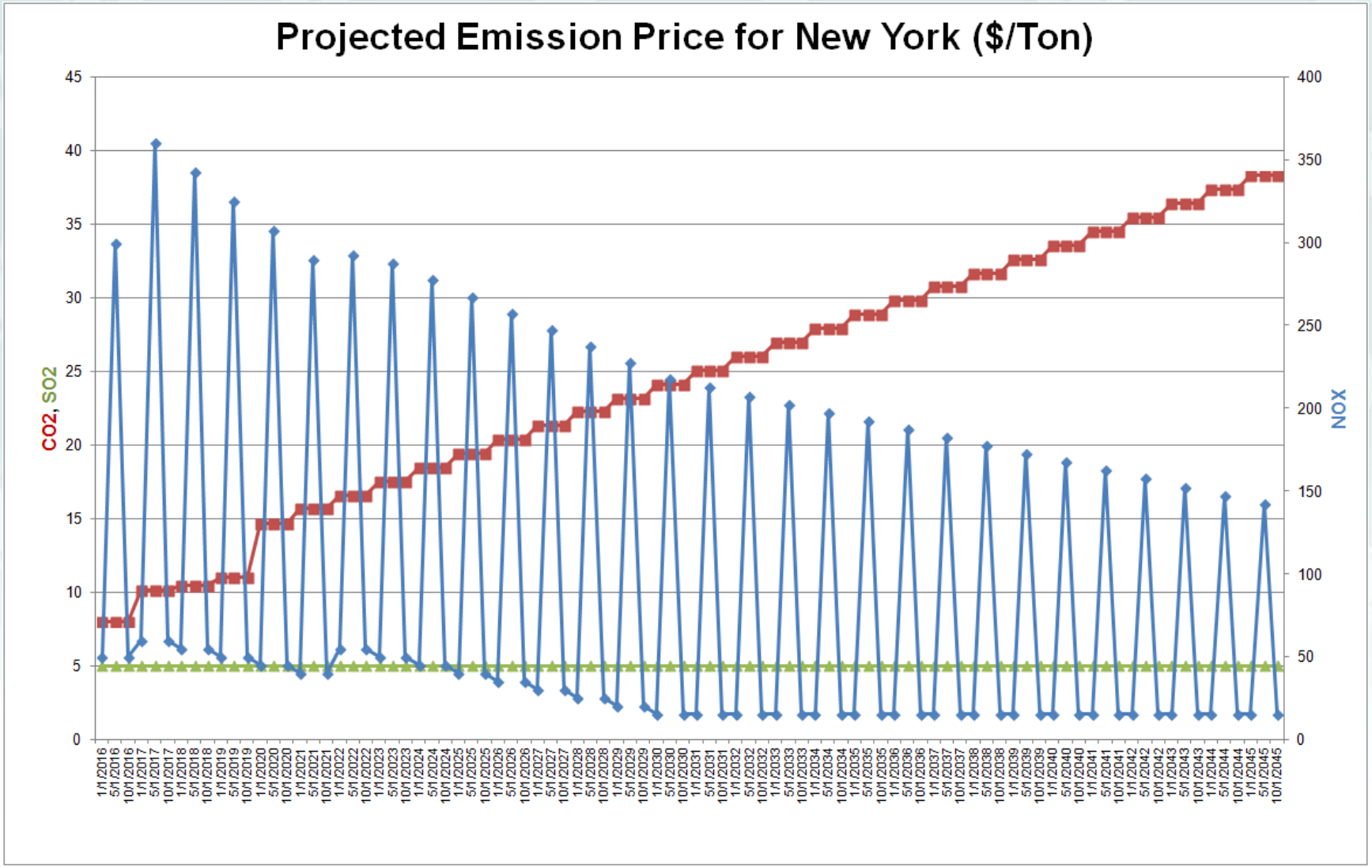
Baseline Solar Forecast



Natural Gas Price



Emission Forecast



MARS Base Case

- **Starting point**
  - ***2016 RNA base case***
- **Updates**
  - ***Generation***
    - **Shoreham GT3 &GT4, and Freeport GT1 out of service**
  - ***Topology***
    - **LIPA import/export updates**
- **Extensions**
  - ***Study period: up to 2045***
  - ***Load***

Power Flow Base Case

- **Viability and Sufficiency Assessment (VSA)**
  - ***2014 CRP baseline (2024 summer) with updates***
- **Transfer analysis in Phase 2**
  - ***Same power flow cases as used in VSA***
  - ***Updates in Western NY: Stolle - Gardenville 230kV line #66 terminal upgrades***

Non-BPTF Upgrades for Projects

- **10/13/2016 PSC Order: The commission expects National Grid to undertake the necessary upgrades on non-BPTF recommended by NYISO.**
  - ***Terminal upgrades for Gardenville-Depew 115kV #54 line***
  - ***Reconductoring for Niagara-Packard 115kV #193 and #194 lines.***
- **Modeling of the three non-BPTF upgrades**
  - ***The same way for all the viable and sufficient projects***
  - ***Back out portions of proposed projects intended to address the overloads, if any.***
- **Cost of these upgrades not a distinguishing factor for selection among competing projects**

Potential Scenarios

- **Load forecast**
- **Natural gas price forecast**
- **CO2 emission price forecast**
- **AC Transmission upgrades**

Next Steps

- **Further questions regarding WNY PPTN evaluation and selection can be sent to PublicPolicyPlanningMailbox@nyiso.com**
- **12/21/2016: deadline for questions to be submitted to NYISO**
- **FAQ document will be posted in January 2017**

The mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefit to consumers by:

- ***Maintaining and enhancing regional reliability***
- ***Operating open, fair and competitive wholesale electricity markets***
- ***Planning the power system for the future***
- ***Providing factual information to policy makers, stakeholders and investors in the power system***

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Updates on Western NY PPTN Phase 2 Study Assumptions

Dawei Fan

Supervisor, Public Policy and Interregional Planning
NYISO

ESPWG/TPAS
January 24, 2017
KCC

DRAFT – FOR DISCUSSION PURPOSES ONLY

Overview

- **NYISO presented "Western NY PPTN Phase 2 Study Assumptions" at the December 7, 2016 ESPWG/TPAS meeting**
- **Updates on two issues today**
  - ***Non-BPTF upgrades***
  - ***Power Flow cases for transfer analysis***
- **FAQ to address all written questions**

Non-BPTF Upgrades

- **10/13/2016 PSC Order: The commission expects National Grid to undertake the upgrades necessary on the non-bulk system, such as those identified by the NYISO.**
- **Non-BPTF upgrades recommended in WNY PPTN Viability and Sufficiency Assessment (VSA)**
  - ***Gardenville-Depew 115kV #54 line***
  - ***Niagara-Packard 115kV #193 and #194 lines.***

Non-BPTF Solutions

- **In evaluating projects, assume non-BPTF issues resolved per PSC Order**
- **#54 line**
  - ***Include specific National Grid LTP in the pre-project cases to address the issue***
  - ***Back out the proposed components intended to address the overloads, if any***
- **#193 and #194 lines**
  - ***National Grid is expected to identify the upgrades prior to the selection***

Non-BPTF Solutions

- **#193 and #194 lines (cont.)**
  - ***NYISO evaluation backs out the proposed components intended to address the overloads, if any, and model generic solutions by assuming adequate ratings***
  - ***NYISO will include the upgrades as part of the Public Policy Transmission Project***
  - ***Per PSC Order, cost of these upgrades not a distinguishing factor for selection***

Power Flow

- **VSA: 2014 CRP baseline with updates**
- **Transfer analysis in Phase 2**
  - ***Baseline:***
    - **Start with the VSA power flow case**
    - **Updates: Stolle - Gardenville 230kV line #66 terminal upgrades, and LTP for line #54**
  - ***Scenarios:***
    - **Other recent updates could be captured**
    - **Can be considered when selecting a project**

The mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefit to consumers by:

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- ***Operating open, fair and competitive wholesale electricity markets***
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Appendix D – SECO Western New York Public Policy Transmission Need Technical Review Report

SUBSTATION ENGINEERING COMPANY

Western New York Public Policy Transmission Need

Technical Review Report

Draft Public Version

07/14/2017
O7/24/2017 Rev#1
08/09/2017 Rev #2

This report summarizes the independent consultant evaluation of transmission solution for Western New York Public Policy Need.

The independent consultant project team (alternately, “review team”, “consultant”, “reviewer” or “reviewers”) includes:

Project Lead: Joseph W. Allen, SECo Vice President

Lead Contributors:

Barry Hart, SECo Principal Transmission Engineer
Prakash Pradhan, SECo Sr. Transmission Engineer
Tracy Hollands, SECo Manager of New York Operations
Todd Smith, SECo Lead Substation Designer
Jack Holodak, SECo VP Senior Project Manager
Joe Simone, GEI Consultants Senior Consulting Engineer
Curtis Compton, Kenny Construction Vice President
Joe Miller, Kenny Construction Regional Operations Manager
Lisa Mena, Kenny Construction Lead Estimator
William Chan, Kenny Construction Senior Estimator
James Grimm, Contract Real Estate Consultant

Table of Contents

1. Introduction

This report documents the technical evaluation of the ten proposals for the Western NY Public Policy Transmission Need (Western NY PPTN) that the New York Independent System Operator, Inc. (NYISO) determined, in its May 31, 2016 Viability and Sufficiency Assessment Report, would be able to satisfy the public policy transmission need criteria. The ten proposals evaluated are :

- North America Transmission (NAT) – Proposal #1 (T006)
- North America Transmission (NAT) – Proposal #2 (T007)
- North America Transmission (NAT) – Proposal #3 (T008)
- North America Transmission (NAT) – Proposal #4 (T009)
- National Grid (NGRID)_– Moderate Power Transfer Solution (T011)
- National Grid (NGRID) – High Power Transfer Solution (T012)
- New York Power Authority (NYPA)/ New York State Electric and Gas (NYSEG) – Western NY Energy Link (T013)
- NextEra Energy Transmission New York – Empire State Line #1 (T014)
- NextEra Energy Transmission New York – Empire State Line #2 (T015)
- Exelon Transmission Company – Niagara Area Transmission Expansion (T017)

The evaluation included review of the initial proposals received as well as answers to the Requests For Information (RFIs) issued to the Developers in January and March 2017.

This evaluation focused on the following areas:

- Site review and “walk down” of proposed sites and routes to evaluate their constructability and identify potential issues with the proposed design, siting and routing.
- Review of the environmental and permitting requirements for the project as proposed by Developers and identify gaps and issues. The environmental reviews were completed predominately using “desktop” analysis supplemented with occasional field review.
- Evaluate completeness and reasonableness of the proposed project schedules, including identification of potential issues associated with delay in obtaining permits for and construction of the proposed project.
- Evaluate cost estimates and develop independent cost estimates.
- Review, identify and estimate real estate requirements.
- Review proposals and identify risks to licensing and construction of the project on a timely basis.
- Determine expandability of proposed project.
- Assess the Developer’s plans for site control.
- Evaluate the Developer’s operating plan.

The review team's evaluation did not include further review of Developers' qualifications or credentials beyond the initial screening completed prior to the submittal of proposals.

2. Executive Summary

This technical review focused primarily on schedule, cost, identifiable risks, the ability to expand on the project in the future, site control plan and availability of Rights of Way (ROW), and the operating plan provided by each Developer. Below is a brief summary of our findings. Please see the remainder of the report for further detail.

2.1. Schedule

Each Developer's schedule for permitting and construction of its project was reviewed based on the review team's collective experience with transmission projects sited by the New York State Public Service Commission (NYPSC) under Article VII of the New York Public Service Law and constructed in New York State. A review of recent Article VII project timelines was completed to identify comparable schedules. A summary of the expected durations for each Developer's proposed scope is shown on the table below:

Proposal	Developer Proposed Total Duration	Estimated Duration	Minimum Duration
T006 NAT Proposal #1	41 Months	43 Months	40 months
T007 NAT Proposal #2	48 Months	63 Months	59 months
T008 NAT Proposal #3	51 Months	69 Months	65 months
T009 NAT Proposal #3	53 Months	75 Months	71 months
T011 NGRID Moderate Power Transfer	51 Months	57 Months	57 months
T012 NGRID High Power Transfer	51 Months	60 Months	60 months
T013 NYPA/NYSEG	53 Months	55 Months	44 months
T014 NextEra w/ phase shifter	42 Months	49 (53 Months for alternative with new ROW)	40 months (49 months for alternative with new ROW)
T015 NextEra w/ no phase shifter	42 Months	49 (53 Months for alternative with new ROW	40 months (49 months for alternative with new ROW)
T017 Exelon	75 Months	82 Months	66 months

"Estimated Duration" is calculated using the anticipated time for Article VII application preparation, the anticipated time for the Article VII approval process, ROW procurement where significant and the anticipated time for construction of the project. For each of these time periods the review team used the greater of the duration shown by the Developer or what the review team believes to be the minimum. The review team also assumed that the Environmental Management & Construction Plan ("EM&CP") preparation is completed and ready for submission when the Article VII certificate is received. All of these components will depend on the experience and the level of resources of the Developer and the complexity of the project. If the "Estimated Duration" is shown to be shorter than that proposed by the Developer, that does not lead to the conclusion that the Developer should or could accelerate its schedule but rather is intended to highlight schedules that the review team believes to be deficient.

The "Minimum Duration" is calculated using what the review team considered to be the minimum duration for Article VII application preparation, the anticipated time for the Article VII approval process, ROW procurement where significant and the anticipated time for construction of the project. This is an absolute best case and is shown for comparative purposes.

2.2. Cost

In evaluating the construction cost of each proposal, Kenny Construction ("Kenny") prepared independent estimates for each proposal. Kenny reviewed the Developers' proposals with the costs redacted. GEI Consultants, Inc. estimated the environmental licensing and permitting costs. An independent real estate agent estimated the cost of obtaining ROW. The results are shown below:

Project	Independent Estimate
T006 NAT Proposal #1	$157,487,990
T007 NAT Proposal #2	$278,030,710
T008 NAT Proposal #3	$355,917,057
T009 NAT Proposal #4	$487,143,285
T011 NGRID Moderate Power Transfer	$177,016,086
T012 NGRID High Power Transfer	$433,188,925
T013 NYPA/NYSEG	$231,685,063
T014 NextEra w/ phase shifter	$180,706,286
T014 NextEra w/ phase shifter Alternate ROW	$218,693,080
T015 NextEra w/ no phase shifter	$159,289,397
T015 NextEra w/ no phase shifter Alternate ROW	$197,276,192
T017 Exelon	$299,083,008

The review team conducted an analysis to place the proposals on a common basis by adjusting the cost estimates to 2017 costs, and identify reasons for the most significant variances.

2.3. Risk

2.3.1. The review team completed a review of the potential risks associated with the proposals focusing on the most significant drivers to the project risks including:

- Article VII review approval process and potential environmental issues
- Procurement of major equipment
- Construction
- Site Control and procurement of real estate
- Operational Plan

2.3.2. The proposals share many risks in common such as potential delays in preparation and approval of regulatory licenses and permits.

2.3.3. The most significant risk to the projects is the acquisition of significant new real estate for the transmission line ROWs, and most notably, the corridor between Stolle Road and Gardenville. That corridor traverses many commercial and residential properties and requires the acquisition of homes. Those projects affected include NAT -T007, NAT -T008, NAT -T009 and Exelon –T017.

2.4. Expandability

The review identified several items that may be considered common to all proposals:

- New line segments could be designed for double circuit capability. The Developers have not proposed such a design.
- The transmission lines could be constructed with higher ampacity conductor or re-conductored in the future.
- The western New York system could be expanded in the future with modifications proposed by Developers in addition to the one ultimately selected by the NYISO. For example, National Grid's solution could be further expanded by a number of the new lines and modifications proposed by the other Developers.

2.5. Site Control and Real Estate

2.5.1. In all proposals, the following is common for the property rights acquisition process:

- Use existing ROW as much as practical.
- Where additional ROWs must be acquired, it will be accomplished through arm's length negotiation with property owners.
- If negotiations are unsuccessful, the property will be acquired through eminent domain.
- All Developers have completed preliminary routing of their proposed lines.

2.5.2. The non-incumbent Developers all claim two common rights to assist in obtaining property:

- They cite the recent 12/17/15 NYPSC order (Case 12-T-0502) related to the AC Transmission proceeding as having applicability to this project in terms of obtaining access to the incumbent utility ROW. The Order stated on page 60: *"Incumbent utilities should offer competitors the same terms they offer Transco; there should be no bias shown to Transco."*
  Further on page 60 the NYPSC Order states:
  "Commission expects the utility company owner to bargain in good faith to reach an agreement with the developer of the transmission solution as to property access and compensation as it would for other linear project developers that seek to co-locate on utility property."
- If negotiations with private land owners are unsuccessful they believe, under New York State Law, Developers may have eminent domain authority after certification of a route by the NYPSC.

2.6. Operational Plan

2.6.1. The review team conducted a review of the Developers' operations and maintenance plans associated with the proposals. The review team did not identify any major flaw with any Developer's plans and the plans are essentially the same.

2.6.2. For the non-incumbent entity proposals, the following is common :

- The Developers stated that all O&M activities will comply with required NERC regulations.
- Developer owned facilities will be part of the NYISO Bulk Power System with real-time reporting of operating data to the NYISO.

2.6.3. The non-incumbent Developers proposed the following arrangements for Control Center services:

- North American Transmission proposes to use Cross Texas Transmission, an affiliate of NAT, to provide control center services.
- NextEra also proposes to use an out-of-state affiliate control center.
- Exelon plans to contract with an incumbent utility or third party for control center services.

3. Discussion of Proposals

Brief descriptions of the proposed projects are provided below.

3.1. T006 –North American Transmission –Proposal #1

NAT proposal T006 includes the following major work items:

- New Dysinger 345 kV Switchyard (loops Niagara-Somerset & Niagara-Rochester 345 kV lines into station)
- New Dysinger-Stolle Road 345 kV line #1
- New (third) 345-115 kV transformer at Stolle Road

Additional system upgrades that Developer identified to support proposal T006 include:

- Gardenville to Stolle Road 230 kV terminal upgrades
- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV Line #103 reconductoring
- Roll Road 115-34.5 kV transformer replacement
- Lockport to Shaw 115 kV terminal upgrades

3.2. T007 –North American Transmission –Proposal #2

NAT proposal T007 builds on T006 by adding a new 345 kV line between Stolle Road and Gardenville and a new 345-230kV transformer at Gardenville and includes the following major work items:

- New Dysinger 345 kV Switchyard (loops Niagara-Somerset & Niagara-Rochester 345 kV lines into station)
- New Dysinger-Stolle Road 345 kV line #1
- New Stolle Road-Gardenville 345 kV line
- New 345-230 kV transformer at Gardenville 230 kV

Additional possible system upgrades that Developer identified to support proposal T007 include:

- Gardenville to Stolle Road 230 kV terminal upgrades
- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV Line #103 reconductoring
- Roll Road 115-34.5 kV transformer replacement
- Lockport to Shaw 115 kV terminal upgrades
- New South Perry 230-115 kV transformer

3.3. T008 –North American Transmission –Proposal #3

NAT proposal T008 builds on T007 by adding a second 345kV line between Dysinger and Stolle Road and includes the following major work items:

- New Dysinger 345 kV Switchyard (loops Niagara-Somerset & Niagara-Rochester 345 kV lines into station)
- New Dysinger-Stolle Road 345 kV line #1
- New Stolle Road-Gardenville 345 kV line
- New 345-230 kV transformer at Gardenville 230 kV
- Second new Dysinger-Stolle Road 345 kV line #2

Additional possible system upgrades that Developer identified to support proposal T008 include:

- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV Line #103 reconductoring
- Roll Road - 115-34.5 kV transformer replacement
- Lockport to Shaw 115 kV terminal upgrades
- New South Perry 230-115 kV transformer

3.4. T009 –North American Transmission –Proposal #4

NAT proposal T009 builds on T008 by adding a new Niagara to Dysinger 345kV line and includes the following major work items:

- New Dysinger 345 kV Switchyard (loops Niagara-Somerset & Niagara-Rochester 345 kV lines into station)
- New Dysinger-Stolle Road 345 kV line #1
- New Stolle Road-Gardenville 345 kV line
- New 345-230 kV transformer at Gardenville 230 kV (connecting to the NYSEG 230 kV yard)
- Second new Dysinger-Stolle Road 345 kV line #2
- New Niagara-Dysinger 345 kV line

Additional possible system upgrades that Developer identified to support proposal T009 include:

- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV Line #103 reconductoring
- Roll Road 115-34.5 kV transformer replacement
- Lockport to Shaw 115 kV terminal upgrades
- New South Perry 230-115 kV transformer

3.5. T011 –National Grid - Moderate Power Transfer Solution

National Grid's "Moderate Power Transfer Solution" proposal T011 includes the following major work items:

- Reconductor 115 kV lines (~62 miles) including:
  - Niagara/Packard-Gardenville 115 kV (180, 181, 182) reconductor ("Minimal Solution")
  - Niagara-Packard (191, 192) reconductoring
  - Packard-Huntley (130, 133) partial reconductoring
  - Niagara-Lockport (103, 104) partial reconductoring
  - Tower separation of 61/64 230 kV lines
  - Replacement of thermally limiting equipment at Packard, Huntley, Lockport, Robinson Rd, Erie St. and Niagara stations

3.6. T012 –National Grid – High Power Transfer Solution

National Grid's "High Power Transfer Solution" proposal T012 includes the following major work items:

- New Niagara-Gardenville 230 kV line (connecting to the National Grid 230kV yard)
- New Park Club Lane 115 kV switching station (connects to Packard, Stolle Road, Gardenville)
- Reconductor 115 kV lines (~76 miles worth) including:
  - Niagara/Packard-Gardenville 115 kV (180, 181, 182) reconductor ("Full solution")
  - Niagara-Packard (191, 192) reconductoring
  - Packard-Huntley (130, 133) partial reconductoring
  - Niagara-Lockport (103, 104) partial reconductoring
  - Tower separation of 61/64 230 kV lines
  - Replacement of thermally-limiting equipment at Packard, Huntley, Lockport, Robinson Road, Erie St. and Niagara stations

3.7. T013 –NYPA/NYSEG - Western NY Energy Link

NYPA/NYSEG proposal T013 includes the following major work items:

- New Dysinger 345 kV Switchyard (loops in Niagara-Somerset & Niagara-Rochester 345 kV lines)
- New Dysinger-Stolle Road 345 kV line
- Reconductoring Stolle Road-Gardenville 230 kV line
- Protection relay upgrade at Gardenville for the reconductored Stolle-Gardenville 230 kV line
- Two new 345-230 kV transformers at Stolle Road

- Tower separation of 230 kV Line Nos. 61/64 at Niagara
- New 230-115 kV transformer at South Perry
- New 115 kV Phase Angle Regulator (PAR) at South Perry substation (on South Perry – Meyer 115 kV line)

3.8. T014 –NextEra – Empire State Line #1

NextEra proposal T014 includes the following major work items:

- New Dysinger 345 kV Switchyard (loops in Niagara-Somerset & Niagara-Rochester 345 kV lines, and cuts out the 345 kV line loop to Somerset 345 kV)
- New East Stolle Switchyard (near Stolle Road substation)
- New Dysinger-East Stolle 345 kV line with 700 MVA PAR at Dysinger end and a shunt reactor at East Stolle

Additional possible system upgrades that Developer identified to support proposal T014 include:

- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV - Reconductor approximately 12 miles of line
- Roll Road - to Stolle Road 115 kV Line #928 – Replace terminal equipment at Stolle Road to increase the line rating.
- Add 100 MVAR shunt reactor at Rochester

3.9. T015 –NextEra – Empire State Line #2

NextEra proposal T015 is the same as T014 except that it does not have the 700 MVA PAR. Proposal T015 includes the following major work items:

- New Dysinger 345 kV Switchyard (loops in Niagara-Somerset & Niagara-Rochester 345 kV lines)
- New East Stolle Switchyard (near Stolle Road substation)
- New Dysinger-East Stolle 345 kV line and a shunt reactor at East Stolle Road

Additional possible system upgrades that Developer identified to support proposal T015 include:

- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV - Reconductor approximately 12 miles of line
- Roll Road - to Stolle Road 115 kV Line #928 – Replace terminal equipment at Stolle Road to increase the line rating.
- Add 100MVAR shunt reactor at Rochester

3.10. T017 –Exelon - Niagara Area Transmission Expansion

Exelon proposal T017 includes the following major work items:

- New Niagara-Stolle Road 345 kV line
- New Gardenville-Stolle Road 230 kV line
- Reconductoring 115 kV lines (~33.1 miles worth) including:
    - Packard –Huntley (130, 133) (approximately 19.6 miles of line reconductoring)
    - Packard-Niagara Falls Blvd(181) (approximately 3.7 miles of line reconductoring)
    - Watch Road-Huntley (133) (approximately 9.8 miles of line reconductoring)

4. Evaluation

4.1. Schedule

The NYISO OATT section 31.4.8.1.7 states the following: "The potential issues associated with delay in constructing the proposed regulated Public Policy Transmission Project consistent with the major milestone schedule and the schedule for obtaining any permits and other certifications as required to timely meet the need."

The review team completed a review of the schedules submitted with the proposals. All show proposed start dates that are not achievable at this point, so the team focused on task durations instead of the dates. The review teams evaluation was based on the team's collective experience with transmission line and substation projects in New York State, and comparison of each schedule to actual Article VII projects completed.

The main drivers to the project schedule durations considered were:

- Article VII approval process including preliminary and final engineering
- Procurement of major equipment
- Real Estate acquisition
- Construction requirements.

The review team's conclusion for minimum durations for the Article VII process is:

	Scope of the Proposed Transmission Project		
Task	Re-conductor/minor rebuild on existing ROW	Rebuild on Existing ROW	Widen or New ROW
Prepare and submit Article VII application (minimum)	3 mo.	3-6 mo.	8 mo.
PSC issue certificate (minimum)	12 mo.	12 mo.	18-24 mo.
DPS review and approve EM&CP (assumes drafted during Article VII proceedings)	3 mo.	6 mo.	9 mo.
Total: Best Case Submit application -Start Construction	**15 mo.**	**18 mo.**	**27-33 mo.**

The project durations discussed in this evaluation assume that preparation of the Article VII application will begin at the time the project is awarded to the selected Developer and that any preliminary work required has already been completed by the Developer prior to that date. The review team also assumed that the EM&CP preparation will be completed and ready for submission when the Article VII certificate is received.

The review team's estimated duration for each project was calculated using the anticipated time for Article VII application preparation, the anticipated time for the Article VII approval process, ROW procurement where significant and the anticipated time for construction of the project. For each of these time periods, the review team used the greater of the duration shown by the Developer or what the review team believed to be the minimum. All of these components will depend on the experience and the level of resources of the Developer and the complexity of the project. Therefore, if the review team's estimate of the minimum duration for an activity was shorter than that proposed by the

Developer, the review team did not accelerate the Developer's schedule. The analysis is intended to highlight scheduled tasks that the review team believes to be deficient.

In general, all of the Developers' schedules should show more break down of the construction phases to help ensure they understand all the requirements. The selected Developer should submit a more detailed construction milestone schedule for inclusion in the Development Agreement with the NYISO. Summarized below are the review team's findings for each Developer.

4.1.1. North American Transmission

4.1.1.1. NAT Proposal T006

- Includes 6 months for Preliminary Engineering and Article VII preparation. Based on the review team's experience, the Developer should allocate 8 months.
- Overall Article VII review process schedule is adequate.
- Engineering is not shown on the schedule but it is reasonable to expect that the preliminary engineering will progress in parallel with Article VII application preparation and that final engineering will be progressed during Article VII review and approval and preparation of EM&CP. Those time frames appear reasonable.
- Adequate time is available to negotiatiate with the incumbent utility for use of ROW. This can occur between the award of the project to the start of construction which is 26 months.
- Procurement of major equipment and materials is not detailed in the schedule but would be significant based on the project scope. The large power transformer has a minimum 12 month lead time. The Developer's schedule shows nine months between Article VII review approval and start of substation construction. The proposed construction period is approximately 19 months. Therefore, there is adequate time to procure equipment, but the Developer needs to add equipment procurement on their schedule.
- Overall construction schedule appears adequate.
- The Developer's proposed project duration is 41 months. The review team estimates that a total of 43 months should be allocated for licensing and construction of this project.

4.1.1.2. NAT Proposal T007

- NAT has proposed 12 months for preliminary engineering and Article Vll application preparation. Considering the additional scope of this proposal, including new Stolle Road to Gardenville 345kV line, a 12 month period appears appropriate.
- Overall Article VII review process schedule is not adequate. Based on past Article VII projects a minimum of 27 months is required.
- Engineering is not shown on the schedule but it is anticipated that the preliminary engineering will progress in parallel with Article VII application preparation and final

engineering will progress during the Article VII application review and approval, and preparation of EM&CP. The Developer's time frames appear reasonable.

- Procurement of major equipment and materials is not detailed in the schedule but would be significant based on the project scope. The large power transformer has a minimum 12 month lead time. The Developer's schedule shows 12 months between Article VII application approval and start of substation construction. The review team recommends that additional time be added to the construction schedule. If additional time is added to construction then the overall project schedule provides adequate time to procure equipment. However, the procurement needs to be detailed on its schedule.
- Adequate time is available to negotiatiate with the incumbent utility for use of ROW. This can occur between the award of the project to the start of construction which is 35 months.
- Additional Real Estate ROW is required. There appears to be adequate time to procure ROW in parallel with other planned activities. See Section 4.3 for associated risks.
- The overall construction schedule is not adequate. Considering the additional Stolle Road to Gardenville 345kV Circuit, 13 miles in length, and the additional work requiring a 345-230kV transformer in the Gardenville Substation, the team estimates that an additional five months will be required to complete construction. Based on historical work in this region and with the impacted utilities, there is no evidence to support the likelihood for concurrent parallel path construction for the added work scope. Similar Article VII projects include Lockport to Mortimer and Rochester Transmission Project (RTP). The length of the proposed T007 proposal requires work through two potentially severe winter cycles and two summer cycles where outages will be difficult to obtain.
- The proposed project duration is 48 months. The review team estimates that a total of 63 months should be allocated for this project.

4.1.1.3. NAT Proposal T008

- NAT has proposed 12 months for preliminary engineering and Article Vll application preparation. Considering the additional scope of this proposal, including a new Stolle Road to Gardenville 345kV line and second Stolle Road to Dysinger 345kV line, it appears that that a 12 month period at minimum is appropriate.
- Overall Article VII review process schedule is not adequate. Based on past Article VII projects a minimum of 27 months is required.
- Non-Article VII permits can/should be done earlier.
- Engineering is not shown on the schedule but it is anticipated that the preliminary engineering will progress in parallel with Article VII application preparation and final

engineering will progress during Article VII application review and approval, and preparation of EM&CP. The Developer's time frames appear reasonable.

- Procurement of major equipment and materials is not detailed in the schedule but would be significant based on the project scope. The large power transformer has a minimum 12 month lead time. The Developer's schedule shows 12 months between Article VII application approval and start of substation construction. The review team recommends that additional time be added to the construction schedule. If additional time is added to construction then the overall project schedule provides adequate time to procure equipment. However, the procurement needs to be detailed on its schedule.
- Adequate time is available to negotiatiate with the incumbent utility for use of ROW. This can occur between the award of the project to the start of construction which is 35 months.
- Additional Real Estate ROW is required. The review team assumes that there will be adequate time to procure ROW in parallel with other planned activities. See Section 4.3 for associated risks.
- Overall Construction schedule is not adequate. Considering the scope addition of a second 345kV line from the proposed Dysinger Switchyard to the existing Stolle Road 345kV Substation, which will require new structures and foundations, as well as the expansion of the Dysinger Switchyard, the review team estimates a total duration of 30 months for construction. Exposure to as many as three winter and summer cycles in the region should be expected to impact outage availability, work day lengths, and create long periods of less than optimal construction performance. This is based on historical experience on Article VII projects performed in western New York. Examples include RTP, Auburn Transmission and Lockport to Mortimer.
- The Developer's proposed project duration is 51 months. The review team estimates a total of 69 months should be allocated for this project.

4.1.1.4. NAT Proposal T009

- NAT has proposed 12 months for preliminary engineering and Article Vll application preparation. Considering the additional scope of this proposal, including a new Niagara to Dysinger 345kV line, a 12 month period at minimum appears appropriate.
- Overall Article VII review process schedule is not adequate. Based on past Article VII projects a minimum of 27 months is required.
- Engineering is not shown on the schedule but it is anticipated that the preliminary engineering will progress in parallel with Article VII application preparation and final engineering will progress during Article VII application review and approval, and preparation of EM&CP. The Developer's time frames appear reasonable.

- Procurement of major equipment and materials is not detailed in the schedule but would be significant based on the project scope. The large power transformer has a minimum 12 month lead time. The Developer's schedule shows 12 months between Article VII application approval and start of substation construction. The review team recommends that additional time be added to the construction schedule. If additional time is added to construction then the overall project schedule provides adequate time to procure equipment. However, the procurement needs to be detailed on its schedule.
- Adequate time is available to negotiatiate with the incumbent utility for use of ROW. This can occur between the award of the project to the start of construction which is 35 months.
- Additional Real Estate ROW is required. The review team assumes that there will be adequate time to procure ROW in parallel with other planned activities. See Section 4.3 for associated risks.
- The Developer's construction schedule is not adequate. Considering the addition of a new 345kV transmission line from the Niagara Substation to the proposed Dysinger Switchyard and the requirement to expand the Dysinger Yard to seven positions, the review team estimates that 36 months will be required to complete the construction efforts for all items included in the scope. The scope of this proposal includes numerous components across wide geographical/service area. The risk/potential for outage restraints, and weather restraints, material issues, and schedule constraints is exacerbated. Example projects include Auburn Transmission, RTP and Lockport to Mortimer.
- The Developer's proposed project duration is 53 months. The review team estimates that a total of 75 months should be allocated for this project.

4.1.2. National Grid

4.1.2.1. Moderate Power Transfer T011

- National Grid has provided a very detailed and well thought out schedule. The review team estimates that additional time should be allocated for the Article VII application review and EM&CP process. National Grid has allocated 9 months. The review team estimates approximately 15 months should be allocated recognizing that previous National Grid projects have taken at least that much time. The review team agrees with construction durations and other aspects of the Developer's schedule.
- The Developer's proposed project duration is 51 months. The review team estimates that 57 months should be allocated for this project.

4.1.2.2. High Power Transfer T012

- National Grid has provided a very detailed and well thought out schedule. The review team estimates that additional time should be allocated for the Article VII application review and EM&CP process. National Grid has allocated 9 months. The review team estimates that approximately 18 months should be allocated since there will be a new Niagara to Gardenville 230kV line in this scope. The review team agrees with construction durations and other aspects of the Developer's schedule.
- The Developer's proposed project duration is 51 months. The review team estimates that 60 months should be allocated for this project

4.1.3. NYPA/NYSEG Proposal T013

- The review team believes that the NYPA/NYSEG proposal allows sufficient time to put the project in service. The proposed schedule shows a six month duration to prepare the Article VII application. Based on past history, the team expects this to take about eight months. The Developer has allocated sufficient durations for all other major activities and its overall schedule duration is adequate. However, the schedule is at a very high level at this stage and should be further detailed.
- The Developer's proposed project duration is 53 months. The review team estimates that 55 months should be allocated for this project.

4.1.4. NextEra

4.1.4.1. Proposal T014 w/phase shifter

- NextEra has proposed 12 months for Article Vll application preparation and 23 months for the overall Article VII approval process. The review team believes this is more than adequate if the existing NYSEG ROW is utilized.
- If the Developer procures new ROW for the 345kV line, then the proposed 12 month Article VII preparation period is appropriate. However, the overall Article VII approval process schedule is not adequate. Based on past Article VII projects and considering the new ROW, the review team recommends a minimum of 27 months.
- Adequate time is available to negotiatiate with the incumbent utility for use of ROW for the primary proposal. This can occur between the award of the project to the start of construction which is 26 months.
- Procurement of major equipment including the phase shifting transformer which has a 16 month lead time can be accomplished in parallel with other activities.

- If the additional Real Estate ROW alternative is required, the review team estimates a minimum of 14 months to accomplish this, and believes it can be done in parallel with other activities, but would need to begin earlier than shown on its schedule. See Section 4.3 for associated risks.
- The Developer's construction schedule is not adequate. Considering the scope which includes new transmission line construction and considerable substation enhancements and construction, and based on historical project experience, NextEra has not allowed sufficient time for construction of 20 miles of new 345kV transmission line, substation construction and all other components as described in its proposal. The schedule targets a November to May time frame for construction. While this may be beneficial to avoid additional environmental concerns, it places all of the construction in the most unpredictable weather of the calendar year. Based on the review team's experience, 14 – 16 months is a reasonable duration for construction.
- The Developer's proposed project duration is 42 months assuming it is able to utilize NYSEG's existing ROW. The review team estimates that 49 months should be allocated for this project. If NextEra is required to purchase new additional ROW, the review team estimates that 53 months should be allocated to this project.

4.1.4.2. Proposal T015 w/o phase shifter

- NextEra has proposed 12 months for Article Vll application preparation and 23 months for the overall Article VII approval process. The review team believes this is more than adequate if the existing NYSEG ROW is utilized.
- If the Developer procures new ROW for the 345kV line, then the proposed 12 month Article VII preparation period is appropriate. However, the overall Article VII approval process schedule is not adequate. Based on past Article VII projects and considering the new ROW, the review team recommends a minimum of 27 months.
- Adequate time is available to negotiatiate with the incumbent utility for use of ROW for the primary proposal. This can occur between the award of the project to the start of construction which is 26 months.
- Procurement of major equipment can be accomplished in parallel with other activities.
- If the additional Real Estate ROW alternative is required, the review team estimates a minimum of 14 months to accomplish this, and believes it can be done in parallel with other activities, but would need to begin earlier than shown on its schedule. See Section 4.3 for associated risks.
- The Developer's construction schedule is not adequate. Considering the scope which include new transmission line construction and considerable substation enhancements

and construction, and based on historical project experience, NextEra has not allowed sufficient time for construction of 20 miles of new 345kV transmission line, substation construction and all other components as described in its proposal. The schedule targets a November to May time frame for construction. While this may be beneficial to avoid additional environmental concerns, it places all of the construction in the most unpredictable weather of the calendar year. Based on the review team's experience, 14 – 16 months is a reasonable duration for construction.

- The Developer's proposed project duration is 42 months assuming it is able to utilize NYSEG's existing ROW. The review team estimates that 49 months should be allocated for this project. If NextEra is required to purchase new additional ROW, review team estimates that 53 months should be allocated to this project.

4.1.5. Exelon Proposal T017

- Exelon's schedule shows the overall Article VII approval process to be 20 months. Based on comparable Article VII projects and the need to obtain new ROW for the Stolle Road to Gardenville 230kV line, the review team estimates that a minimum of 27 months is required for the licensing process. However, Exelon appears to have included what would appear to be more than adequate time for Article VII preparation and its overall schedule is more than sufficient.
- Adequate time is available to negotiatiate with the incumbent utility for use of ROW. This can occur between the award of the project to the start of construction which is 35 months.
- Additional Real Estate ROW is required. The review team believes that there will be adequate time to procure ROW in parallel with other planned activities. See Section 4.3 for associated risks.
- The Developer's schedule is very high level at this stage and should be further detailed.
- Exelon's proposed project duration is 75 months. The review team estimates that a total of 82 months should be allocated for this project.

Based on the review, the team estimates the following total project durations:

Proposal	Developer Proposed Total Duration	Estimated Duration (Note #1)	Minimum Duration (Note #2)
T006 NAT Proposal #1	41 Months	43 Months	40 months
T007 NAT Proposal #2	48 Months	63 Months	59 months
T008 NAT Proposal #3	51 Months	69 Months	65 months
T009 NAT Proposal #4	53 Months	75 Months	71 months
T011 NGRID Moderate Power Transfer	51 Months	57 Months	57 months
T012 NGRID High Power Transfer	51 Months	60 Months	60 months
T013 NYPA/NYSEG	53 Months	55 Months	44 months
T014 NextEra w/ phase shifter	42 Months	49 (53 Months for alternative with new ROW)	40 months (49 months for alternative with new ROW)
T015 NextEra w/ no phase shifter	42 Months	49 (53 Months for alternative with new ROW)	40 months (49 months for alternative with new ROW)
T017 Exelon	75 Months	82 Months	66 months

Note #1

"Estimated Duration" is calculated using the anticipated time for Article VII application preparation, the anticipated time for the Article VII approval process, ROW procurement where significant and the anticipated time for construction of the project. For each of these time periods, the review team used the greater of the duration shown by the Developer or what the review team believes to be the minimum. The review team also assumed that the EM&CP preparation is completed and ready for submission when the Article VII certificate is received. All of these components will depend on the experience and the level of resources of the Developer and the complexity of the project. If the "Estimated Duration" is shown to be shorter than that proposed by the Developer, that does not lead to the conclusion that the Developer should or could accelerate its schedule but rather is intended to highlight schedules that the review team believes to be deficient.

Note #2

The "Minimum Duration" is calculated using what the review team considered to be the minimum duration for Article VII application preparation, the anticipated time for the Article VII approval process, ROW procurement where significant and the anticipated time for construction of the project. This is absolute best case and is shown for comparison purposes.

4.2. Cost

Concerning the cost of proposed transmission projects, the NYISO OATT section 31.4.8.1.1 states the following: "The capital cost estimates for the proposed regulated Public Policy Transmission Project, including the accuracy of the proposed estimates. For this evaluation, the Developer shall provide the ISO with credible capital cost estimates for its proposed project, with itemized supporting work sheets that identify all material and labor cost assumptions, and related drawings to the extent applicable and available. The work sheets should include an estimated quantification of cost variance, providing an assumed plus/minus range around the capital cost estimate. The estimate shall include all components that are needed to meet the Public Policy Transmission Need. To the extent information is available, the Developer should itemize: material and labor cost by equipment, engineering and design work, permitting, site acquisition, procurement and construction work, and commissioning needed for the proposed project, all in accordance with Good Utility Practice. For each of these cost categories, the Developer should specify the nature and estimated cost of all major project components and estimate the cost of the work to be done at each substation and/or on each feeder to physically and electrically connect each facility to the existing system. The work sheets should itemize to the extent applicable and available all equipment for: (i) the proposed project, (ii) interconnection facilities (including Attachment Facilities and Direct Assignment Facilities), and (iii) Network Upgrade Facilities, System Upgrade Facilities, System Deliverability Upgrades, Network Upgrades, and Distribution Upgrades."

In evaluating the construction cost of each proposal, independent estimates were prepared. Kenny Construction prepared independent estimates for each proposal. Kenny reviewed the Developers' proposals with the costs redacted. GEI Consultants, Inc. estimated the environmental licensing and permitting costs. An independent real estate agent estimated the cost of obtaining the new ROW and estimated value of the existing incumbent utility-owned ROW.

The estimates were prepared in accordance with the Association for the Advancement of Cost Engineering International Recommended Practice for Class 4 Accuracy. The expected accuracy range typically varies from a low of (-15% to -30%) and high of (+20% to +50%).

ESTIMATE CLASS	MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES Expressed as % of complete definition	END USAGE Typical purpose of estimate	METHODOLOGY Typical estimating method	EXPECTED ACCURACY RANGE Typical variation in low and high ranges
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%

A summary of the results are shown below:

Project	Independent Estimate
T006 NAT Proposal #1	$157,487,990
T007 NAT Proposal #2	$278,030,710
T008 NAT Proposal #3	$355,917,057
T009 NAT Proposal #4	$487,143,285
T011 NGRID Moderate Power Transfer	$177,016,086
T012 NGRID High Power Transfer	$433,188,925
T013 NYPA/NYSEG	$231,685,063
T014 NextEra w/ phase shifter	$180,706,286
T014 NextEra w/ phase shifter Alternate ROW	$218,693,080
T015 NextEra w/ no phase shifter	$159,289,397
T015 NextEra w/ no phase shifter Alternate ROW	$197,276,192
T017 Exelon	$299,083,008

4.2.1. NAT T006

A summary of the independent cost estimate is shown below:

NAT T006		
	Description	**Total Amount**
1	**CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION**	$ 12,359,030
2	**TRANSMISSION LINE FOUNDATIONS**	$ 6,777,500
3	**STRUCTURES - TRANSMISSION LINE**	$ 12,081,851
4	**CONDUCTOR, SHIELDWIRE, OPGW**	$ 5,187,754
5	**TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE**	$ 1,328,890
6	**NEW DYSINGER SWITCHYARD**	$ 19,771,000
7	**STOLLE ROAD SUBSTATION WORKS**	$ 11,447,500
8	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**	
	MOB / DEMOB	$ 1,000,000
9	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**	
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$ 5,950,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$ 1,800,000
10	**ENGINEERING**	
	DESIGN ENGINEERING	$ 3,750,000
	LIDAR	$ 400,000
	GEOTECH	$ 800,000
	SURVEYING/STAKING	$ 300,000
11	**TESTING & COMMISSIONING**	
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$ 1,150,000
12	**PERMITTING AND ADDITIONAL COSTS**	
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$ 2,308,505
	ENVIRONMENTAL MITIGATION	$ 8,202,072
	WARRANTIES / LOC'S	$ 418,284
	REAL ESTATE COSTS (NEW ROW)	$ 157,126
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$ 1,502,000
	LEGAL FEES	$ 2,000,000
	SALES TAX ON MATERIALS	$ 2,535,304
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$ 200,000
	CONTRACTOR MARK-UP (OH&P) 15%	$ 15,214,022
	SUBTOTAL:	$ 116,640,839
	CONTINGENCY (20%)	$ 23,328,168
	TOTAL (A):	**$ 139,969,006**
13	**SYSTEM UPGRADE FACILITIES (SUF)**	
	DEVELOPER IDENTIFIED SUF	$ 9,227,025
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$ 3,750,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 4,541,959
	TOTAL (B):	**$ 17,518,984**
	TOTAL PROJECT COST (A+B):	**$ 157,487,990**

4.2.2. NAT T007

A summary of the independent cost estimate is shown below:

NAT T007		
	Description	**Total Amount**
1	**CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION**	$ 18,262,638
2	**TRANSMISSION LINE FOUNDATIONS**	$ 21,747,379
3	**STRUCTURES - TRANSMISSION LINE**	$ 27,076,848
4	**CONDUCTOR, SHIELDWIRE, OPGW**	$ 8,522,568
5	**TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE**	$ 2,536,564
6	**NEW DYSINGER SWITCHYARD**	$ 19,771,000
7	**STOLLE ROAD SUBSTATION WORKS**	$ 7,548,000
8	**GARDENVILLE 345/230kV SUBSTATION WORKS**	$ 12,822,500
9	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**	
	MOB / DEMOB	$ 1,200,000
10	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**	
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$ 9,000,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$ 2,000,000
11	**ENGINEERING**	
	DESIGN ENGINEERING	$ 6,600,000
	LIDAR	$ 600,000
	GEOTECH	$ 1,100,000
	SURVEYING/STAKING	$ 450,000
12	**TESTING & COMMISSIONING**	
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$ 1,500,000
13	**PERMITTING AND ADDITIONAL COSTS**	
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$ 3,120,534
	ENVIRONMENTAL MITIGATION	$ 9,884,084
	WARRANTIES / LOC'S	$ 738,968
	REAL ESTATE COSTS (NEW ROW)	$ 7,623,974
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$ 1,949,484
	LEGAL FEES	$ 2,500,000
	SALES TAX ON MATERIALS	$ 4,815,807
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$ 200,000
	CONTRACTOR MARK-UP (OH&P) 15%	$ 25,735,552
	SUBTOTAL:	$ 197,305,901
	CONTINGENCY (25%)	$ 49,326,475
	TOTAL (A):	$ 246,632,377
14	**SYSTEM UPGRADE FACILITIES (SUF)**	
	DEVELOPER IDENTIFIED SUF	$ 9,227,025
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$ 14,031,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 8,140,309
	TOTAL (B):	$ 31,398,334
	TOTAL PROJECT COST (A+B):	$ 278,030,710

4.2.3. NAT T008

A summary of the independent cost estimate is shown below:

NAT T008		
	Description	**Total Amount**
1	**CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION**	$ 22,772,195
2	**TRANSMISSION LINE FOUNDATIONS**	$ 28,417,010
3	**STRUCTURES - TRANSMISSION LINE**	$ 39,158,699
4	**CONDUCTOR, SHIELDWIRE, OPGW**	$ 13,710,320
5	**TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE**	$ 3,821,694
6	**NEW DYSINGER SWITCHYARD**	$ 20,868,000
7	**STOLLE ROAD SUBSTATION WORKS**	$ 14,263,000
8	**GARDENVILLE 345/230kV SUBSTATION WORKS**	$ 12,822,500
9	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**	
	MOB / DEMOB	$ 1,500,000
10	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**	
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$ 12,000,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$ 2,200,000
11	**ENGINEERING**	
	DESIGN ENGINEERING	$ 8,400,000
	LIDAR	$ 600,000
	GEOTECH	$ 1,100,000
	SURVEYING/STAKING	$ 450,000
12	**TESTING & COMMISSIONING**	
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$ 2,000,000
13	**PERMITTING AND ADDITIONAL COSTS**	
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$ 3,608,602
	ENVIRONMENTAL MITIGATION	$ 16,814,084
	WARRANTIES / LOC'S	$ 970,163
	REAL ESTATE COSTS (NEW ROW)	$ 7,623,974
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$ 3,168,924
	LEGAL FEES	$ 3,000,000
	SALES TAX ON MATERIALS	$ 6,282,990
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$ 200,000
	CONTRACTOR MARK-UP (OH&P) 15%	$ 33,862,823
	SUBTOTAL:	$ 259,614,978
	CONTINGENCY (25%)	$ 64,903,745
	TOTAL (A):	**$ 324,518,723**
14	**SYSTEM UPGRADE FACILITIES (SUF)**	
	DEVELOPER IDENTIFIED SUF	$ 9,227,025
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$ 14,031,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 8,140,309
	TOTAL (B):	**$ 31,398,334**
	TOTAL PROJECT COST (A+B):	**$ 355,917,057**

4.2.4. NAT T009

A summary of the independent cost estimate is shown below:

NAT T009		
	Description	**Total Amount**
1	**CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION**	$ 48,929,055
2	**TRANSMISSION LINE FOUNDATIONS**	$ 40,444,048
3	**STRUCTURES - TRANSMISSION LINE**	$ 57,905,468
4	**CONDUCTOR, SHIELDWIRE, OPGW**	$ 21,865,190
5	**TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE**	$ 5,828,824
6	**NEW DYSINGER SWITCHYARD**	$ 23,229,000
7	**STOLLE ROAD SUBSTATION WORKS:**	$ 14,263,000
8	**GARDENVILLE 345/230kV SUBSTATION WORKS**	$ 12,822,500
9	**NIAGARA SUBSTATION WORK**	$ 4,246,500
10	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**	
	MOB / DEMOB	$ 2,000,000
11	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**	
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$ 16,200,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$ 2,500,000
12	**ENGINEERING**	
	DESIGN ENGINEERING	$ 10,500,000
	LIDAR	$ 800,000
	GEOTECH	$ 1,700,000
	SURVEYING/STAKING	$ 1,000,000
13	**TESTING & COMMISSIONING**	
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$ 2,500,000
14	**PERMITTING AND ADDITIONAL COSTS**	
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$ 4,336,429
	ENVIRONMENTAL MITIGATION	$ 20,514,989
	WARRANTIES / LOC'S	$ 1,358,623
	REAL ESTATE COSTS (NEW ROW)	$ 7,675,534
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$ 4,555,924
	LEGAL FEES	$ 3,500,000
	SALES TAX ON MATERIALS	$ 8,164,882
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$ 200,000
	CONTRACTOR MARK-UP (OH&P) 15%	$ 47,555,995
	SUBTOTAL:	$ 364,595,961
	CONTINGENCY ON ENTIRE PROJECT (25%)	$ 91,148,990
	TOTAL (A):	**$ 455,744,951**
15	**SYSTEM UPGRADE FACILITIES (SUF)**	
	DEVELOPER IDENTIFIED SUF	$ 9,227,025
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$ 14,031,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 8,140,309
	TOTAL (B):	**$ 31,398,334**
	TOTAL PROJECT COST (A+B):	**$ 487,143,285**

4.2.5. National Grid T011

A summary of the independent cost estimate is shown below:

National Grid T011		
	Description	**Total Amount**
1	**CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION**	$ 28,554,443
2	**WG D2 -IDENTIFIED LINE WORK 180, 181, 182 (MINIMAL SOLUTION)**	$ 45,533,358
	WG E NEW BUS TIE BREAKER AT PACKARD STATION TO BE PLACED IN SERIES WITH EXISTING BREAKER R342	$ 880,000
	WG F REPLACE THERMALLY LIMITING EQUIPMENT AT PACKARD STATION FOR LINE 181	$ 200,000
3	**WG-H IDENTIFIED LINE WORK 130, 133**	$ 7,261,318
	WG-I REPLACE THERMALLY LIMITING EQUIPMENT AT HUNTLEY STATION	$ 235,000
4	**WG-J IDENTIFIED LINE WORK 191**	$ 3,670,736
5	**WG-M IDENTIFIED LINE WORK 103, 104**	$ 486,376
	WG-N REPLACE THERMALLY LIMITING EQUIPMENT AT LOCKPORT STATION FOR LINES 101,102	$ 500,000
6	**WG-O - NYSEG/NYPA/N GRID - ELIMINATE DOUBLE CIRCUIT CONTINGENCY FOR LINE 61/64**	$ 1,570,740
	WG-P2 - IDENTIFIED 181 LINE WORK (URBAN SWITCH TO ERIE, NYSEG)	$ 3,564,852
	WG-Q - REPLACE THERMALLY LIMITING EQUIPMENT AT ERIE STN FOR LINE 181	$ 1,250,000
	WG-R - REPLACE THERMALLY LIMITING EQUIPMENT LINE 54 (NYSEG 921)	$ 1,250,000
	WG-U - REPLACE THERMALLY LIMITING EQUIPMENT ROBINSON STN LINE 64	$ 1,700,000
	WG-V - REPLACE THERMALLY LIMITING EQUIPMENT NIAGARA STN LINE 102	$ 500,000
7	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**	
	MOB / DEMOB	$ 1,500,000
8	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**	
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$ 7,920,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$ 1,700,000
9	**ENGINEERING**	
	DESIGN ENGINEERING	$ 5,000,000
	LIDAR	$ 500,000
	GEOTECH	$ 1,100,000
	SURVEYING/STAKING	$ 500,000
10	**TESTING & COMMISSIONING**	
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$ 1,000,000
11	**PERMITTING AND ADDITIONAL COSTS**	
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$ 3,984,698
	ENVIRONMENTAL MITIGATION	$ 227
	WARRANTIES / LOC'S	$ 515,916
	REAL ESTATE COSTS (NEW ROW)	$ -
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$ -
	LEGAL FEES	$ 2,000,000
	SALES TAX ON MATERIALS	$ 1,526,384
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$ 200,000
	CONTRACTOR MARK UP (OH&P) 15%	$ 18,690,607
	SUBTOTAL (A):	$ 143,294,655
	CONTINGENCY ON ENTIRE PROJECT (20%)	$ 28,658,931
	TOTAL (A):	$ 171,953,586
12	**SYSTEM UPGRADE FACILITIES (SUF)**	
	DEVELOPER IDENTIFIED SUF	$ -
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$ 3,750,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 1,312,500
	SUBTOTAL (B):	$ 5,062,500
	TOTAL PROJECT COST (A+B):	$ 177,016,086

4.2.6. National Grid T012

A summary of the independent cost estimate is shown below:

National Grid T012			
	Description		Total Amount
1	CLEARING & ACCESS WORKS FOR T-LINE CONSTRUCTION	$	77,418,870
2	WG A - NEW 230kV NIAGARA TO GARDENVILLE LINE & RELOCATIONS	$	70,767,955
	WG B NEW 230kV LINE ASSOCIATED WORK AT GARDENVILLE SUBSTATION	$	1,105,500
	WG C NEW 230kV LINE - NIAGARA SUBSTATION CONNECTION	$	1,075,000
3	WG-D1 REBUILD & RE-CONDUCTOR	$	55,276,810
	WG-E NEW BUS BREAKER AT PACKARD STATION	$	880,000
	WG-F REPLACE THERMALLY LIMITING EQUIPMENT AT PACKARD SUBSTATION FOR LINE 181	$	200,000
	WG-G NEW 115kV SWITCHING STATION	$	11,169,000
4	WG-H PACKARD-HUNTLEY & WALCK-HUNTLEY DOUBLE CIRCUIT LINE WORKS	$	7,261,318
	WG-I - UPGRADE AMPACITY OF LINES 130 AND 133 AT HUNTLEY SUBSTATION	$	235,000
5	WG-J - REFURBISHMENT WORKS ON LINES 191	$	3,670,736
6	WG-M - LINE WORK 103,104	$	486,376
	WG-N - LINE WORK 101, 102, 103, 104	$	500,000
7	WG-O - NYSEG/NYPA/N GRID - ELIMINATE DOUBLE CIRCUIT CONTINGENCY FOR LINE 61/64	$	1,570,740
	WG-P1 - IDENTIFIED 181 LINE WORK (URBAN SWITCH TO ERIE, NYSEG)	$	5,366,640
	WG-Q - REPLACE THERMALLY LIMITING EQUIPMENT AT ERIE STN FOR LINE 181	$	1,250,000
	WG-R - REPLACE THERMALLY LIMITING EQUIPMENT LINE 54 (NYSEG 921)	$	1,250,000
	WG-U - REPLACE THERMALLY LIMITING EQUIPMENT ROBINSON STN LINE 64	$	1,700,000
	WG-V - REPLACE THERMALLY LIMITING EQUIPMENT NIAGARA STN LINE 102	$	500,000
8	CONTRACTOR MOBILIZATION / DEMOBILIZATION		
	MOB / DEMOB	$	2,000,000
9	PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES		
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$	12,600,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$	2,500,000
10	ENGINEERING		
	DESIGN ENGINEERING	$	10,000,000
	LIDAR	$	800,000
	GEOTECH	$	1,800,000
	SURVEYING/STAKING	$	800,000
11	TESTING & COMMISSIONING		
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$	2,500,000
12	PERMITTING AND ADDITIONAL COSTS		
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$	5,965,150
	ENVIRONMENTAL MITIGATION	$	7,796,225
	WARRANTIES / LOC'S	$	1,277,797
	REAL ESTATE COSTS (NEW ROW)	$	172,069
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$	1,157,000
	LEGAL FEES	$	2,000,000
	SALES TAX ON MATERIALS	$	4,574,892
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$	200,000
	CONTRACTOR MARK UP (OH&P) 15%	$	44,674,062
	SUBTOTAL:	$	342,501,140
	CONTINGENCY ON ENTIRE PROJECT (25%)	$	85,625,285
	TOTAL (A):	$	428,126,425
13	SYSTEM UPGRADE FACILITIES (SUF)		
	DEVELOPER IDENTIFIED SUF	$	-
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$	3,750,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$	1,312,500
	TOTAL (B):	$	5,062,500
	TOTAL PROJECT COST (A+B):	$	433,188,925

4.2.7. NYPA/NYSEG T013

A summary of the independent cost estimate is shown below:

NYPA/NYSEG T013			
	Description	**Total Amount**	
1	**DYSINGER SWITCHING STATION**	$	21,947,000
2	**GARDENVILLE TO STOLLE ROAD 230KV TRANSMISSION LINE RECONDUCTORING**	$	14,140,200
3	**LINE SEPARATION**	$	2,292,025
4	**SOUTH PERRY SUBSTATION**	$	5,421,000
5	**STOLLE ROAD SUBSTATION**	$	36,859,022
6	**DYSINGER - STOLLE ROAD NEW 345kV TRANSMISSION LINE**	$	46,864,263
7	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**		
	MOB / DEMOB	$	1,500,000
8	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**		
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$	7,700,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$	1,800,000
9	**ENGINEERING**		
	DESIGN ENGINEERING	$	6,000,000
	LIDAR	$	500,000
	GEOTECH	$	800,000
	SURVEYING/STAKING	$	500,000
10	**TESTING & COMMISSIONING**		
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$	2,500,000
11	**PERMITTING AND ADDITIONAL COSTS**		
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$	2,366,540
	ENVIRONMENTAL MITIGATION	$	6,312,700
	WARRANTIES / LOC'S	$	693,715
	REAL ESTATE COSTS (NEW ROW)	$	497,876
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$	1,613,000
	LEGAL FEES	$	2,000,000
	SALES TAX ON MATERIALS	$	5,380,386
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$	200,000
	CONTRACTOR MARK UP (OH&P) 15%	$	25,183,159
	SUBTOTAL:	$	193,070,886
	CONTINGENCY ON ENTIRE PROJECT (20%)	$	38,614,177
	TOTAL PROJECT COST:	$	231,685,063
	Note: System Impact Study completed and no additional system upgraded facilities (SUF) beyond Developer proposal identified or anticipated.		

4.2.8. NextEra T014

A summary of the independent cost estimate is shown below:

NextEra T014		
	Description	**Total Amount**
1	**CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION**	$ 12,717,405
2	**TRANSMISSION LINE FOUNDATIONS**	$ 3,200,398
3	**STRUCTURES - TRANSMISSION LINE**	$ 4,688,312
4	**CONDUCTOR, SHIELDWIRE, OPGW**	$ 6,137,208
5	**TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE**	$ 1,382,170
6	**NEW DYSINGER SUBSTATION**	$ 37,852,000
7	**EAST STOLLE RD SUBSTATION**	$ 13,963,000
8	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**	
	MOB / DEMOB	$ 800,000
9	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**	
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$ 3,080,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$ 1,400,000
10	**ENGINEERING**	
	DESIGN ENGINEERING	$ 3,600,000
	LIDAR	$ 400,000
	GEOTECH	$ 600,000
	SURVEYING/STAKING	$ 400,000
11	**TESTING & COMMISSIONING**	
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$ 1,600,000
12	**PERMITTING AND ADDITIONAL COSTS**	
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$ 2,312,325
	ENVIRONMENTAL MITIGATION	$ 9,472,635
	WARRANTIES / LOC'S	$ 459,515
	REAL ESTATE COSTS (NEW ROW)	$ 391,346
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$ 1,793,000
	LEGAL FEES	$ 2,000,000
	SALES TAX ON MATERIALS	$ 3,219,867
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$ 200,000
	CONTRACTOR MARK-UP (OH&P) 15%	$ 16,750,377
	SUBTOTAL:	$ 128,419,558
	CONTINGENCY (20%)	$ 25,683,912
	TOTAL (A):	**$ 154,103,470**
13	**SYSTEM UPGRADE FACILITIES (SUF)**	
	DEVELOPER IDENTIFIED SUF	$ 15,955,790
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$ 3,750,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 6,897,027
	TOTAL (B):	**$ 26,602,817**
	TOTAL PROJECT COST (A+B):	**$ 180,706,286**

4.2.8.1. NextEra T014 Alternative

A summary of the independent cost estimate is shown below:

NextEra T014 Alternative		
	Description	**Total Amount**
1	**CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION**	$ 13,571,466
2	**TRANSMISSION LINE FOUNDATIONS**	$ 10,001,353
3	**STRUCTURES - TRANSMISSION LINE**	$ 12,215,200
4	**CONDUCTOR, SHIELDWIRE, OPGW**	$ 6,089,688
5	**TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE**	$ 1,829,571
6	**NEW DYSINGER SUBSTATION**	$ 37,852,000
7	**EAST STOLLE RD SUBSTATION**	$ 13,963,000
8	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**	
	MOB / DEMOB	$ 1,000,000
9	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**	
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$ 4,900,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$ 1,400,000
10	**ENGINEERING**	
	DESIGN ENGINEERING	$ 4,770,000
	LIDAR	$ 500,000
	GEOTECH	$ 1,100,000
	SURVEYING/STAKING	$ 500,000
11	**TESTING & COMMISSIONING**	
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$ 1,600,000
12	**PERMITTING AND ADDITIONAL COSTS**	
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$ 3,477,113
	ENVIRONMENTAL MITIGATION	$ 8,002,635
	WARRANTIES / LOC'S	$ 575,441
	REAL ESTATE COSTS (NEW ROW)	$ 7,993,538
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$ 90,000
	LEGAL FEES	$ 3,500,000
	SALES TAX ON MATERIALS	$ 4,064,839
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$ 200,000
	CONTRACTOR MARK-UP (OH&P) 15%	$ 20,879,377
	SUBTOTAL:	$ 160,075,220
	CONTINGENCY (20%)	$ 32,015,044
	TOTAL (A):	**$ 192,090,264**
13	**SYSTEM UPGRADE FACILITIES (SUF)**	
	DEVELOPER IDENTIFIED SUF	$ 15,955,790
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$ 3,750,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 6,897,027
	TOTAL (B):	**$ 26,602,817**
	TOTAL PROJECT COST (A+B):	**$ 218,693,080**

4.2.9. NextEra T015

A summary of the independent cost estimate is shown below:

NextEra T015		
	Description	**Total Amount**
1	**CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION**	$ 12,717,405
2	**TRANSMISSION LINE FOUNDATIONS**	$ 3,200,398
3	**STRUCTURES - TRANSMISSION LINE**	$ 4,688,312
4	**CONDUCTOR, SHIELDWIRE, OPGW**	$ 6,137,208
5	**TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE**	$ 1,382,170
6	**NEW DYSINGER SUBSTATION**	$ 25,374,000
7	**EAST STOLLE RD SUBSTATION**	$ 13,963,000
8	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**	
	MOB / DEMOB	$ 800,000
9	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**	
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$ 3,080,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$ 1,400,000
10	**ENGINEERING**	
	DESIGN ENGINEERING	$ 3,000,000
	LIDAR	$ 400,000
	GEOTECH	$ 600,000
	SURVEYING/STAKING	$ 400,000
11	**TESTING & COMMISSIONING**	
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$ 1,000,000
12	**PERMITTING AND ADDITIONAL COSTS**	$ -
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$ 2,312,325
	ENVIRONMENTAL MITIGATION	$ 9,472,635
	WARRANTIES / LOC'S	$ 395,286
	REAL ESTATE COSTS (NEW ROW)	$ 391,346
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$ 1,793,000
	LEGAL FEES	$ 2,000,000
	SALES TAX ON MATERIALS	$ 1,442,611
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$ 200,000
	CONTRACTOR MARK-UP (OH&P) 15%	$ 14,422,454
	SUBTOTAL:	$ 110,572,150
	CONTINGENCY (20%)	$ 22,114,430
	TOTAL (A):	**$ 132,686,580**
13	**SYSTEM UPGRADE FACILITIES (SUF)**	
	DEVELOPER IDENTIFIED SUF	$ 15,955,790
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$ 3,750,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 6,897,027
	TOTAL (B):	**$ 26,602,817**
	TOTAL PROJECT COST (A+B):	**$ 159,289,397**

4.2.9.1. NextEra T015 Alternative

A summary of the independent cost estimate is shown below:

NextEra T015 Alternative		
	Description	**Total Amount**
1	**CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION**	$ 13,571,466
2	**TRANSMISSION LINE FOUNDATIONS**	$ 10,001,353
3	**STRUCTURES - TRANSMISSION LINE**	$ 12,215,200
4	**CONDUCTOR, SHIELDWIRE, OPGW**	$ 6,089,688
5	**TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE**	$ 1,829,571
6	**NEW DYSINGER SUBSTATION**	$ 25,374,000
7	**EAST STOLLE RD SUBSTATION**	$ 13,963,000
8	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**	
	MOB / DEMOB	$ 1,000,000
9	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**	
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$ 4,900,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$ 1,400,000
10	**ENGINEERING**	
	DESIGN ENGINEERING	$ 4,170,000
	LIDAR	$ 500,000
	GEOTECH	$ 1,100,000
	SURVEYING/STAKING	$ 500,000
11	**TESTING & COMMISSIONING**	
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$ 1,000,000
12	**PERMITTING AND ADDITIONAL COSTS**	
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$ 3,477,113
	ENVIRONMENTAL MITIGATION	$ 8,002,635
	WARRANTIES / LOC'S	$ 511,213
	REAL ESTATE COSTS (NEW ROW)	$ 7,993,538
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$ 90,000
	LEGAL FEES	$ 3,500,000
	SALES TAX ON MATERIALS	$ 2,287,583
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$ 200,000
	CONTRACTOR MARK-UP (OH&P) 15%	$ 18,551,454
	SUBTOTAL:	$ 142,227,813
	CONTINGENCY (20%)	$ 28,445,563
	TOTAL (A):	**$ 170,673,376**
13	**SYSTEM UPGRADE FACILITIES (SUF)**	
	DEVELOPER IDENTIFIED SUF	$ 15,955,790
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$ 3,750,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 6,897,027
	TOTAL (B):	**$ 26,602,817**
	TOTAL PROJECT COST (A+B):	**$ 197,276,192**

4.2.10. Exelon T017

A summary of the independent cost estimate is shown below:

Exelon T017		
	Description	**Total Amount**
1	**CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION**	$ 40,368,420
2	**TRANSMISSION LINE FOUNDATIONS**	$ 16,694,900
3	**STRUCTURES - TRANSMISSION LINE**	$ 30,784,427
4	**CONDUCTOR, SHIELDWIRE, OPGW**	$ 15,797,866
5	**TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE**	$ 4,498,017
6	**STOLLE ROAD SUBSTATION WORKS:**	$ 3,616,500
7	**GARDENVILLE 230kV SUBSTATION WORKS**	$ 3,414,500
8	**NIAGARA SUBSTATION WORK**	$ 4,209,000
9	**CONTRACTOR MOBILIZATION / DEMOBILIZATION**	
	MOB / DEMOB	$ 1,500,000
10	**PROJECT MANAGEMENT, MATERIAL HANDLING & AMENITIES**	
	PROJECT MANAGEMENT & STAFFING (INCLUDES PM, FIELD ENGINEERS / SUPERVISION, SCHEDULER AND COST MANAGER, SHEQ STAFF, ADMIN, MATERIALS MANAGEMENT STAFF)	$ 11,200,000
	SITE ACCOMMODATION, FACILITIES, STORAGE	$ 2,000,000
11	**ENGINEERING**	
	DESIGN ENGINEERING	$ 7,200,000
	LIDAR	$ 800,000
	GEOTECH	$ 1,700,000
	SURVEYING/STAKING	$ 1,000,000
12	**TESTING & COMMISSIONING**	
	TESTING & COMMISSIONING OF T-LINE AND EQUIPMENT	$ 1,800,000
13	**PERMITTING AND ADDITIONAL COSTS**	
	ENVIRONMENTAL LICENSING & PERMITTING COSTS	$ 2,859,705
	ENVIRONMENTAL MITIGATION	$ 18,601,683
	WARRANTIES / LOC'S	$ 786,713
	REAL ESTATE COSTS (NEW ROW)	$ 7,017,412
	REAL ESTATE COSTS (INCUMBENT UTILITY ROW)	$ 2,774,000
	LEGAL FEES	$ 3,500,000
	SALES TAX ON MATERIALS	$ 3,864,884
	FEES FOR PERMITS, INCLUDING ROADWAY, RAILROAD, BUILDING OR OTHER LOCAL PERMITS	$ 200,000
	CONTRACTOR MARK-UP (OH&P) 15%	$ 27,928,204
	SUBTOTAL:	$ 214,116,230
	CONTINGENCY ON ENTIRE PROJECT (25%)	$ 53,529,058
	TOTAL (A):	**$ 267,645,288**
14	**SYSTEM UPGRADE FACILITIES (SUF)**	
	DEVELOPER IDENTIFIED SUF	$ 15,787,200
	SYSTEM IMPACT STUDY IDENTIFIED SUF: (including potential additional SUFs)	$ 7,500,000
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 8,150,520
	TOTAL (B):	**$ 31,437,720**
	TOTAL PROJECT COST (A+B):	**$ 299,083,008**

4.3. Risk

The review team completed an evaluation of the potential risks associated with the proposals. The review team has summarized the significant risks, including those previously identified by each Developer. The review team's evaluation was based on the team's collective experience with transmission line and substation projects in New York State.

The significant drivers to the project risks considered were:

- Article VII review approval process and potential environmental issues
- Procurement of major equipment
- Real Estate acquisition
- Construction

A qualitative assessment of the risks was used in determining the potential impact on the schedule and the amount of contingency to be included in each Developers' independent cost estimates. The largest risk involves the projects where significant new ROW will be required. A larger contingency was factored into those cost estimates. Also, since detailed studies have not been completed, additional contingency for unanticipated System Upgrade Facilities (SUF) such as overdutied breakers was included in the cost estimates.

4.3.1. Common Risks

Many of the risks are common to all proposals and are summarized below.

#	Risk Title	Description	Comment
1	Article VII Certificate	Article VII review approval process could take longer than estimated in schedule for a variety of reasons. (i.e., additional special studies requested by involved agencies, lack of stakeholder consensus)	Developer needs early outreach with all stakeholders and to prepare a comprehensive application. Teams experienced with Article VII process will be essential.
2	Other environmental approvals.	Federal agency and other approvals could take longer than State Article VII process. This could become more likely if cutbacks of funding to regulatory agencies affect employee staffing.	Developer needs early outreach with Federal Agencies and others, to prepare comprehensive applications and obtain approvals in parallel with Article VII process.

3	Public Opposition	If local groups or citizens oppose the project it could cause significant delays especially if opposition results in litigation.	Opposition and litigation risk is more likely with new ROW than with existing ROW. Developer needs early outreach to solicit public involvement, incorporate public concerns during planning stage before project execution, build mitigation into design, and foster community buy-in.
4	EM&CP Approval	EM&CP approval process could take longer than estimated in schedule.	Developer needs to prepare a comprehensive plan. Teams experience with DPS, DEC, Ags. & Markets and other agency requirements will be essential.
5	Environmental Study Findings	Environmental studies could find critical habitat; wetlands; agricultural lands; rare, threatened or endangered species; cultural or archeological sites: etc. that could require reroutes of lines or special conditions such as seasonal restriction on construction. Time of year when studies can be conducted could also affect project schedule.	Studies need to be scheduled and conducted early in the process to ensure design and EM&CP adequately minimizes, mitigates or avoids environmental impacts.
6	Unknown environmental conditions discovered during construction	During construction the Developer could encounter previously unidentified issues, such as contaminated soil, archeological remains, rare, threatened or endangered species, unidentified utilities, etc.	Environmental monitor will be on-site during construction. Such findings could require relocating and redesigning structures resulting in construction delays.
7	Work on Incumbent/Other	Upgrade to facilities not owned and operated by Developer are dependent on the specific design	Influence by the NYISO or PSC may be required to incentivize third party

	Utilities Facilities	requirement, willingness and schedule of the incumbent utility companies.	owners
8	Material Shortages	Material and equipment shortages and delayed shipments.	Mitigated by proper QA during engineering to insure adequate quantities ordered. Procurement with sufficient period of float between scheduled deliveries from suppliers and when material is needed for construction and proactive monitoring and expediting.
9	Need for additional System Upgrade Facilities	Completion of the detailed studies such as fault studies for the project will normally be completed during the SIS, the Facilities Study and detailed engineering.	The reinforcements proposed by the Developers may overduty and require replacement of some breakers and protection equipment on the existing system. Additional thermal overloads may be identified.

4.3.2. Developer Specific Risks

Summarized below are the review team's most significant findings for each Developer. This is not all inclusive but is intended to provide a summary of those items that are most critical.

4.3.2.1. *North American Transmission*

- **NAT Proposal T006** (Dysinger to Stolle 345 kV)

#	Risk Title	Description	Comment
1	Reliability Concern - Stolle Road Substation (Avangrid Owned) - Third Transformer	Proposal calls for the addition of a third 345 –115 kV transformer in parallel with the existing two transformers. This will expose all three transformers to outages for a single contingency.	The NYISO evaluated reliability impacts and considered the configuration in its technical analysis. Incumbent utility may request additional breakers, protective relays and associated equipment.
2	Design Concern - Stolle Road Substation (Avangrid Owned) - Third Transformer	Proposal calls for adding two 345kV breakers and related equipment to create a ring bus and a new line terminal. It also calls for the addition of a third 345 –115 kV transformer. This will be installed just west of existing transformers.	The proposed location of the new transformer will reduce access to the existing west transformer and the 345 kV yard. The transformer will also be in close proximity to the existing transformer and control house which would require fire walls. The new transformer should be relocated to the east and a fire wall installed between the new and existing east transformer. This will require expansion of fenced area. Included cost in independent estimate.

- **NAT Proposal T007** (Dysinger to Stolle 345kV and Stolle Gardenville 345kV)

#	Risk Title	Description	Comment
1	Right-of-way Acquisition	Acquisition cost of ROW may be higher than estimated and procurement may impact schedule. 6 gaps exist on the existing ROW to be utilized for the Dysinger to Stolle line. The Stolle to Gardenville 345kV line will require 179 acres of new ROW. 2 houses and 2 commercial properties are located on the proposed Stolle to Gardenville ROW. 35 parcels to be crossed by the proposed Stolle to Gardenville line contain houses within the parcel.	The ROW issue is mitigated by having a conservative estimate for ROW that includes a premium over market value, as well as project contingency funds.
2	Design Concern - Gardenville Substation (National Grid Owned) - Options 2 & 3	NAT proposes installing a new 345-230kV transformer in a new station adjacent to and connecting into NGRID's Gardenville substation and includes installing a three-bay breaker-and-a-half station with overhead transmission-lines interconnecting the new station with Gardenville. Option 1 involves the use of property located between the existing substations owned by National Grid. Option 2 and 3 require purchase of additional property adjacent to industrial and residential properties.	These two options represent improved reliability over NAT Option 1, but carry a significant cost increase to the project, additional construction time, and increased potential for public and land owner opposition in developing either of the two proposed sites. The NYISO considered Option 1 in its technical evaluations.

- **NAT Proposal T008** (Dysinger to Stolle 345kV and Stolle Gardenville 345kV and 2'nd Dysinger to Stolle line)

#	Risk Title	Description	Comment
1	Right-of-way Acquisition	Acquisition cost of ROW may be higher than estimated and procurement may impact schedule. 6 gaps exist on the existing ROW to be utilized for the Dysinger to Stolle line. The Stolle to Gardenville 345kV line will require 179 acres of new ROW. 2 houses and 2 commercial properties are located on the proposed Stolle to Gardenville ROW. 35 parcels to be crossed by the proposed Stolle to Gardenville line contain houses within the parcel.	The ROW issue is mitigated by having a conservative estimate for ROW that includes a premium over market value, as well as project contingency funds.
2	Design Concern - Gardenville Substation (National Grid Owned) - Options 2 & 3	NAT proposes installing a new 345-230kV transformer in a new station adjacent to and connecting into NGRID's Gardenville substation and includes installing a three-bay breaker-and-a-half station with overhead transmission-lines interconnecting the new station with Gardenville. Option 1 involves the use of property located between the existing substations owned by National Grid. Option 2 and 3 require purchase of additional property adjacent to industrial and residential properties.	These two options represent improved reliability over NAT Option 1, but carry a significant cost increase to the project, additional construction time, and increased potential for public and land owner opposition in developing either of the two proposed sites. The NYISO considered Option 1 in its technical evaluations.

- **NAT Proposal T009** (Dysinger to Stolle 345kV and Stolle Gardenville 345kV and 2'nd Dysinger to Stolle line and Niagara to Dysinger 345kV line)

#	Risk Title	Description	Comment
1	Right-of-way Acquisition	Acquisition cost of ROW may be higher than estimated and procurement may impact schedule. 6 gaps exist on the existing ROW to be utilized for the Dysinger to Stolle lines. The Stolle to Gardenville 345kV line will require 182 acres of new ROW. 2 houses and 2 commercial properties are located on the proposed Stolle to Gardenville ROW. 35 parcels to be crossed by the proposed Stolle to Gardenville line contain houses within the parcel. 6 gaps exist on the existing ROW to be utilized for the Niagara to Dysinger line. At the NYPA cross state 345kv crossing, it appears that the existing ROW may need to be widened to accommodate the proposed horizontal configuration of the new line.	The ROW issue is mitigated by having a conservative estimate for ROW that includes a premium over market value, as well as project contingency funds.
2	Design Concern - Gardenville Substation (National Grid Owned) - Options 2 & 3	NAT proposes installing a new 345-230kV transformer in a new station adjacent to and connecting into NGRID's Gardenville substation and includes installing a three-bay breaker-and-a-half station with overhead transmission lines interconnecting the new station with Gardenville. Option 1 involves the use of property located between the existing substations owned by National Grid. Option 2 and 3 require purchase of additional property adjacent to industrial and residential properties.	These two options represent improved reliability over NAT Option 1, but carry a significant cost increase to the project, additional construction time, and increased potential for public and land owner opposition in developing either of the two proposed sites. The NYISO considered Option 1 in its technical evaluation.

3	Crossing of the NYPA cross state 345kv lines	NAT proposed crossing over the existing 345kV with 3 pole horizontal configuration – each 195 ft. structure height on either side. In addition to the construction risks of crossing these lines, if the new line is to cross over the top of the existing lines, there may be concern that throughout the life of the facilities, failure of the top circuit would result in outage of both cross- state lines at the same time.	NYPA and/or other entities concerned with reliability of the Bulk Power System may require the incorporation of additional design measures to minimize or eliminate this risk. Crossing under would help mitigate the risk. From a contingency analysis perspective, line crossingis not a defined NERC design contingency in planning studies.

4.3.2.2. *National Grid*

- **Moderate Power Transfer T011**

#	Risk Title	Description	Comment
1	No critical risks identified		

- **High Power Transfer T012**

#	Risk Title	Description	Comment
1	No Critical risks identified		

4.3.2.3. *NYPA/NYSEG*

- **Proposal T013** (Dysinger to Stolle 345kV, Reconductor Stolle -Gardenville 230kV)

#	Risk Title	Description	Comment
1	No Critical risks identified		

4.3.2.4. *NextEra*

- **Proposal T014 Base Proposal on existing ROW** (Dysinger Stolle w/phase shifter)

#	Risk Title	Description	Comment
1	No Critical risks identified		

- **Proposal T014 Alternative Proposal on new ROW (Dysinger Stolle w/phase shifter)**

#	Risk Title	Description	Comment
1	Right-of-way Acquisition (*for Alternate to build on new ROW*)	Acquisition cost of ROW may be higher than estimated and procurement may impact schedule. Constructing the Dysinger to Stolle 345kV line off the existing ROW will require 252 acres of new ROW. 5 houses are located on the proposed new Dysinger to Stolle ROW. 86 parcels to be crossed by the proposed Dysinger to Stolle line contain houses within the parcel. NextEra's alternative proposal includes 9 crossings of the existing NYSEG ROW (with existing 230kV line). This has the risk of outages required during construction, potential of upper circuit falling into lower circuit taking out both lines at once throughout the life of the line(s) and could limit or impede future utilization of the existing ROW for additional circuit(s).	Mitigation is best achieved by allowing adequate time and money to acquire ROW and for possible condemnation. Also utilization of existing utility owned ROW will greatly reduce risk. The risk is minimal if they build on the existing ROW as included in their base proposal.

- **Proposal T015 Base Proposal on existing ROW** (Dysinger Stolle w/o phase shifter)

#	Risk Title	Description	Comment
1	No Critical risks identified		

- **Proposal T015 Alternative Proposal on new ROW (Dysinger Stolle w/o phase shifter)**

#	Risk Title	Description	Comment
1	Right-of-way Acquisition (*for Alternate to build on new ROW*)	Acquisition cost of ROW may be higher than estimated and procurement may impact schedule. Constructing the Dysinger to Stolle 345kV line off the existing ROW will require 252 acres of new ROW. 5 houses are located on the proposed new Dysinger to Stolle ROW. 86 parcels to be crossed by the proposed Dysinger to Stolle line contain houses within the parcel. NextEra's alternative proposal includes 9 crossings of the existing NYSEG ROW (with existing 230kV line). This has the risk of outages required during construction, potential of upper circuit falling into lower circuit taking out both lines at once throughout the life of the line(s) and could limit or impede future utilization of the existing ROW for additional circuit(s).	Mitigation is best achieved by allowing adequate time and money to acquire ROW and for possible condemnation. Also utilization of existing Utility owned ROW will greatly reduce risk. The risk is minimal if they build on the existing ROW as included in their base proposal.

4.3.2.5. *Exelon*

- **Exelon Proposal T017** (Niagara to Stolle and New Gardenville to Stolle 230kV)

#	**Risk Title**	**Description**	**Comment**
1	Right-of-way Acquisition	Acquisition cost of ROW may be higher than estimated and procurement may impact schedule. Many gaps exist on the existing National Grid ROW to be utilized for the Niagara to Dysinger line segment. To fill those gaps, 53 acres of new ROW will need to be acquired in	Mitigation is best achieved by allowing adequate time and money to acquire ROW and for possible condemnation.

		addition to the ROW to be obtained from National Grid. Constructing the Dysinger to Stolle line segment will require .68 acres of new ROW. Construction of the new Stolle to Gardenville line will require 141 acres of new ROW. 4 houses and 1 commercial properties are located on the proposed new Stolle to Gardenville ROW. 35 parcels to be crossed by the proposed Stolle to Gardenville line contain houses within the parcel.	
2	Crossing of the NYPA cross state 345kv lines	Exelon proposed crossing under the existing 345 kV with single pole delta configuration – 105 ft and 100 ft heights either side. In addition to the construction risks of crossing these lines, there may be concern that throughout the life of the facilities, failure of the top circuit would result in outage of both a cross state line and the new line at the same time.	NYPA and or other entities concerned with reliability of the Bulk system may require the incorporation of additional design measures to minimize or eliminate this risk. From a contingency analysis perspective, line crossing is not a defined NERC design contingency event in planning studies.
3	Re-use of existing structures	During construction the Developer could discover that structures originally planned for re-use are in worse condition than expected and require repair or replacement. Exelon is assuming that all existing structures and foundations on National Grid Line Nos. 130 & 133 can be re-used. It is highly likely that some of these structures will need to be replaced or repaired.	Thorough inspection of existing structures is advisable prior to completing final design.
4	Reliability Concern - Gardenville Substation (Avangrid Owned) -New	Exelon proposes connecting a new 230 kV transmission line into Gardenville with a new line terminal and a single 230kV circuit breaker.	While this may be the simplest arrangement, it also provides the least amount of reliability. With this configuration, a failed breaker or a bus fault will cause a loss of 230kV Line 66 to Stolle Road and a loss of Transformer

	Line Terminal		Bank #7. Incumbent utility may request additional breakers, protective relays and associated equipment, which would increase project cost.
5	Reliability Concern - Stolle Road Substation (Avangrid Owned) -New Line Terminal	Exelon proposes connecting a new 230kV transmission line into Stolle Road with a new line terminal and a single 230kV circuit breaker.	While this may be the simplest arrangement and it matches the existing 230kV transmission line arrangements, it also provides the least amount of reliability. With this configuration, a failed breaker or a bus fault will cause a loss of 230kV Line 66 to Gardenville, a loss of 230kV Line 67 to High Sheldon, and a loss of 230kV Line 65 to Lewiston. Incumbent utility may request additional breakers, protective relays and associated equipment, which would increase project cost.
6	Reliability Concern - Stolle Road Substation (Avangrid Owned)	Exelon proposes connecting a new 345kV transmission line into Stolle Road by adding a 345kV circuit breaker with disconnect switches to the existing bay. The line will terminate at the existing east dead end tower.	While this may be the simplest arrangement, it also provides the least amount of reliability. With this configuration, a failed breaker or a bus fault will cause a loss of 345kV Line 37 to Homer City and a loss of Transformer Banks #3 and #4. Incumbent utility may request additional breakers, protective relays and associated equipment, which would increase project cost.

4.4. Expandability

The NYISO OATT section 31.4.8.1.3 prescribed the following: "The expandability of the proposed regulated Public Policy Transmission Project. The ISO will consider the impact of the proposed project on future construction. The ISO will also consider the extent to which any subsequent expansion will continue to use this proposed project within the context of system expansion."

The review team conducted an evaluation of the expansion capability of the Developers' proposals. The review centered predominately on the Developers' claims as presented in their proposals and additional information provided in response to a NYISO RFI. Below is a summary of the most significant items.

Items that may be considered that would be common to all proposals:

1. New line segments could be designed for double circuit capability. The Developers have not included such a design in their proposals.
2. Similarly the transmission lines could be constructed with higher ampacity conductor or re-conductored in the future.
3. The western New York system could be expanded in the future with the modifications as proposed by Developers other than the project ultimately selected by the NYISO. For example, National Grid's solution could be further expanded by constructing new lines and modifications as proposed by the other Developers.

Significant items specific to each Developer:

#	Developer	Transmission Line Expandability	Substation Expandability
T006 T007 T008 T009	North American Transmission	NAT's four proposals build upon each other providing potential expandability should the NYISO select one of the lower tier proposals.	Dysinger substation could be expanded to bring the 345 kV Somerset to Rochester T-line or the 230 kV Niagara to Stolle Road line with the installation of a 345-230 kV transformer.
T011 T012	National Grid	No significant expandability to NGRID's proposal beyond the common items mentioned above.	For T012, the proposed New Park Club Lane station will include a spare bay position.
T013	NYPA/NYSEG	No significant expandability to NYPA/NYSEG proposal beyond the common items mentioned above.	As proposed, the new 345 kV Dysinger station and the expansion of the 345 kV Stolle Road station will include spare bays. At both stations, the control houses will be constructed to accommodate further yard expansions without adding on to the buildings. Their initial design also includes significant build out and conversion of 230 kV and 345 kV busses to breaker and half schemes at Stolle Rd.
T014 T015	NextEra	No significant expandability to NextEra proposal beyond the common items mentioned above.	NextEra's proposed design for the 345 kV Dysinger station includes one open bay position. Their initial design also includes the termination of both cross state transmission lines into Dysinger.
T017	Exelon	No significant expandability to Exelon proposal beyond the common items	Dysinger substation could be constructed in the future to provide additional operating flexibility.

		mentioned above.	

4.5. Site Control and Real Estate

4.5.1. Site Control

The NYISO OATT section 31.4.8.1.6 states the following: "The extent to which the Developer of a proposed regulated Public Policy Transmission Project has the property rights, or ability to obtain the property rights, required to implement the project. The ISO will consider whether the Developer: (i) already possesses the rights of way necessary to implement the project; (ii) has completed a transmission routing study, which (a) identifies a specific routing plan with alternatives, (b) includes a schedule indicating the timing for obtaining siting and permitting, and (c) provides specific attention to sensitive areas (e.g., wetlands, river crossings, protected areas, and schools); or (iii) has specified a plan or approach for determining routing and acquiring property rights."

The review team conducted a review of the Developers' property rights acquisition plans associated with the proposals. The review centered on the Developers' claims as presented in their proposals and additional information provided in response to a NYISO RFI submitted to Developers in March 2017.

In all proposals, the following characteristics are common for the property rights acquisition process:

- Use existing ROW as much as practical.
- Where additional ROWs must be acquired, it will be accomplished through arm's length negotiation with property owners.
- If negotiations are unsuccessful, the property will be acquired through eminent domain.
- All Developers have completed preliminary routing of proposed line.

The non-incumbent Developers all claim two common rights to assist in obtaining property:

- They cite the recent 12/17/15 PSC order (Case 12-T-0502) related to the AC Transmission proceeding as have applicability to this project in terms of obtaining access to the incumbent utility ROW. The Order stated on page 60: *"Incumbent utilities should offer competitors the same terms they offer Transco; there should be no bias shown to Transco."* Further on page 60 the PSC Order states: *"Commission expects the utility company owner to bargain in good faith to reach an agreement with the developer of the transmission solution as to property access and compensation as it would for other linear project developers that seek to co-locate on utility property."* If negotiations with private land owners are unsuccessful, the Developer believes that under New York State Law they will have eminent domain authority after certification of a route by the NYPSC.

Below is a summary of the teams' review:

#	Developer	Property Rights Acquisition
T006 T007 T008 T009	North American Transmission	Their plan for T006 relies on use of the incumbent utility ROW with the exception of property to be acquired for the Dysinger and Stolle Road substations. Proposals T007, T008 and T009 require significant new ROW.The real estate requirements are further detailed in the Real Estate Analysis. Risk associated with obtaining the new ROW is documented in the Risk Section. NAT lays out a detailed plan for obtaining site control. 1. They would rely on affiliates of LS Power who have experience in negotiating easements and joint use agreements, which have been developed for many past generation and transmission projects. 2. The Developer states that landowner outreach will be accomplished through direct mailings, a website, advertisements, and public meetings. 3. Regarding use of incumbent utility ROW, they cite the recent PSC order related to the AC Transmission proceeding as having applicability to this project in terms of obtaining access to the incumbent utility ROW. 4. Regarding private property, they provide an opinion letter from Harris Beach PLLC asserting the ability of private Developers of electric transmission facilities to acquire real property, including utility-owned rights-of-way, through condemnation if necessary. They state: "North America Transmission Corporation is a transportation corporation under New York State Law. Accordingly, North America Transmission Corporation will have eminent domain authority after certification of a route by the NYPSC, in the event bilateral negotiations with landowners is not successful. Such a condemnation will be possible after a public interest finding by the NYPSC under Article VII of the PSL." NAT does not yet possess the required ROWs. However, they have a well-documented plan to obtain property. North American Transmission Corporation, as a New York Transportation Corporation, will own the Bulk Power System assets included within its proposal, except for any real estate within the existing substations associated with the interconnections. NAT stated that they would acquire easements for the ROW.

T011 T012	National Grid	NGRID completed a routing study and states "the ROW targeted for this project is either fee-owned by, or under the control (via easement or permit)" of NGRID. There are a few minor parcels that will need to be obtained. As a New York utility, NGRID has a demonstrated history of negotiating and obtaining ROW for its transmission system. National Grid will own all assets included within its proposal.
T013	NYPA/NYSEG	Most property rights for this proposal are already owned by the Developer except for National Grid ROW required for line separation and an additional parcel to be acquired for Dysinger Switching station. As New York utilities, NYPA and NYSEG haves a demonstrated history of negotiating and obtaining ROW's for its transmission system. As proposed, NYPA will own, operate and maintain all assets for the Dysinger Switching Station, the 345 kV Dysinger to Stolle Road transmission line, and the additions at Niagara Station. NYSEG will own, operate and maintain the remaining assets within the proposal.
T014 T015	NextEra	Their preferred route would predominately use existing ROW owned by the incumbent utility with the exception of property to be acquired for the Dysinger and Stolle Road substations. They have provided an alternative plan to obtain all new ROW between Dysinger and Stolle Road should they not be able to obtain rights to the incumbent utility ROW. NextEra lays out a detailed plan for obtaining site control. 1. They would rely on affiliates of NextEra who have experience in negotiating easements for transmission projects. 2. Regarding use of incumbent utility ROW they cite the recent NYPSC order related to the AC Transmission proceeding as having applicability to this project in terms of obtaining access to and lease of the incumbent utility ROW. 3. Regarding private property, they provide a plan to obtain through negotiations with land owners. Should negotiations fail they cite precedent that allows for Developers of electric transmission facilities to acquire real property through condemnation, if necessary.

		NextEra does not yet possess the required ROWs. However, they have a well-documented plan to obtain property. NextEra Energy Transmission New York, Inc., as a New York Transportation Corporation, will own all assets included within its proposal, except for non-bulk transmission upgrades that will be constructed and owned by the transmission provider. NextEra states it has an option on a parcel of land (Parcel 8) as a potential location for Dysinger Substation.
T017	Exelon	Their plan utilizes existing ROW owned by incumbent utilities and significant new ROW to be obtained. The real estate requirements are further detailed in the Real Estate Analysis. Risk associated with obtaining the new ROW is documented in the Risk Section. Exelon lays out a detailed plan for obtaining site control. 1. They would have a Right of Way Project Manager directing internal and contract personnel. 2. Regarding use of incumbent utility ROW, they cite the recent PSC order related to the AC Transmission proceeding as having applicability to this project in terms of obtaining access to the incumbent utility ROW. 3. Regarding private property they provide a plan to obtain through negotiations with land owners. Should negotiations fail they cite precedent that allows for Developer of electric transmission facilities to acquire real property through condemnation if necessary. Exelon does not yet possess the required ROWs. However, they have a well-documented plan to obtain property. Exelon is proposing to own and maintain the transmission lines associated with its proposal. Substation additions required as part of its proposal will be owned and maintained by the existing transmission substation owner(s). Exelon stated that they would acquire easements for the ROW.

4.5.2. Real Estate Analysis

A review of the proposed routing for the transmission lines and substations was completed to identify where new property rights would need to be acquired. Estimates for the property were derived by obtaining recent comparable sales and tax assessments in the town and county where the property is located.

A summary of the property requirements for new transmission line ROW (substation property is not shown on this table):

PROPOSAL	DEVELOPER	SEGMENT	NEW RIGHT OF WAY (ROW)			SUB-TOTAL	TOTAL ROW REQUIRED		COMMENTS
			COMMER	RESIDENTI	AGRICULT				
			AREA (ACRES)	AREA (ACRES)	AREA (ACRES)	AREA (ACRES)	AREA (ACRES)	COST	
T006	North American Transmission (Proposal 1)	Dysinger SS to Stolle Rd SS - 19.98 miles	0.68			0.68	0.68	$ 4,376	ROW GAP
T007	North American Transmission (Proposal 2)	Dysinger SS to Stolle Rd SS - 19.98 miles	0.68			0.68	179.34	$ 7,471,224	ROW GAP
		Stolle Rd SS to Gardenville SS - 12.84 miles	67.56	40.27	70.83	178.66			ROW W/ 2 HOUSES AND 2 COMM BLDGS
T008	North American Transmission (Proposal 3)	Dysinger SS to Stolle Rd SS - 19.98 miles	0.68			0.68	179.34	$ 7,471,224	ROW GAP
		Stolle Rd SS to Gardenville SS - 12.84 miles	67.56	40.27	70.83	178.66			ROW W/ 2 HOUSES AND 2 COMM BLDGS
T009	North American Transmission (Proposal 4)	Dysinger SS to Stolle Rd SS - 19.98 miles	0.68			0.68	181.72	$ 7,522,784	ROW GAP
		Stolle Rd SS to Gardenville SS - 12.84 miles	67.56	40.27	70.83	178.66			ROW W/ 2 HOUSES AND 2 COMM BLDGS
		Niagara to Dysinger - 27.16	1.56		0.82	2.38			ROW GAP
T011	National Grid (Moderate Transfer)	No New Lines							
T012	National Grid (High Transfer)	Niagara to Gardenville - 36.2 miles	3.97		14.01	17.98	17.98	$ 172,069	ROW GAP
T013	NYPA and NYSEG	Dysinger to Stolle - 20.6 miles	0.68			0.68	0.68	$ 4,376	ROW GAP
T014	NextEra Energy	Dysinger SS to Stolle Rd SS - 19.93 miles	0.68			0.68	0.68	$ 4,376	ROW GAP
	NextEra Energy (Alternative)	Dysinger SS to Stolle Rd SS - 21.66 miles	33.71	120.66	97.51	251.88	251.88	$ 7,606,569	ROW W/ 5 HOUSES
T015	NextEra Energy	Dysinger SS to Stolle Rd SS - 19.93 miles	0.68			0.68	0.68	$ 4,376	ROW GAP
	NextEra Energy (Alternative)	Dysinger SS to Stolle Rd SS - 21.66 miles	33.71	120.66	97.51	251.88	251.88	$ 7,606,569	ROW W/ 5 HOUSES
T017	Exelon Transmission	Niagara to Stolle - 47.12 miles	4.25	3.48	45.67	53.40	53.40	$ 408,382	ROW GAP
		Stolle Rd SS to Gardenville SS - 12.10 miles	40.56	62.3	38.37	141.23	141.23	$ 6,609,030	ROW W/ 4 HOUSES AND 1 COMM BLDG

A summary of the estimated value for use of existing incumbent transmission ROW is shown below:

PROPOSAL	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY ROW		TOTAL INCUMBENT UTILITY ROW USES (ACRES)	AVERAGE COMs (Agricultural)/ ACRES	SUB-TOTAL ROW COST	TOTAL ROW COST
				NIAGARA MOHAK (ACRES)	NYSEG (ACRES)				
T006	North American Transmission (Proposal 1)	Dysinger SS to Stolle Rd SS - 19.98 miles	Niagara		5.74	5.74	$ 3,400	$ 20,000	$ 1,502,000
			Erie		296.31	296.31	$ 5,000	$ 1,482,000	
T007	North American Transmission (Proposal 2)	Dysinger SS to Stolle Rd SS - 19.98 miles	Niagara		5.74	5.74	$ 3,400	$ 20,000	$ 1,640,000
			Erie		296.31	296.31	$ 5,000	$ 1,482,000	
		Stolle Rd SS to Gardenville SS - 12.84 miles	Erie		27.55	27.55	$ 5,000	$ 138,000	
T008	North American Transmission (Proposal 3)	Dysinger SS to Stolle Rd SS - 2x19.98 miles	Niagara		10.33	10.33	$ 3,400	$ 35,000	$ 2,846,000
			Erie		534.58	534.58	$ 5,000	$ 2,673,000	
		Stolle Rd SS to Gardenville SS - 12.84 miles	Erie		27.55	27.55	$ 5,000	$ 138,000	
T009	North American Transmission (Proposal 4)	Dysinger SS to Stolle Rd SS - 2x19.98 miles	Niagara		10.33	10.33	$ 3,400	$ 35,000	$ 4,234,000
			Erie		534.58	534.58	$ 5,000	$ 2,673,000	
		Stolle Rd SS to Gardenville SS - 12.84 miles	Erie		27.55	27.55	$ 5,000	$ 138,000	
		Niagara to Dysinger - 27.16	Niagara	42.05	366.27	408.32	$ 3,400	$ 1,388,000	
T011	National Grid (Moderate Transfer)	No New Lines							
T012	National Grid (High Transfer)	Niagara to Gardenville - 36.2 miles	Niagara	203.82		203.82	$ 3,400	$ 693,000	$ 1,157,000
			Erie	92.85		92.85	$ 5,000	$ 464,000	
T013	NYPA and NYSEG	Dysinger to Stolle - 20.6 miles	Niagara		5.97	5.97	$ 3,400	$ 20,000	$ 1,613,000
			Erie		318.64	318.64	$ 5,000	$ 1,593,000	
T014	NextEra Energy	Dysinger SS to Stolle Rd SS - 19.93 miles	Niagara		4.59	4.59	$ 3,400	$ 16,000	$ 1,793,000
			Erie		355.48	355.48	$ 5,000	$ 1,777,000	
	NextEra Energy (Alternative)	Dysinger SS to Stolle Rd SS - 21.66 miles	Niagara		1.20	1.20	$ 3,400	$ 4,000	$ 90,000
			Erie		17.16	17.16	$ 5,000	$ 86,000	
T015	NextEra Energy	Dysinger SS to Stolle Rd SS - 19.93 miles	Niagara		4.59	4.59	$ 3,400	$ 16,000	$ 1,793,000
			Erie		355.48	355.48	$ 5,000	$ 1,777,000	
	NextEra Energy (Alternative)	Dysinger SS to Stolle Rd SS - 21.66 miles	Niagara		1.20	1.20	$ 3,400	$ 4,000	$ 90,000
			Erie		17.16	17.16	$ 5,000	$ 86,000	
T017	Exelon Transmission	Niagara to Stolle - 47.12 miles	Niagara	293.19	65.30	358.49	$ 3,400	$ 1,219,000	$ 2,701,000
			Erie		296.31	296.31	$ 5,000	$ 1,482,000	
		Stolle Rd SS to Gardenville SS - 12.10 miles	Erie		14.63	14.63	$ 5,000	$ 73,000	$ 73,000

4.6. Operational Plan

The review team conducted an evaluation of the Developers' operations and maintenance plans associated with the proposals. The review centered on the Developers' plans as presented in their proposals and additional information provided in response to a NYISO RFI submitted to Developers in March 2017.

For the non-incumbent Developers, the following is common among the proposals (The review team recognized that, while not stated in the proposals, these items are also common for the incumbent Developers):

- The Developers stated that all O&M activities will comply with required NERC regulations.
- Real time system operations will be conducted by the NYISO.

- Control center schedules will be 24-7-365.

Below is a summary of the review team's findings. The review team did not identify any major flaw with any Developers' plans. The review team believes the NYISO is best positioned to determine the suitability of non-incumbent utility providing control center services in New York.

#	Developer	Operations	Maintenance
T006 T007 T008 T009	North American Transmission	NAT states real time system monitoring and control center services will be provided under contract with an affiliate, Cross Texas Transmission (CTT). CTT primary and backup control centers are located in Austin, TX. The CTT control center has extensive experience. The NYISO should determine the suitability of this Texas affiliate to provide services in New York.	Transmission line and substation maintenance will be managed by local NAT staff. Maintenance activities will be performed by third-party contractors. NAT has experience maintaining transmission systems in other areas of the country and has provided a detailed maintenance plan.
T011 T012	National Grid	NGRID did not provide an operation and maintenance plan with its proposal. However, the review team recognizes that as a New York utility, NGRID has a demonstrated history of operating and maintaining its transmission and distribution systems.	See comment under Operations.
T013	NYPA/NYSEG	NYPA/NYSEG did not provide an operation and maintenance plan with its proposal. However, the review team recognizes that as New York utilities, they individually have demonstrated histories of operating and maintaining their transmission and distribution systems.	See comment under Operations

T014 T015	NextEra	NextEra preferred operations plan is to control its facilities via one of its existing out-of-NYS control centers. If preferred by NYISO, the Developer will build and operate a control center within New York. Alternatively, the Developer could contract with an incumbent utility for monitoring and control activities. The NYISO should determine the suitability of using an affiliate out-of-NYS control center to provide services in New York.	Transmission line and substation maintenance activities will be managed and performed by NextEra staff supplemented with third-party contractors. NextEra has experience maintaining transmission systems in other areas of the country and provided a detailed maintenance plan.
T017	Exelon	Exelon plans to contract with an incumbent utility or a third-party control center for monitoring and control activities.	Similarly, Exelon plans on contracting with an incumbent utility or third-party contractor for maintenance activities.

4.7. Field Reviews

Field review of proposed transmission line routes and substations was completed by the review team. The results of those field reviews are documented in a report supplemented with checklists and maps marked with comments and observations. This work was used to develop the project estimates and identify potential issues and risks with the proposed design, siting and routing.

4.8. Work Plans

- All selected Developers have a history of managing successful transmission and substation projects. In response to RFI's on work plans, there was variation in the degree of self-performance; all respondents will manage internal and external resources.
- It was not possible to evaluate external team members at this stage, as they are expected to be selected competitively after award from among leading engineering, geo-technical, environmental and construction firms.
- Generally, all Developers included work plan activities in their estimates and schedules.
- They all indicated they will contract for a portion of the engineering and self-perform the remainder. Exelon plans to outsource most engineering.
- All are expected to contract for site work and construction.
- National Grid plans to self-perform above grade/structures and electrical construction (including protection and control).

- All are expected to contract geo-tech and surveying and self-perform real estate acquisition and public outreach.

4.9. Technical Discussions and Investigations

A summary of the technical investigations of significant issues, concerns and design verification is shown below:

4.9.1. North America Transmission – Proposal #1 (T006) Stolle Road Transformer

4.9.1.1. NAT's proposal calls for the addition of a third 345 – 115 kV transformer in parallel with the existing two transformers at Stolle Rd. This will expose all three transformers to outages for a single contingency. The NYISO evaluated reliability impacts and considered the configuration in its technical analysis.

4.9.1.2. Proposal calls for adding two 345kV breakers and related equipment to create a ring bus and a new line terminal with the addition of a third 345 – 115 kV transformer. This equipment will be installed just west of existing transformers. The proposed location of the new transformer will reduce access to the existing west transformer and the 345 kV yard. The transformer will also be in close proximity to the existing transformer and control house which would require fire walls. The new transformer should be relocated to the east and a fire wall installed between the new and existing east transformer. This will require expansion of fenced area. This additional work was included in the independent estimate.

4.9.2. North America Transmission – Proposal #2(T007) Gardenville Substation

4.9.2.1. NAT proposes installing a new 345-230kV transformer in a new station adjacent to and connecting into NGRID's Gardenville substation. Option 1 involves the use of property located between the existing substations owned by National Grid and connects to Gardenville with a single breaker. Options 2 and 3 require purchase of additional property adjacent to industrial and residential properties and include installing a three-bay breaker-and-a-half station. These two options represent improved reliability over NAT Option 1, but carry a significant cost increase to the project, additional construction time, and increased potential for public and land owner opposition in developing either of the two proposed sites. The NYISO considered Option 1 in its technical evaluations. Our estimate is based on Option 1. NAT proposed cost also based on Option 1.

4.9.3. North America Transmission – Proposal #3(T008)

4.9.3.1. Same as 4.9.2.1 above

4.9.4. North America Transmission – Proposal #4 (T009)

4.9.4.1. Same as 4.9.2.1 above

4.9.4.2. NAT proposed crossing over the existing 345 kV with 3 pole horizontal configuration – each 195 ft. structure height either sides. In addition to the construction risks of crossing these lines, if the new line is to cross over the top of the existing lines, there may be concern that throughout the life of the facilities, failure of the top circuit would result in outage of both cross-state lines at the same time. NYPA and/or other entities concerned with reliability of the Bulk Power System may require the incorporation of additional design measures to minimize or eliminate this risk. Crossing under would help mitigate the risk. From a contingency analysis perspective, line crossing is not a defined NERC design contingency event in planning studies. The review team did not make any adjustments to its independent cost estimate.

4.9.4.3. Niagara Station Connection - North American Transmission's proposal called for bringing the new 345 kV transmission line to Dysinger into a new terminal structure in Bay 32. The proposed terminal structure conductor takeoff height is within a few feet of the height of the north-south strain busses in Bay 32. This makes the proposed connection impractical unless the north-south strain bus is reconfigured. Also, the proposed transmission line conductors passing over Bay 32 and Bay 33 pose a risk in that a dropped conductor or static will create a significant outage in the 345 kV yard. Since NAT's proposed arrangement was not feasible, an underground cable was included in the independent estimate.

4.9.5. National Grid – Moderate Power Transfer Solution (T011)

4.9.5.1. No major Technical Issues

4.9.6. National Grid – High Power Transfer Solution (T012)

4.9.6.1. No major Technical Issues

4.9.7. NYPA/NYSEG – Western NY Energy Link (T013)

4.9.7.1. NYPA/NYSEG proposed approximately 20 miles, of new structures for the Dysinger – Stolle Road single circuit 345 kV transmission line using engineered weathering steel poles with delta configuration I-string insulation for tangent & light angles and two or three poles for heavy angle & dead-end structures. Out of the

estimated 159 total structures, 143 structures are tangent structures. The average span length is 660 ft.

All of the structures, including tangent poles, are estimated to be installed on drilled shaft reinforced concrete foundations, with no less than 5.5 feet shaft. The review team believes NYPA/NYSEG over-designed the tangent structures by building on drilled shaft concrete foundations. Directly embedded tangent structure foundations would be more economical for the tangent structures with pole baseline moments less than 1,500-2,000 ft.-kips. (kip = 1000 Pounds-force)

4.9.8. NextEra Energy Transmission New York – Empire State Line #1 (T014)

4.9.8.1. NextEra proposed a width of 80 ft. for the alternative where they proposed an alternate to procure new ROW adjacent to NYSEG's existing ROW. The review team believes this will be inadequate and a minimum of 90 ft. is required. See 4.9.11 below for further detail.

4.9.9. NextEra Energy Transmission New York – Empire State Line #2 (T015)

4.9.9.1. The same comments stated above in section 4.9.8.1 for proposal T014 also apply to proposal T015.

4.9.10. Exelon Transmission Company – Niagara Area Transmission Expansion (T017)

4.9.10.1. Niagara Station Connection -Exelon's original proposal called for bringing the new 345kV transmission line overhead into the south terminal dead-end tower of Bay 32. The south terminal of Bay 32 is already occupied by 345kV line PA-302 which exits the station underground. Therefore, the proposed solution is not feasible. Since Exelon's proposed arrangement was not feasible, an underground cable connection was included in the independent estimate.

4.9.10.2. Exelon proposed crossing under the existing 345 kV NYPA cross state 345kV lines with single pole delta configuration – 105 ft. and 100 ft. heights on either side. In addition to the construction risks of crossing these lines there may be a concern that throughout the life of the facilities, failure of a top circuit would result in outage of both a cross state line and the new Niagara to Stolle line at the same time. NYPA and/or other entities concerned with reliability of the Bulk Power System may require the incorporation of additional design measures to minimize or eliminate this risk. From a contingency analysis perspective, line crossing is not a defined NERC design contingency event in the power flow analysis

4.9.10.3. Exelon proposes connecting a new 230 kV line into Gardenville with a new line terminal and a single 230 kV circuit breaker. While this may be the simplest arrangement, it also provides the least amount of reliability. With this configuration, a failed breaker or a bus fault will cause a loss of 230kV Line 66 to Stolle Road and a loss of Transformer Bank #7. Incumbent utility may object. Increased estimate contingency.

4.9.10.4. Exelon proposes connecting a new 230 kV line into Stolle Road with a new line terminal and a single 230 kV circuit breaker. While this may be the simplest arrangement and it matches the existing 230 kV transmission line arrangements, it also provides the least amount of reliability and operating flexibility. With this configuration, a failed breaker or a bus fault will cause a loss of 230 kV Line 66 to Gardenville, a loss of 230 kV Line 67 to High Sheldon, and a loss of 230 kV Line 65 to Lewiston. Incumbent utility may object. Increased estimate contingency.

4.9.10.5. Exelon proposes connecting a new 345 kV line into Stolle Road by adding a 345 kV circuit breaker with disconnect switches to the existing bay. The line will terminate at the existing east dead end tower. While this may be the simplest arrangement, it also provides the least amount of reliability. With this configuration, a failed breaker or a bus fault will cause a loss of 345 kV Line 37 to Homer City and a loss of Transformer Banks #3 and #4. Incumbent utility may object. Increased estimate contingency.

4.9.10.6. Exelon Transmission proposed approximately 20 miles of new structures for the Dysinger to Stolle Road single circuit 345 kV Transmission line using engineered steel poles with delta configuration I-string insulation for tangent & light angles structures. Out of the estimated 151 total structures, 143 structures are tangent structures. The average span length is 695 ft.

All the structures, including tangent poles, are estimated to be installed on drilled shaft reinforced concrete foundations, with no less than 5.0 feet shaft. The review team believes Exelon Transmission over-designed the tangent structures by building on drilled shaft concrete foundations. Directly embedded tangent structure foundations would be more economical for the tangent structures with pole baseline moments less than 1,500-2,000 ft.-kips.

4.9.11. General Design Verifications

4.9.11.1. Transmission Line Row, Structure Type and EMF Comparison

See table below for a summary of each Developer's proposed ROW:

NY State EMF Criteria	
Max. Electric Field @ 1meter above ground @ Edge of ROW	1.6kV/m
Max. Electric Field @ 1meter above ground over public road	7.0kV/m
Max. Magnetic Field @ 1meter above ground @ Edge of ROW	200 mG

PROPOSAL	DEVELOPER	SEGMENT	LINE			EMF				COMMENTS
			Voltage (kV)	Length (miles)	Structure Configuration	ROW Width (ft.)	Edge of ROW: Max. Electric Field (kV/m)	Edge of ROW: Max. Magnetic Field (mG)	Meets NY State Requirement	
T006	North American Transmission	Dysinger SS to Stolle Rd SS	345	19.98	St. Mono Pole Delta	500	0.20	99.00	Yes	500ft. Existing Utility Corridor
T007	North American Transmission	Dysinger SS to Stolle Rd SS	345	19.98	St. Mono Pole Delta	500	0.20	99.00	Yes	500ft. Existing Utility Corridor
		Stolle Rd SS to Gardenville SS	345	12.84	St. Mono Pole Delta	125	1.30	126.00	Yes	125ft. Proposed new ROW width meets the State EMF requirements
T008	North American Transmission	Dysinger SS to Stolle Rd SS	345	19.98	St. Mono Pole Delta	500	0.20	99.00	Yes	500ft. Existing Utility Corridor
		Stolle Rd SS to Gardenville SS	345	12.84	St. Mono Pole Delta	125	1.30	126.00	Yes	125ft. Proposed new ROW width meets the State EMF requirements
T009	North American Transmission	Dysinger SS to Stolle Rd SS	345	19.98	St. Mono Pole Delta	500	0.20	99.00	Yes	500ft. Existing Utility Corridor
		Stolle Rd SS to Gardenville SS	345	12.84	St. Mono Pole Delta	125	1.30	126.00	Yes	125ft. Proposed new ROW width meets the State EMF requirements
		Niagara SS to Dysinger SS	345	27.16	St. Mono Pole Delta	500	0.50	35.00	Yes	500ft. Existing Utility Corridor
T011	National Grid (Moderate Transfe	No New Lines								
T012	National Grid (High Transfer)	Niagara SS to Gardenville SS	230	36.20	St. Mono Pole Delta					EMF Study not provided, Proposed new line within the existing Utility ROW
T013	NYPA and NYSEG	Dysinger SS to Stolle Rd SS	345	20.60	St. Mono Pole Delta	500	0.33	73.52	Yes	500ft. Existing Utility Corridor
		Stolle Rd SS to Gardenville SS	230	12.00	St. Mono Pole Delta	150-500	0.97	189.30	Yes	150 to 500ft. Existing Utility Corridor, Restringing only
T014	NextEra Energy	Dysinger SS to Stolle Rd SS	345	19.93	Wood H-Pole Horz.	150	1.59	75.21	Yes	Within 500ft. Existing Utility Corridor
	NextEra Energy (Alternative)	Dysinger SS to Stolle Rd SS	345	21.66	St. Mono Pole Vertical	80	1.28	200.00	Yes	80ft. Proposed new ROW width meets the State EMF requirements
T015	NextEra Energy	Dysinger SS to Stolle Rd SS	345	19.93	Wood H-Pole Horz.	150	1.59	75.21	Yes	Within 500ft. Existing Utility Corridor
	NextEra Energy (Alternative)	Dysinger SS to Stolle Rd SS	345	21.66	St. Mono Pole Vertical	80	1.28	200.00	Yes	80ft. Proposed new ROW width meets the State EMF requirements
T017	Exelon Transmission	Niagara SS to Stolle SS	345	47.12	St. Mono Pole Delta	125				EMF Study not provided, but Noted "Exelon proposes a line design that will meet a maximum eletric field of 1.6kV/m and a max. magnetic field of 200 mG at the edge of the
		Stolle Rd SS to Gardenville SS	230	12.10	St. Mono Pole Delta	95				

The Developers' proposed ROW widths are acceptable with the exception of NextEra's alternate design. NextEra proposed a width of 80 ft. for the alternative where they proposed to procure new ROW adjacent to NYSEG's existing ROW. The review team believes this will be inadequate and a minimum of 90 ft. is required. Their distance from the conductor to ROW Edge (other side of NYSEG ROW) is only 37 ft., whereas OSHA requirement for 345 kV is 40.5 ft. (*i.e.*, electrical clearance of 20.5 ft. plus 10 ft. room for work plus 10 ft. growth).

4.9.11.2. Stolle Road 345kV Substation Arrangement Comparison

The review team compared the proposed bus arrangement for Stolle Road 345 kV substation. A summary table of the bus arrangement, number of lines, number of transformers and breakers is shown below. This comparison shows that the bus arrangements vary significantly.

Developer	# of new Lines	# of new Transformers	Total new elements	Proposed Breaker Arrangement	# of Breakers
NYPA/NYSEG T013	1	2	3	Breaker & Half *	10 (9 new)
NAT T006	1	1	2	Ring	3 (2 new)
NAT T007	2	0	2	Ring	4 (3 new)
NAT T008	3	0	3	Breaker & Half	8 (7 new)
NAT T009	3	0	3	Breaker & Half	8 (7 new)
NextEra T014 (includes PAR)	3	0	5	Ring	5 (4 new)
NextEra T015	3	0	5	Ring	5 (4 new)
Exelon	1	0	1	Straight Bus	2 (1new)

*Also includes two series breakers between transformers T4 and T6

Conclusion:

- Exelon is proposing the simplest solution with a single breaker to connect the new line from Dysinger, which of course has much less reliability and operating flexibility than the others.
- NYPA/NYSEG is proposing the most reliable and flexible system and are placing all transformers onto separate breaker positions (no parallel transformers).
- NAT has all three transformers in parallel.
- NextEra keeps the two existing transformers in parallel.

4.9.11.3. Dysinger 345 kV Substation Arrangement Comparison

The review team compared the proposed bus arrangement for Dysinger substation. A summary table of the bus arrangement, number of lines, and breakers is shown below. This comparison shows that the bus arrangements vary.

Developer	# of new Lines	# of new Transformers	Total new elements	Proposed Breaker Arrangement	# of Breakers
NYPA/NYSEG T013	5	0	5	Breaker & Half	8
NAT T006	5	0	5	Breaker & Half	8
NAT T007	5	0	5	Breaker & Half	8
NAT T008	6	0	6	Breaker & Half	9
NAT T009	7	0	7	Breaker & Half	11
NextEra T014 (includes PAR	7	0	7	Breaker & Half	11
NextEra T014	7	0	7	Breaker & Half	11
Exelon –New line by-passes Dysinger	NA	NA	NA	NA	NA

Conclusion:

- NextEra is the only Developer proposing to bring both 345kV cross state lines and both Somerset lines into Dysinger providing for additional operating flexibility.
- Exelon is not constructing a substation at Dysinger.

4.9.11.4. Environmental Discussion

All of the Developers' proposals recognize the need for environmental studies, permits and approvals from various federal and state government agencies. Standard permit requirements include transmission approval under Article VII, wetland delineation and protection, archeological studies, storm water pollution prevention requirements, stream protection, and agricultural land protection, rare, threatened and endangered species surveys and protection. The Developers acknowledge the possibility that the proposals could require modification to address additional permit conditions. At this stage in the development of the proposed projects, it is not possible to determine what those permit conditions would be. The following is a general discussion of the most significant potential environmental issues that could affect the proposals.

Except for T011, all the projects involve clearing of additional ROW for the transmission lines. There does not appear to be any environmental issues that would prevent the projects from being constructed based on the conceptual design information available for review. However, the clearing of new ROW or widening of existing ROW will somewhat proportionaly increase the environmental impacts and risks. These impacts and risks are further described below.

- Clearing of New ROWs or Expansion of Existing ROW.
  The table below contains the estimated acreage that will need to be cleared to construct the transmission lines for each proposed project. The new ROW or expanded ROW will require

archeological studies. These studies could discover archeologically sensitive areas that require actions up to and including re-routing the transmission line or structure to avoid the area. Visual assessments of the proposed line may also be required. If the line is determined to impact scenic resources or are not compatible with the community character, the line could require modifications. The project, including the substation footprint or new transmission structures, could have a permanent impact on emergent wetlands, which would require mitigation.

WNY TRANSMISSION PROJECT: Estimate of Mowing and Clearing (Acres)										
T006	T007	T008	T009	T011	T012	T013	T014	T014 Alt.	T015	T017
121	199	350	515	0	135	94	139	118	139	427

- Clearing of Forested Wetlands
  The table below contains the estimated acreage of forested wetlands that will likely be impacted by each proposed project. Forested wetlands are a very valuable ecological resource in New York and will require mitigation of impacts, including possible replacement offsite. While an estimate of these mitigation costs has been provided, there is the potential that project approval could take additional time and an alternate route could be required to avoid the wetland entirely.

WNY TRANSMISSION PROJECT: Estimate of Impacted Forested/Shrub Wetlands (Acres)										
T006	T007	T008	T009	T011	T012	T013	T014	T014 Alt.	T015	T017
39	47	96	117	0	21	30	45	38	45	106

- Clearing of Protected Species Habitat
  The project area could be determined to include habitat of threatened or endangered species, such as the Northern Long Eared Bat. If such habitat is identified, the project approval could take additional time and an alternate route could be required to avoid the habitat. Restrictions could be placed on when ROW clearing can be conducted which would further extend the project timeline.

- In–water Structures Construction (only T012 National Grid Grand Island Transmission Line)
  If T012 requires the replacement of transmission towers in the Niagara River, the project approval could take additional time. It may also require fishery resource and protected species habitat studies and protection measures such as restricted work windows, USFWS Incidental Take Permit, and open water habitat mitigation.

- Agricultural

  Early coordination with agricultural landowners and consideration of potential impacts to farmland will be needed for the proposed project. Siting and construction coordination will be needed to minimize impacts on prime agricultural lands and limit loss of crop production. Site restoration of disturbed and compacted soils will be required. Herbicide use may be restricted during construction and long-term ROW maintenance operations. Transmission line siting near Certified Organic Farms may require additional planning and consideration for compliance with organic certification. New ROWs will require additional agency coordination if the proposed route would cross properties within an Agricultural Conservation Easement Program or Land Trust.

  The table below contains the estimated acreage of agricultural land that will likely be impacted by each proposed project.

WNY TRANSMISSION PROJECT: Estimate of Impacted to Agricultural Land (Acres)									
T006	T007	T008	T009	T011	T012	T013	T014	T015	T017
16-32	19-37	19-37	53-106	0.3-0.6	50-100	17-34	30-60	30-60	69-137

  Area assumes Agricultural District lands adjacent to the project route with width of 25 ft. to 50 ft.

INDEPENDENT ESTIMATES

ATTACHMENT B1

T006 – NORTH AMERICAN TRANSMISSION

SUBSTATION ENGINEERING COMPANY
8/11/2017

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T006 - North American Transmission

Revision: 4

SUMMARY OF COST ESTIMATE

	Description	Total Amount
1	CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION	$ 12,359,030
2	TRANSMISSION LINE FOUNDATIONS	$ 6,777,500
3	STRUCTURES - TRANSMISSION LINE	$ 12,081,851
4	CONDUCTOR, SHIELDWIRE, OPGW	$ 5,187,754
5	TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE	$ 1,328,890
6	NEW DYSINGER SWITCHYARD	$ 19,771,000
7	STOLLE ROAD SUBSTATION WORKS	$ 11,447,500
8	MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS	$ 32,473,291
	CONTRACTOR MARK-UP (OH&P) 15%	$ 15,214,022
	SUBTOTAL:	$ 116,640,839
	CONTINGENCY (20%)	$ 23,328,168
	TOTAL (A):	**$ 139,969,006**
9	SYSTEM UPGRADE FACILITIES	$ 12,977,025
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 4,541,959
	TOTAL (B):	**$ 17,518,984**
	TOTAL PROJECT COST (A+B):	**$ 157,487,990**

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

Revision: 4

Description of Work: A new 345kV Dysinger Switchyard located approximately 8 miles southeast of the city of Lockport, New York. The Project also includes a new ~20 mile 345kV Transmission Line from Dysinger Switchyard to Stolle Road Substation near Marilla, New York.								
Item	**Description**	**Quantity**	**Unit**	**Supply Rate**	**Labor & Equipment Rate**	**Total Unit Rate:**	**TOTAL:**	**Remarks**
1. CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION								
1.1	Clearing the ROW (mowing & clearing)	121.0	Acre		$ 15,000	$ 15,000	**$ 1,815,000**	
1.2	Access Road	48,535.0	LF		$ 45	$ 45	**$ 2,184,075**	Assumes Type 1 Type Gravel Road
1.3	Silt Fence	48,535.0	LF		$ 4	$ 4	**$ 194,140**	
1.4	Matting	56,952.0	LF		$ 70	$ 70	**$ 3,986,640**	
1.5	Snow Removal	1.0	Sum		$ 320,000	$ 320,000	**$ 320,000**	
1.6	ROW Restoration	20.0	Mile		$ 10,000	$ 10,000	**$ 200,000**	
1.7	Work Pads	770,000.0	SF		$ 4	$ 4	**$ 2,710,400**	
1.8	Restoration for Work Pad areas	77,000.0	SF		$ 0.2	$ 0.2	**$ 11,550**	
1.9	Temporary Access Bridge	20.0	EA		$ 20,035	$ 20,035	**$ 400,700**	
1.10	Air Bridge	5.0	EA		$ 14,445	$ 14,445	**$ 72,225**	
1.11	Stabilized Construction Entrance	10.0	EA		$ 4,580	$ 4,580	**$ 45,800**	
1.12	Maintenance and Protection of Traffic on Public Roads	1.0	LS		$ 300,000	$ 300,000	**$ 300,000**	
1.13	Culverts / Misc. Access	1.0	LS		$ 100,000	$ 100,000	**$ 100,000**	
1.14	Concrete Washout Station	10.0	EA		$ 1,850	$ 1,850	**$ 18,500**	
TOTAL - CLEARING & ACCESS FOR TRANSMISSION LINE:							**$ 12,359,030**	
2. T-LINE FOUNDATIONS								
2.1	Direct Embed Foundations - 23ft deep x 6ft dia.	127.0	Structure		$ 18,000	$ 18,000	**$ 2,286,000**	Supply & Install
2.2	Direct Embed Foundations - 28ft deep x 7ft dia.	5.0	Structure		$ 20,000	$ 20,000	**$ 100,000**	Supply & Install
2.3	Direct Embed Foundations - 30ft deep x 6ft dia.	6.0	Structure		$ 20,000	$ 20,000	**$ 120,000**	Supply & Install
2.4	Drilled Piers - 38ft deep x 9ft dia.	492.4	CUY		$ 1,500	$ 1,500	**$ 738,660**	
2.5	Drilled Piers - 43ft deep x 8ft dia.	792.5	CUY		$ 1,500	$ 1,500	**$ 1,188,780**	
2.6	Drilled Piers - 71ft deep x 9ft dia.	368.0	CUY		$ 1,500	$ 1,500	**$ 552,060**	
2.7	Rock Excavation Adder	896.0	CUY		$ 2,000	$ 2,000	**$ 1,792,000**	
TOTAL - T-LINE FOUNDATIONS:							**$ 6,777,500**	
3. STRUCTURES - TRANSMISSION LINE								
3.1	Tangent Delta Single Steel Pole Tangent (0-1 deg, 100')	18.0	EA	$ 31,401	$ 18,841	$ 50,242	**$ 904,349**	
3.2	Tangent Delta Single Steel Pole Tangent (0-1 deg, 115')	109.0	EA	$ 38,376	$ 23,026	$ 61,402	**$ 6,692,774**	
3.3	Tangent Delta Single Steel Pole Tangent (0-1 deg, 130')	5.0	EA	$ 44,150	$ 26,490	$ 70,641	**$ 353,203**	
3.4	Tangent Delta Single Steel Pole Tangent (0-1 deg, 145')	1.0	EA	$ 50,029	$ 30,018	$ 80,047	**$ 80,047**	
3.5	Small Angle Delta Steel Pole (0-15 deg, 115')	5.0	EA	$ 66,881	$ 40,128	$ 107,009	**$ 535,046**	
3.6	Med Angle Vertical Steel Pole (15-60 deg, 115')	9.0	EA	$ 93,524	$ 56,115	$ 149,639	**$ 1,346,751**	
3.7	Large Angle DE Vertical Steel Pole (60-90 deg, 115')	5.0	EA	$ 111,476	$ 66,885	$ 178,361	**$ 891,806**	
3.8	Large Angle DE Vertical Steel Pole (60-90 deg, 130')	1.0	EA	$ 140,249	$ 84,149	$ 224,398	**$ 224,398**	
3.9	Large Angle DE Vertical Steel Pole (60-90 deg, 145')	1.0	EA	$ 177,172	$ 106,303	$ 283,476	**$ 283,476**	
3.10	Install Grounding	154.0	Structure		$ 5,000	$ 5,000	**$ 770,000**	
TOTAL - STRUCTURES T-LINE:							**$ 12,081,851**	
4. CONDUCTOR, SHIELDWIRE, OPGW								
4.1	(2)/Phase - 795kcmil 26/7 Stranded "Drake" ACSR	20.0	Circuit Mile	$ 53,856	$ 158,400	$ 212,256	**$ 4,240,582**	
4.2	(1) OPGW 36 Fiber AC-33/38/571	20.0	Mile	$ 19,404	$ 27,720	$ 47,124	**$ 941,472**	
4.3	(1) 3/8" HS Steel (2nd SW where required)	1,000.0	Ft	$ 1	$ 5	$ 6	**$ 5,700**	
TOTAL: CONDUCTOR, SHIELDWIRE, OPGW:							**$ 5,187,754**	

SECO SUBSTATION ENGINEERING COMPANY

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
5. TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE								
5.1	Tangent - Polymer V-String	399.0	Set	$ 900	$ 720	$ 1,620	**$ 646,380**	
5.2	Angle - Polymer V-String	15.0	Set	$ 1,300	$ 1,040	$ 2,340	**$ 35,100**	
5.3	Deadend - Polymer Double Deadend including Jumper	96.0	Set	$ 1,500	$ 1,350	$ 2,850	**$ 273,600**	
5.4	OPGW Assembly - Tangent	133.0	Set	$ 200	$ 150	$ 350	**$ 46,550**	
5.5	OPGW Assembly - Angle / DE	42.0	Set	$ 250	$ 150	$ 400	**$ 16,800**	
5.6	OHSW Assembly - Angle / DE	4.0	Set	$ 250	$ 150	$ 400	**$ 1,600**	
5.7	OPGW Splice Boxes	9.0	Set	$ 1,500	$ 1,000	$ 2,500	**$ 22,500**	
5.8	OPGW Splice & Test	1.0	Sum		$ 10,800	$ 10,800	**$ 10,800**	
5.9	Spacer Dampers	1,880.0	Ea	$ 50	$ 35	$ 85	**$ 159,800**	
5.10	Vibration Dampers - Conductor	1,880.0	Ea	$ 32	$ 20	$ 52	**$ 97,760**	
5.11	Shieldwire / OPGW Dampers, Misc Fittings	1.0	Sum	$ 10,000	$ 8,000	$ 18,000	**$ 18,000**	
TOTAL: T-LINE INSULATORS, FITTINGS, HARDWARE:							**$ 1,328,890**	
6. NEW DYSINGER SWITCHYARD								
6.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement	1.0	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
6.2	Substation Fence	2,450.0	LF		$ 200	$ 200	**$ 490,000**	Supply & Install
6.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
6.4	Switches 3ph	16.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 112,000**	
6.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
6.6	Line Switches 3 ph	5.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 150,000**	
6.7	Instrument Transformers	1.0	Sum		$ 1,046,000	$ 1,046,000	**$ 1,046,000**	
6.8	Breakers	8.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 3,040,000**	
6.9	Arrestors (3 per line)	15.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 112,500**	
6.10	Line Traps	5.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 105,000**	
6.11	Two (2) 345 kV buses	2.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
6.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	Supply & Install
6.13	Low Profile Foundations	231.0	Ea		$ 5,000	$ 5,000	**$ 1,155,000**	Supply & Install
6.14	Caisson DE Foundations	20.0	Ea		$ 50,000	$ 50,000	**$ 1,000,000**	Supply & Install
6.15	Circuit Breaker Foundations	8.0	Ea		$ 75,000	$ 75,000	**$ 600,000**	Supply & Install
6.16	Lightning Mast Foundations	15.0	Ea		$ 15,000	$ 15,000	**$ 225,000**	Supply & Install
6.17	SST Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	
6.18	Control House and Pad (30' x 90')	1.0	Sum	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	Supply & Install
6.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	
6.20	Control Cables	1.0	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
6.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
6.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	Supply & Install
6.23	Protection, Telecom and Metering Equipment (Panels)	30.0	Ea		$ 30,000	$ 30,000	**$ 900,000**	Supply & Install
6.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.25	Low Voltage AC Distribution	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
6.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
6.28	Grounding	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	
6.29	Bus Support 1 Ph	93.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 279,000**	
6.30	Switch Stands	16.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 176,000**	
6.31	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
6.32	Misc. Structures	1.0	Sum	$ -	$ 52,000	$ 52,000	**$ 52,000**	
6.33	Substation A-Frame Structures Standalone	5.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 125,000**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
6.34	Lightning Masts	15.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 180,000**	
6.35	Arrestor Stands	15.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 52,500**	
6.36	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
6.37	Connection of Existing Lines to Dysinger Switchyard	1.0	Sum		$ 3,400,000	$ 3,400,000	**$ 3,400,000**	Supply & Install
TOTAL - DYSINGER SWITCHYARD:							**$ 19,771,000**	
7. STOLLE ROAD SUBSTATION WORKS:								
7.1	Switches 3ph	4.00	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 28,000**	
7.2	Line Switches 3 ph w/ motor-operators	1.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 30,000**	
7.3	Instrument Transformers	1.00	Ea		$ 460,000	$ 460,000	**$ 460,000**	
7.4	Breakers	3.00	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 1,140,000**	
7.5	Arrestors (3 per line)	6.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 45,000**	
7.6	Line Traps	1.00	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 21,000**	
7.7	345 kV buses	1.00	Ea	$ 12,500	$ 17,500	$ 30,000	**$ 30,000**	Supply & Install
7.8	Low Profile Foundations	91.00	Ea		$ 5,000	$ 5,000	**$ 455,000**	Supply & Install
7.9	Circuit Breaker Foundations	3.00	Ea		$ 75,000	$ 75,000	**$ 225,000**	Supply & Install
7.10	Lightning Mast Foundations	6.0	Ea		$ 15,000	$ 15,000	**$ 90,000**	
7.11	Control Cables	1.00	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	Supply & Install
7.12	Protection, Telecom and Metering Equipment (Panels)	13.00	Ea		$ 30,000	$ 30,000	**$ 390,000**	Supply & Install
7.13	SCADA and Communications	1.00	Sum		$ 125,000	$ 125,000	**$ 125,000**	Supply & Install
7.14	Control Conduits from Cable Tray to Equipment	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
7.15	Cable Trench Systems for Control Cables	1.00	Sum		$ 750,000	$ 750,000	**$ 750,000**	
7.16	Grounding	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	
7.17	Bus Support 1 Ph	54.00	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 162,000**	
7.18	Switch Stands	4.00	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 44,000**	
7.19	Misc. Structures	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	Supply & Install
7.20	Lightning Masts	6.00	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 72,000**	Supply & Install
7.21	Arrestor Stands	3.00	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 10,500**	
7.22	Miscellaneous Materials and Above / Below Ground Works	1.00	Sum		$ 750,000	$ 750,000	**$ 750,000**	
7.23	Interconnection arrangement at Stolle Rd Substation	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
7.24	345kV - 115kV 204/320/400 MVA Transformer	1.00	Ea	$ 3,900,000	$ 750,000	$ 4,650,000	**$ 4,650,000**	
7.25	Transformer Foundation with concrete moat and double steel grating	1.0	Ea		$ 150,000	$ 150,000	**$ 150,000**	
7.26	Firewall 30' long x 12' tall x 1' thick with footer	1.00	Ea		$ 100,000	$ 100,000	**$ 100,000**	Supply & Install
TOTAL - STOLLE RD SUBSTATION WORKS:							**$ 11,447,500**	
8. MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:								
	Contractor Mobilization / Demobilization							
8.1	Mob / Demob	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
	Project Management, Material Handling & Amenities					$ -	**$ -**	
8.2	Project Management & Staffing (includes PM, Field Engineers / Supervision, Scheduler and	17.0	Months		$ 350,000	$ 350,000	**$ 5,950,000**	
8.3	Site Accommodation, Facilities, Storage	1.0	Sum		$ 1,800,000	$ 1,800,000	**$ 1,800,000**	
	Engineering					$ -	**$ -**	
8.4	Design Engineering	1.0	Sum		$ 3,750,000	$ 3,750,000	**$ 3,750,000**	
8.5	LiDAR	1.0	Sum		$ 400,000	$ 400,000	**$ 400,000**	
8.6	Geotech	1.0	Sum		$ 800,000	$ 800,000	**$ 800,000**	
8.7	Surveying/Staking	1.0	Sum		$ 300,000	$ 300,000	**$ 300,000**	
	Testing & Commissioning					$ -	**$ -**	
8.8	Testing & Commissioning of T-Line and Equipment	1.0	Sum		$ 1,150,000	$ 1,150,000	**$ 1,150,000**	
	Permitting and Additional Costs					$ -	**$ -**	
8.9	Environmental Licensing & Permitting Costs	1.0	Sum		$ 2,308,505	$ 2,308,505	**$ 2,308,505**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
8.10	Environmental Mitigation	1.0	Sum		$ 8,202,072	$ 8,202,072	**$ 8,202,072**	
8.11	Warranties / LOC's	1.0	Sum		$ 418,284	$ 418,284	**$ 418,284**	
8.12	Real Estate Costs (New ROW)	1.0	Sum		$ 157,126	$ 157,126	**$ 157,126**	
8.13	Real Estate Costs (Incumbent Utility ROW)	1.0	Sum		$ 1,502,000	$ 1,502,000	**$ 1,502,000**	
8.14	Legal Fees	1.0	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
8.15	Allowance for Funds Used During Construction (AFUDC)	1.0	Sum			$ -	**$ -**	
8.16	Carrying Charges	1.0	Sum			$ -	**$ -**	
8.17	Sales Tax on Materials	1.0	Sum	$ 2,535,304		$ 2,535,304	**$ 2,535,304**	
8.18	Fees for permits, including roadway, railroad, building or other local permits	1.0	Sum		$ 200,000	$ 200,000	**$ 200,000**	
TOTAL - MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:							**$ 32,473,291**	
9. SYSTEM UPGRADE FACILITIES								
SUF 1.1	Depew to Erie Street 115kV Transmission Line 921. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Relay was replaced and line ratings increased to 124/137/158 (NOR/LTE/STE) resulting ratings are below line conductor ratings. Scope is to remove all limitations on the circuit so it is limited by lien conductor ratings 125/152/181 (NOR/LTE/STE).
SUF 1.2	Engineering, T&C, PM, Indirects for SUF 1.1 (15%)					$ -	**$ 75,000**	
SUF 2.1	Shawnee to Swann Reconductor	12.00	Mile		$ 400,000	$ 400,000	**$ 4,800,000**	Rate for reconductor is pro-rated from National Grid Niagara - Packard reconductor. Note that rate does not include upgrades to structures or foundations.
SUF 2.2	Engineering, T&C, PM, Indirects FOR SUF 2.2 (15%)					$ -	**$ 720,000**	
SUF 3	Roll Rd Substation							
SUF 3.1	Restoration of station stone within existing substation fence. Assume spoil materials disposed of on-site.	1.00	Ea		$ 100,000	$ 100,000	**$ 100,000**	Supply & Install
SUF 3.2	Transformer 115-34.5kV 90 MVA	1.00	Ea	$ 700,000	$ 200,000	$ 900,000	**$ 900,000**	
SUF 3.3	Switches 115kV 3Ph	1.00	Ea	$ 15,000	$ 12,000	$ 27,000	**$ 27,000**	
SUF 3.4	Switches 35kV 3Ph	1.00	Ea	$ 6,000	$ 4,000	$ 10,000	**$ 10,000**	
SUF 3.5	Breakers 115kV 1200A	1.00	Ea	$ 150,000	$ 50,000	$ 200,000	**$ 200,000**	
SUF 3.6	Breakers 35kV 2000A	1.00	Ea	$ 75,000	$ 15,000	$ 90,000	**$ 90,000**	
SUF 3.7	CVT's 115kV	3.00	Ea	$ 10,000	$ 8,000	$ 18,000	**$ 54,000**	
SUF 3.8	Arrestors 115kV	6.00	Ea	$ 5,000	$ 700	$ 5,700	**$ 34,200**	
SUF 3.9	Arrestors 35kV (for transformer)	3.00	Ea	$ 2,500	$ 500	$ 3,000	**$ 9,000**	
SUF 3.10	Low Profile Foundations	8.00	Ea		$ 5,000	$ 5,000	**$ 40,000**	Supply & Install
SUF 3.11	Circuit Breaker Foundation 115kV	1.00	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
SUF 3.12	Circuit Breaker Foundation 35kV	1.00	Ea		$ 30,000	$ 30,000	**$ 30,000**	Supply & Install
SUF 3.13	Transformer Foundation with concrete moat and double steel grating	1.00	Ea		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
SUF 3.14	Firewall 30' long x 12' tall x 1' thick with footer	1.00	Ea		$ 100,000	$ 100,000	**$ 100,000**	Supply & Install
SUF 3.15	Control Cables	1.00	Sum		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
SUF 3.16	Protection & Telecom Equipment	3.00	Ea		$ 30,000	$ 30,000	**$ 90,000**	
SUF 3.17	SCADA and Communications	1.00	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
SUF 3.18	Low Voltage AC Distribution	1.00	Sum		$ 30,000	$ 30,000	**$ 30,000**	Supply & Install
SUF 3.19	Control Conduits	1.0	Sum		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
SUF 3.20	Grounding	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
SUF 3.21	Switch Stand 115kV (reuse 1 existing)	1.0	Ea	$ 1,500	$ 800	$ 2,300	**$ 2,300**	
SUF 3.22	CVT Stand	3.0	Ea	$ 1,000	$ 1,000	$ 2,000	**$ 6,000**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
SUF 3.23	Arrestor Stand	3.0	Ea	$ 1,000	$ 1,000	$ 2,000	**$ 6,000**	
SUF 3.24	Misc Materials and Above / Below Ground Works	1.0	Sum		$ 120,000	$ 120,000	**$ 120,000**	Supply & Install
SUF 3.25	Engineering, T&C, PM, Indirects for SUF 3 (15%)					$ -	**$ 333,525**	Assumed 15% to cover all misc costs
SUF 4.1	Lockport to Shaw 115kV Transmsision Line 102. NAT report indicated: Remove all limitations to achieve line conductor ratings as the limit. Terminal allowance included.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	The limiting equipment is not known - scope undefined.
SUF 4.2	Engineering, T&C, PM, Indirects for SUF 4.1 (15%)					$ -	**$ 75,000**	
SUF 5	SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)						**$ 3,750,000**	Contingency for possible additional SUF upgrades
TOTAL - SYSTEM UPGRADE FACILITIES:							**$ 12,977,025**	

PROJECT TITLE WNY PROJECT EVALUATION- ENVIRONMENTAL LICENSING & PERMITTING COST ELEMENTS						ENVIRONMENTAL LICENSING & PERMITTING COST ESTIMATE RANGE FOR PROPOSED WNY TRANSMISSION PROJECT - T006	
FEDERAL						Proposal 1	
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans	Min.	Max.
USACE	Waters of the US under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act (including regulated wetland areas)	Nationwide Permits (NWP) or Individual Permit (IP)	Any work within the boundaries of regulated wetlands (with the exception of isolated wetlands) or waterways to the spring high tide or ordinary high water mark	If project qualifies for a NWP (<0.5 acre disturbance and within NWP project type parameters), a pre-construction notification (PCN) is typically required. NWPs have a 45 day review period starting from when project logged in system (up to 6wk backlog delay in logging projects) If an IP is triggered, USACE will require Alternative Analysis and Public Notice/Hearing. IPs could also trigger restrictive environmental work windows. IPs have a 120 day review period starting from when permit is "deemed complete"	Wetland Delineation; Wetland Function & Value Assessment; Stream Delineation; Restoration Plan	$24,360	$69,050
National Park Service	National Parks	Consultation; Special Use Permit	Only applies if National Park located in project area.	Depending on impact of project request for a special use permit may require a NEPA environmental assessment.			
USFWS	Endangered Species Act Section 7 (ESA) Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act	Consultation (Formal or Informal); Special Use Permit	Any work that may have an affect on listed species or their habitat; or projects within National Wildlife Refuges	USACE coordinates consultation with USFWS for ESA listed species during their permit review. Also includes the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act compliance. Season restrictions on construction could be imposed.	Rare, Threatened & Endangered Species Search; Preparation of Reports and Conservation Plans	$27,800	$94,000
NEPA	National Environmental Policy Act	Categorical Exclusion; EA Finding of No Impact; or EIS Record of Decision	With some exemptions, projects on federally owned lands and/or projects requiring federal permit approvals	Possible NEPA review due if federal agency coordination is required. Federal agency involved to determine if Categorical Exclusion applies. Assumes Article 7 covers NEPA requirements or if an EIS is required it is prepared under SEQRA Task.			
FAA	Airports / Airspace	Federal Aviation Administration (FAA) Notification	New or Replacement Structures near Airports	Depending on construction locations, this permit may only be needed for OP work.	Obstruction Analysis, Mitigation Plan (assumes Engineering Cost)		
STATE							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
NYS Public Service Commission / Department of Public Service (NYSDPS)	Article VII	Article VII: Certificate of Environmental Compatibility and Public Need and Environmental Management & Construction Plan (EM&CP)	Article 7: Major electric transmission facilities with design capacity of 100kV or more extending for at least 10 miles or 125kV and over extending a distance of 1 mile or more (some exclusions for underground transmission applies)	Article 7 will incorporate all of the required State and Local approvals (costed separately), as well as Engineering and Environmental Studies and Public Outreach. Article VII Intervenor Fund payment expected to be $100,000. An Environmental Management & Construction Plan (EM&CP) must be prepared and approved by the PSC. (see 16 NYCRR Parts 85 through 88)	Includes Reports and Plans required for State and Federal Agency Permits, as well as EM&CP, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan, Mitigation Plans	$600,000	$3,100,000

NYS Public Service Commission / Department of Public Service (NYSDPS)	Part 102		Construction of a utility overhead transmission facility that will convey electric energy at 65kV or higher for a distance of one mile or longer and are not subject to Article VII of the Public Service Law.	May include coordination or studies completed under other line items including: Visual assessment, SHPO determination, OPRHP consultation, Ecological Impacts Assessment	Advantage-Disadvantage Analysis		
NYSDEC	Article 15 Stream Disturbance; Article 24 Wetlands, Open Waters, Wetlands Buffers (100' for Freshwater Wetland)	Individual Permit (IP) (unless developer has General Permit (GP))	Any work within the boundaries of regulated waterways or wetlands, and wetland adjacent areas	Any disturbance within wetlands and/or below mean high tide will require an IP. Areas of temporary disturbance will likely require restoration, including a monitoring and maintenance period. Permanent disturbance will require offsite mitigation up to 3:1 area ratio; also includes a monitoring and maintenance period. GP may only be applicable if project ground disturbance is located outside of wetlands areas (above MHW).	Wetland Delineation; Wetland Restoration/Mitigation Plan	$16,800	$62,000
NYSDEC	Stormwater (If >1 Acre Soil Disturbance)	SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 & SWPPP	Project areas of soil disturbance	If project involves 1 acre or more soil disturbance, then the GP is required. If located within a Regulated MS4 Municipality, additional coordination may be needed. Weekly inspections by a Qualified Inspector during construction will be required.	SWPPP (assumes Engineering Cost includes Sediment & Erosion Control Plan, Hydraulic & Hydrology Studies, Stormwater Management Design)	$11,200	$38,000
Any State or local government agency that issues permits or approvals	State Environmental Quality Review Act (SEQRA)	Environmental Assessment (EA) Determination of Significance	Projects not covered as a Type II Action (Note a project can not be segmented - all phases/tasks must be considered in the review)	Most projects or activities proposed by a state agency, and all discretionary approvals (permits) from a NYS agency or local government, require an environmental impact assessment. SEQR requires the sponsoring or approving governmental body to identify and mitigate the significant environmental impacts of the activity it is proposing or permitting.			
NYSDOS	State Coastal Management Program Mapped Coastal Area Boundary	Coastal Consistency Concurrence	Projects within the NYSDOS designated Coastal Zone; and consistency with Local Waterfront Revitalization Plans (LWRPs); e.g., Town of Grand Island LWRP	Online mapping available to check if within coastal zone, a significant coastal fish & wildlife habitat (SCFWH), a local waterfront revitalization program area (LWRP), or a comprehensive management program areas (CMP)			
NYSHPO	National Historic Preservation Act (NHPA) Section 106: State and Federal Historic Places; State Mapped Archeologically Sensitive Areas	Cultural Resource Information System (CRIS) Determination	Local, State, or Federal eligible or designated historic places and/or areas of archeological sensitivity (in off-road areas and areas that have not been previously disturbed)	NYSDEC EAF Online Mapper identifies State or National Register of Historic Places and archeological sensitive areas within or adjacent to the project site. Formally enter project information and supporting documents into SHPO's online CRIS program. Staff will review and email a determination of impacts letter	Phase 1A & 1B Archaeological Studies	$13,200	$49,000

NYS NHP	Threatened and Endangered Species	Consultation	Activities that may affect T&E species or their habitat.		See USFWS	$1,200	$6,400
NYSDOT/NYS Thruway Authority/FHWA	State Roadways	Highway Work Permit/Utility Permit, Vegetation Management Permit; Easement	Any work within or crossing State highway ROW	May require restoration landscaping coordination. Typically requires compliance with NEPA including SHPO and USFWS effects determination	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$17,000	$69,000
NYS Canal Corporation	Erie Canal - jurisdiction varies along edge	Canal Occupancy & Work Permit (TA-W99072)	Any work involving the Erie Canal	Must coordinate with Division Permit Engineer about particular section of canal being affected. Commercial permit fee = $25 plus $2,000,000 additional General Aggregate Liability Insurance	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)		
NYS Dept. of Agriculture and Markets	All agricultural lands (including Agricultural Districts)	Part of Article 7 & Article 10 Review process	Any work impacting agricultural land	Must minimize impacts and restore damage to agricultural land, and coordinate with County Soil & Water Conservation District; Vineyards are a major concern in WNYS. Pre-application conference with PSC, DEC and Ag& Markets recommended. Must develop EM&CP in conformance with Art. 7/10 Certificate Conditions. Agricultural Monitor must oversee construction & restoration; requisite 2-yrs post restoration monitoring.	Crop/Pasturing Mitigation Plan (not included in costing)	$11,000	$24,000

REGIONAL

Railroads	Railroad crossings	Consultation-permits may be required; Easement	Access / new structures on RR property		Easement area survey (not included in costs)	$11,000	$76,000

LOCAL/MUNICIPAL

Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
County Dept. of Public Works	County Roadways	Lane Closure Permit, Highway Work or Access Permit	Work within county roadways and right-of-ways			$6,000	$40,000
Town, City or Village	Municipal Stormwater (MS4) Review	Approval of SWPPP or EM&CP	Project areas of soil disturbance		See NYSDEC SPDES	$6,000	$35,000
Town, City or Village	Variable	Building Permits	New Structures	Individual Towns/Villages must be consulted on a project specific basis to determine notification and/or permitting procedures. Permit application names vary (e.g. road obstruction permit)		$18,000	$92,000
Town, City or Village	Municipal Roadways	Highway Work Permit; Road Opening Permit	Work within municipal roadways and right-of-ways			$6,000	$35,000
Town, City or Village	Wetlands	Wetland Permit / Conservation Approvals	Mapped wetlands and wetland adjacent areas (buffer width variable)		See USACE / NYSDEC Art. 24	$6,000	$52,000

		Minimum	Maximum
ENVIRONMENTAL LICENSING & PERMITTING COST (EXCLUDING MITIGATION)	**PROJECT T006 TOTAL**	**$775,560**	**$3,841,450**
Excluded cost: Mitigation or restoration for impact to regulated wetlands; agricultural land and tree clearing	**Expected Value**	**$2,308,505**	

ENVIRONMENTAL MITIGATION ESTIMATE

Revision: 4

	Offsite Wetland Mitigation*		Farmland**	
	Min.	Max.	Min.	Max.
Area	39 acres	39 acres	16 acres	32 acres
Cost/Acre	$60,000	$120,000	$503	$503
Ratio	1:1	3:1	1:1	1:1
Total	$2,340,000	$14,040,000	$8,048	$16,096

T006 MITIGATION TOTAL	Minimum	Maximum	Expected Value
	$2,348,048	**$14,056,096**	**$ 8,202,072**

*Offsite wetland mitigation area assumes clearing of NWI Forested/Shrub Wetland Approx. 3.24 miles (17107 lF) by 100' ROW width; Max. cost per acre assumes additional mitigation required for permanent impacts of proposed structures in non-forested wetlands; costing includes design and installation costs only; does not include land acquisition or long term monitoring

**Farmland mitigation based on corn bushel yield at 129 BU/Acre and $3.9/BU (production numbers from 2016 USDA NYS Agriculture Overview), area assumes 5.28 miles (27878 LF) Adjacent to Agriculture Properties by 25' Wide (Min.) or 50' Wide (Max.); does not include land acquisition

REAL ESTATE ESTIMATE (NEW ROW)

Revision: 4

COUNTY: ERIE

DEVELOPER: NORTH AMERICAN (T006)

SEGMENT: DYSINGER - STOLLE SEGMENT

		Area (Acres)	Total Cost
	Sub Total	0.68	$ 4,376.00

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T006 - North American Transmission

Revision: 4

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

COUNTY: NIAGARA & ERIE
DEVELOPER: NORTH AMERICAN (T006)
SEGMENT: DYSINGER - STOLLE SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
1	North American Transmission (Proposal 1)	Dysinger SS to Stolle Rd SS - 19.98 miles	Niagara	5.74	$ 1,502,000
			Erie	296.31	

REAL ESTATE ESTIMATE (SUBSTATIONS)

Revision: 4

COUNTY:	NIAGARA
DEVELOPER:	NORTH AMERICAN (T006)
SEGMENT:	DYSINGER SWITCHYARD

		Total Cost
	Total Cost of Proposed Substation Site	$152,750.00

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

a) Cost Estimate is based on 2017 rates.
b) Construction schedule is in accordance with the Developers proposed schedule (10 months) - we have assumed continuous working with no breaks in the schedule. Six months have been added to the construction schedule for start up and close out works and assisting in pre-construction activities (i.e. permitting activites, material procurement etc.).
c) Stringing rates allow for protection over crossings (such as rider poles).
d) We have assumed a typical work week (6 x 10 hour days).
e) We have assumed that the Access Road included in Developer Estimate will be Type 1 Gravel Type.
f) Costs will vary for handling and disposal of contaminated spoils, depending on type of contaminants and availability / location of the appropriate tipping facility. Since there is not enough information to provide a quantified estimate for this item, allowance is included in the contingency monies.
g) Costs have been developed based on historical data from Projects of a similar nature (AACE Class 5 and 4 Estimating Practices). We have not engaged any subcontractors or material vendors for formal quotes.
h) Estimated quantities have been used for items in red text in Section 1 of the Estimate (CLEARING & ACCESS FOR T-LINE CONSTRUCTION). These items were not quantified in the Developers Estimate, however we believe that they are necessary for the works.
i) Foundation rates include supply and installation of materials. Drilled Pier rates include supply and testing of concrete, rebar cage and the use of temp or permanent casing.
j) A Contractor Mark-Up (OH&P) of 15% has been included in the Total section.
k) Assumes all environmental data and project details provided are accurate unless noted otherwise.
l) USFWS T&E Assumes that ¼ of the total line in ROW per segment will require field survey for T&E (5 miles).
m) NEPA-Assumes no NEPA because Art VII.
n) SHPO-Assumes consultation and Phase 1A/1B archeological studies with field survey for 50% of project route (10 miles).
o) NYSDOT/FHWA-Assumes any required NEPA coordination/requirements are covered under Article VII.
p) Assumes no coordination with National Parks Service or OPRHP/State Parks.
q)USACE wetland delineation total based on Line Miles in Wetlands - NWI wetland length of 3.34 mile.
r) DEC wetland delineation total based on Line Miles in Wetlands - DEC wetland length of 1.19 miles.

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

s) Offsite wetland mitigation area costs based on impacts anticipated by clearing of NWI Forested/Shrub Wetland of approximately 3.24 miles (calculated by GEI based on NWI mapper legend categories). Assumes clearing an additional 100 feet within Right of Way. Minimum costs at $60,000/acre, maximum costs at $120,000/acre for additional permanent impacts of proposed structures in non-forested wetlands. Costing includes design and installation costs only and does not include land acquisition or long term monitoring.
t) Agricultural mitigation assumes timber matting impacts and pad impacts on adjacent agriculture land (5.28 miles) requires crop damage payments based on USDA 2016 NYS Agriculture Overview corn yield and bushel price/acre. Minimum assumes 25-foot-wide impact, Maximum assumes 50-foot-wide impact.
u)Mitigation costs for landscaping only (no paving, sidewalks, sound walls, etc.).
v) No tree survey or replanting required outside regulated wetlands areas.
w) Article VII Intervenor Fund payment expected to be $100,000.
x) SUF pricing includes 35% to cover Contractor markup (15%) and contingency (20%)
y) SUF reconductor rate is based on Niagara-Packard (National Grid) reconductor estimate, pro-rated to a rate / mile. Note that this is based on conductor, shieldwire and hardware pricing only and does not include structure or foundation works.
z) System Upgrade Facilities Contingency is allowance for potential additional system upgrades including overdutied breakers, protection changes, unidentified thermal issues, etc that may be identified as detailed studies are completed.

INDEPENDENT ESTIMATES

ATTACHMENT B2

T007 – NORTH AMERICAN TRANSMISSION

SUBSTATION ENGINEERING COMPANY
8/11/2017

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T007 - North American Transmission

Revision: 4

SUMMARY OF COST ESTIMATE

	Description		Total Amount
1	CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION	$	18,262,638
2	TRANSMISSION LINE FOUNDATIONS	$	21,747,379
3	STRUCTURES - TRANSMISSION LINE	$	27,076,848
4	CONDUCTOR, SHIELDWIRE, OPGW	$	8,522,568
5	TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE	$	2,536,564
6	NEW DYSINGER SWITCHYARD	$	19,771,000
7	STOLLE ROAD SUBSTATION WORKS	$	7,548,000
8	GARDENVILLE 345/230kV SUBSTATION WORKS	$	12,822,500
9	MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS	$	53,282,851
	CONTRACTOR MARK-UP (OH&P) 15%	$	25,735,552
	SUBTOTAL:	$	197,305,901
	CONTINGENCY (25%)	$	49,326,475
	TOTAL (A):	**$**	**246,632,376**
10	SYSTEM UPGRADE FACILITIES	$	23,258,025
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$	8,140,309
	TOTAL (B):	**$**	**31,398,334**
	TOTAL PROJECT COST (A+B):	**$**	**278,030,710**

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

Description of Work: Proposal 1 - A new 345kV Dysinger Switchyard located approximately 8 miles southeast of the city of Lockport, New York. The Project also includes a new ~20 mile 345kV Transmission Line from Dysinger Switchyard to Stolle Road Substation near Marilla, New York. Proposal 2 - Includes Proposal 1 Scope of Work, with the addition of a single circuit 345kV Transmission Line from the Stolle Road 345kV Substation to the existing Gardenville Substation, and a new 345/230kV Transformer at the existing Gardenville Substation. This cost estimate uses Option 1 routing (as per NAT estimate).

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
1. CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION								
1.1	Clearing the ROW (mowing & clearing)	199.0	Acre		$ 15,000	$ 15,000	**$ 2,985,000**	
1.2	Access Road	98,960.0	LF		$ 45	$ 45	**$ 4,453,200**	Assumes Type 1 Type Gravel Road
1.3	Silt Fence	98,960.0	LF		$ 4	$ 4	**$ 395,840**	
1.4	Matting	74,295.0	LF		$ 70	$ 70	**$ 5,200,650**	
1.5	Snow Removal	1.0	Sum		$ 492,000	$ 492,000	**$ 492,000**	
1.6	ROW Restoration	33.0	Mile		$ 10,000	$ 10,000	**$ 330,000**	
1.7	Work Pads	832,500.0	SF		$ 4	$ 4	**$ 2,930,400**	
1.8	Restoration for Work Pad areas	83,250.0	SF		$ 0.2	$ 0.2	**$ 12,488**	
1.9	Temporary Access Bridge	30.0	EA		$ 20,035	$ 20,035	**$ 601,050**	
1.10	Air Bridge	8.0	EA		$ 14,445	$ 14,445	**$ 115,560**	
1.11	Stabilized Construction Entrance	15.0	EA		$ 4,580	$ 4,580	**$ 68,700**	
1.12	Maintenance and Protection of Traffic on Public Roads	1.0	LS		$ 500,000	$ 500,000	**$ 500,000**	
1.13	Culverts / Misc. Access	1.0	LS		$ 150,000	$ 150,000	**$ 150,000**	
1.14	Concrete Washout Station	15.0	EA		$ 1,850	$ 1,850	**$ 27,750**	
TOTAL - CLEARING & ACCESS FOR TRANSMISSION LINE:							**$ 18,262,638**	
2. TRANSMISSION LINE FOUNDATIONS								
2.1	Direct Embed Foundations - 23ft deep x 6ft dia.	136.0	Structure		$ 18,000	$ 18,000	**$ 2,448,000**	Supply & Install
2.2	Direct Embed Foundations - 28ft deep x 7ft dia.	5.0	Structure		$ 20,000	$ 20,000	**$ 100,000**	Supply & Install
2.3	Direct Embed Foundations - 30ft deep x 6ft dia.	35.0	Structure		$ 20,000	$ 20,000	**$ 700,000**	Supply & Install
2.4	Direct Embed Foundations - 37ft deep x 7ft dia.	11.0	Structure		$ 22,000	$ 22,000	**$ 242,000**	Supply & Install
2.5	Drilled Pier 38ft deep x 9ft dia.	984.9	CUY		$ 1,500	$ 1,500	**$ 1,477,334**	
2.6	Drilled Pier 45ft deep x 9ft dia.	349.9	CUY		$ 1,500	$ 1,500	**$ 524,849**	
2.7	Drilled Pier 47ft deep x 8ft dia.	1,347.5	CUY		$ 1,500	$ 1,500	**$ 2,021,250**	
2.8	Drilled Pier 57ft deep x 9ft dia.	443.2	CUY		$ 1,500	$ 1,500	**$ 664,785**	
2.9	Drilled Pier 64ft deep x 8ft dia.	393.2	CUY		$ 1,500	$ 1,500	**$ 589,793**	
2.10	Drilled Pier 71ft deep x 9ft dia.	4,048.4	CUY		$ 1,500	$ 1,500	**$ 6,072,627**	
2.11	Drilled Pier 43ft deep x 8ft dia.	792.5	CUY		$ 1,500	$ 1,500	**$ 1,188,743**	
2.12	Rock Excavation Adder	2,859.0	CUY		$ 2,000	$ 2,000	**$ 5,718,000**	
TOTAL - TRANSMISSION LINE FOUNDATIONS:							**$ 21,747,379**	
3. STRUCTURES - TRANSMISSION LINE								
3.1	Single Steel Pole Tangent Delta - 00- 10 (Ht. 100')	18.0	ea	$ 31,401	$ 18,841	$ 50,242	**$ 904,349**	
3.2	Single Steel Pole Tangent Delta - 00- 10 (Ht. 115')	118.0	ea	$ 38,376	$ 23,026	$ 61,402	**$ 7,245,389**	
3.3	Single Steel Pole Tangent Delta - 00- 10 (Ht. 130')	29.0	ea	$ 44,150	$ 26,490	$ 70,641	**$ 2,048,579**	
3.4	Single Steel Pole Tangent Delta - 00- 10 (Ht. 145')	6.0	ea	$ 50,029	$ 30,018	$ 80,047	**$ 480,280**	
3.5	Single Steel Pole Small Angle Delta - 10- 15 (Ht. 115')	5.0	pole	$ 66,881	$ 40,128	$ 107,009	**$ 535,046**	
3.6	Single Steel Pole Small Angle Delta - 10- 15 (Ht. 130)	4.0	pole	$ 78,872	$ 47,323	$ 126,196	**$ 504,783**	
3.7	Single Steel Pole Small Angle Delta - 10- 15 (Ht. 145)	2.0	pole	$ 94,927	$ 56,956	$ 151,883	**$ 303,765**	
3.8	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 115')	9.0	pole	$ 93,524	$ 56,115	$ 149,639	**$ 1,346,751**	
3.9	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 130')	7.0	pole	$ 120,604	$ 72,362	$ 192,966	**$ 1,350,760**	
3.10	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 145')	7.0	pole	$ 153,391	$ 92,034	$ 245,425	**$ 1,717,975**	
3.11	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 185')	3.0	pole	$ 187,828	$ 112,697	$ 300,525	**$ 901,575**	
3.12	Single Steel Pole Large Angle DE Vertical - 60- 90 (Ht. 115')	10.0	pole	$ 111,476	$ 66,885	$ 178,361	**$ 1,783,613**	
3.13	Single Steel Pole Large Angle DE Vertical - 60- 90 (Ht. 130')	15.0	pole	$ 140,249	$ 84,149	$ 224,398	**$ 3,365,971**	
3.14	Single Steel Pole Large Angle DE Vertical - 60- 90 (Ht. 145')	7.0	pole	$ 177,172	$ 106,303	$ 283,476	**$ 1,984,329**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
3.15	Large Angle DE (Ht. 195')	3.0	pole	$ 169,360	$ 101,616	$ 270,976	**$ 812,929**	
3.16	Tangent DE (Ht. 195')	3.0	pole	$ 116,824	$ 70,094	$ 186,918	**$ 560,753**	
3.17	Install Grounding	246.0	Structure		$ 5,000	$ 5,000	**$ 1,230,000**	
TOTAL - STRUCTURES TRANSMISSION LINE:							**$ 27,076,848**	
4. CONDUCTOR, SHIELDWIRE, OPGW								
4.1	(2)/Phase - 795kcmil 26/7 Stranded "Drake" ACSR	32.8	Circuit Mile	$ 53,856	$ 158,400	$ 212,256	**$ 6,964,864**	
4.2	(1) OPGW 36 Fiber AC-33/38/571	32.8	Mile	$ 19,404	$ 27,720	$ 47,124	**$ 1,546,304**	
4.3	(1) 3/8" HS Steel (2nd SW where required)	2,000.0	Ft	$ 1	$ 5	$ 6	**$ 11,400**	
TOTAL: CONDUCTOR, SHIELDWIRE, OPGW:							**$ 8,522,568**	
5. TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE								
5.1	Tangent - Polymer V-String	516.0	Set	$ 900	$ 720	$ 1,620	**$ 835,920**	
5.2	Angle - Polymer V-String	33.0	Set	$ 1,300	$ 1,040	$ 2,340	**$ 77,220**	
5.3	Deadend - Polymer Double Deadend including Jumper	354.0	Set	$ 1,500	$ 1,350	$ 2,850	**$ 1,008,900**	
5.4	OPGW Assembly - Tangent	172.0	Set	$ 200	$ 150	$ 350	**$ 60,200**	
5.5	OPGW Assembly - Angle / DE	148.0	Set	$ 250	$ 150	$ 400	**$ 59,200**	
5.6	OHSW Assembly - Angle / DE	8.0	Set	$ 250	$ 150	$ 400	**$ 3,200**	
5.7	OPGW Splice Boxes	15.0	Set	$ 1,500	$ 1,000	$ 2,500	**$ 37,500**	
5.8	OPGW Splice & Test	1.0	Sum		$ 18,000	$ 18,000	**$ 18,000**	
5.9	Spacer Dampers	2,952.0	Ea	$ 50	$ 35	$ 85	**$ 250,920**	
5.10	Vibration Dampers - Conductor	2,952.0	Ea	$ 32	$ 20	$ 52	**$ 153,504**	
5.11	Shieldwire / OPGW Dampers, Misc Fittings	1.0	Sum	$ 20,000	$ 12,000	$ 32,000	**$ 32,000**	
TOTAL: TRANSMISSION LINE INSULATORS, FITTINGS, HARDWARE:							**$ 2,536,564**	
6. NEW DYSINGER SWITCHYARD								
6.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement	1.0	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
6.2	Substation Fence	2,450.0	LF		$ 200	$ 200	**$ 490,000**	Supply & Install
6.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
6.4	Switches 3ph	16.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 112,000**	
6.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
6.6	Line Switches 3 ph	5.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 150,000**	
6.7	Instrument Transformers	1.0	Sum		$ 1,046,000	$ 1,046,000	**$ 1,046,000**	
6.8	Breakers	8.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 3,040,000**	
6.9	Arrestors (3 per line)	15.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 112,500**	
6.10	Line Traps	5.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 105,000**	
6.11	Two (2) 345 kV buses	2.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
6.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	Supply & Install
6.13	Low Profile Foundations	231.0	Ea		$ 5,000	$ 5,000	**$ 1,155,000**	Supply & Install
6.14	Caisson DE Foundations	20.0	Ea		$ 50,000	$ 50,000	**$ 1,000,000**	Supply & Install
6.15	Circuit Breaker Foundations	8.0	Ea		$ 75,000	$ 75,000	**$ 600,000**	Supply & Install
6.16	Lightning Mast Foundations	15.0	Ea		$ 15,000	$ 15,000	**$ 225,000**	Supply & Install
6.17	SST Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	
6.18	Control House and Pad (30' x 90')	1.0	Sum	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	Supply & Install
6.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	
6.20	Control Cables	1.0	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
6.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
6.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	Supply & Install
6.23	Protection, Telecom and Metering Equipment (Panels)	30.0	Ea		$ 30,000	$ 30,000	**$ 900,000**	Supply & Install
6.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.25	Low Voltage AC Distribution	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
6.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
6.28	Grounding	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	
6.29	Bus Support 1 Ph	93.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 279,000**	
6.30	Switch Stands	16.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 176,000**	
6.31	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
6.32	Misc. Structures	1.0	Sum	$ -	$ 52,000	$ 52,000	**$ 52,000**	
6.33	Substation A-Frame Structures Standalone	5.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 125,000**	
6.34	Lightning Masts	15.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 180,000**	
6.35	Arrestor Stands	15.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 52,500**	
6.36	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
6.37	Connection of Existing Lines to Dysinger Switchyard	1.0	Sum		$ 3,400,000	$ 3,400,000	**$ 3,400,000**	Supply & Install
TOTAL - DYSINGER SWITCHYARD:							**$ 19,771,000**	
7. STOLLE ROAD SUBSTATION WORKS:								
7.1	Switches 3ph	6.00	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 42,000**	
7.2	Line Switches 3 ph w/ motor-operators	2.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 60,000**	
7.3	Instrument Transformers	1.00	Sum		$ 544,000	$ 544,000	**$ 544,000**	
7.4	Breakers	4.00	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 1,520,000**	
7.5	Arrestors (3 per line)	6.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 45,000**	
7.6	Line Traps	2.00	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 42,000**	
7.7	345 kV buses	1.00	Ea	$ 12,500	$ 17,500	$ 30,000	**$ 30,000**	Supply & Install
7.8	Low Profile Foundations	110.00	Ea		$ 5,000	$ 5,000	**$ 550,000**	Supply & Install
7.9	Caisson DE Foundations	4.00	Ea		$ 50,000	$ 50,000	**$ 200,000**	Supply & Install
7.1	Circuit Breaker Foundations	4.00	Ea		$ 75,000	$ 75,000	**$ 300,000**	Supply & Install
7.11	Lightning Mast Foundations	4.0	Ea		$ 15,000	$ 15,000	**$ 60,000**	
7.12	Control Cables	1.00	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	Supply & Install
7.13	Protection, Telecom and Metering Equipment (Panels)	16.00	Ea		$ 30,000	$ 30,000	**$ 480,000**	Supply & Install
7.14	SCADA and Communications	1.00	Sum		$ 125,000	$ 125,000	**$ 125,000**	Supply & Install
7.15	Control Conduits from Cable Tray to Equipment	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
7.16	Cable Trench Systems for Control Cables	1.00	Sum		$ 750,000	$ 750,000	**$ 750,000**	
7.17	Grounding	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	
7.18	Bus Support 1 Ph	54.00	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 162,000**	
7.19	Switch Stands	6.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 66,000**	
7.2	Misc. Structures	1.00	Sum		$ 28,000	$ 28,000	**$ 28,000**	
7.21	Substation A-Frame Structures Standalone	1.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 25,000**	
7.22	Lightning Masts	4.00	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 48,000**	
7.23	Arrestor Stands	6.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 21,000**	
7.24	Miscellaneous Materials and Above / Below Ground Works	1.00	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
7.25	Interconnection arrangement at Stolle Rd Substation	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
TOTAL - STOLLE RD SUBSTATION WORKS:							**$ 7,548,000**	
8. GARDENVILLE 345/230kV SUBSTATION WORKS								
8.1	Site Works including sediment controls, access roads, rough grading, final grading	1.0	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
8.2	Substation Fence	1,400.0	LF		$ 200	$ 200	**$ 280,000**	Supply & Install
8.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
8.4	Switches 3ph	1.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 7,000**	
8.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
8.6	Line Switches 3 ph w/ motor-operators	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
8.7	Instrument Transformers	1.0	Sum		$ 271,000	$ 271,000	**$ 271,000**	
8.8	Breakers	1.0	Ea	$ 250,000	$ 75,000	$ 325,000	**$ 325,000**	

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
8.9	Arrestors (3 per line)	12.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 90,000**	
8.10	Line Traps	1.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 21,000**	
8.11	230 kV buses	1.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 60,000**	
8.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
8.13	Low Profile Foundations	40.0	Ea		$ 5,000	$ 5,000	**$ 200,000**	Supply & Install
8.14	Caisson DE Foundations	12.0	Ea		$ 50,000	$ 50,000	**$ 600,000**	Supply & Install
8.15	Circuit Breaker Foundations	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
8.16	Lightning Mast Foundations	1.0	Ea		$ 15,000	$ 15,000	**$ 15,000**	Supply & Install
8.17	SST Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
8.18	Control House and Pad (14' x 70' - 980 sq. ft)	1.0	Ea	$ 350,000	$ 100,000	$ 450,000	**$ 450,000**	
8.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
8.20	Control Cables	1.0	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
8.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
8.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	
8.23	Protection, Telecom and Metering Equipment (Panels)	11.0	Ea		$ 30,000	$ 30,000	**$ 330,000**	Supply & Install
8.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
8.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
8.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
8.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 350,000	$ 350,000	**$ 350,000**	Supply & Install
8.28	Grounding	1.0	Sum		$ 125,000	$ 125,000	**$ 125,000**	Supply & Install
8.29	Bus Support 1 Ph	18.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 54,000**	
8.30	Switch Stands	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
8.31	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
8.32	Misc. Structures	1.0	Sum		$ 27,000	$ 27,000	**$ 27,000**	
8.33	Substation A-Frame Structures Standalone	3.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 75,000**	
8.34	Lightning Masts	1.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 12,000**	
8.35	Arrestor Stands	6.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 21,000**	
8.36	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 725,000	$ 725,000	**$ 725,000**	Supply & Install
8.37	345kV - 230kV 480/540/600 MVA Transformer	1.0	Ea	$ 4,750,000	$ 750,000	$ 5,500,000	**$ 5,500,000**	
8.38	Transformer Foundation with concrete moat and double steel grating	1.0	Ea		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
TOTAL - GARDENVILLE SUBSTATION WORKS:							**$ 12,822,500**	
9. MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:								
	Contractor Mobilization / Demobilization							
9.1	Mob / Demob	1.0	Sum		$ 1,200,000	$ 1,200,000	**$ 1,200,000**	
	Project Management, Material Handling & Amenities					$ -	**$ -**	
9.2	Project Management & Staffing (includes PM, Field Engineers / Supervision,	24.0	Months		$ 375,000	$ 375,000	**$ 9,000,000**	
9.3	Site Accommodation, Facilities, Storage	1.0	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
	Engineering					$ -	**$ -**	
9.4	Design Engineering	1.0	Sum		$ 6,600,000	$ 6,600,000	**$ 6,600,000**	
9.5	LiDAR	1.0	Sum		$ 600,000	$ 600,000	**$ 600,000**	
9.6	Geotech	1.0	Sum		$ 1,100,000	$ 1,100,000	**$ 1,100,000**	
9.7	Surveying/Staking	1.0	Sum		$ 450,000	$ 450,000	**$ 450,000**	
	Testing & Commissioning					$ -	**$ -**	
9.8	Testing & Commissioning of TRANSMISSION LINE and Equipment	1.0	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	
	Permitting and Additional Costs					$ -	**$ -**	
9.9	Environmental Licensing & Permitting Costs	1.0	Sum		$ 3,120,534	$ 3,120,534	**$ 3,120,534**	
9.10	Environmental Mitigation	1.0	Sum		$ 9,884,084	$ 9,884,084	**$ 9,884,084**	
9.11	Warranties / LOC's	1.0	Sum		$ 738,968	$ 738,968	**$ 738,968**	
9.12	Real Estate Costs (New ROW)	1.0	Sum		$ 7,623,974	$ 7,623,974	**$ 7,623,974**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
9.13	Real Estate Costs (Incumbent Utility ROW)	1.0	Sum		$ 1,949,484	$ 1,949,484	**$ 1,949,484**	
9.14	Legal Fees	1.0	Sum		$ 2,500,000	$ 2,500,000	**$ 2,500,000**	
9.15	Allowance for Funds Used During Construction (AFUDC)	1.0	Sum			$ -	**$ -**	
9.16	Carrying Charges	1.0	Sum			$ -	**$ -**	
9.17	Sales Tax on Materials	1.0	Sum	$ 4,815,807		$ 4,815,807	**$ 4,815,807**	
9.18	Fees for permits, including roadway, railroad, building or other local permits	1.0	Sum		$ 200,000	$ 200,000	**$ 200,000**	
TOTAL - MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:							**$ 53,282,851**	
10. SYSTEM UPGRADE FACILITIES								
SUF 1.1	Depew to Erie Street 115kV Transmission Line 921. Terminal allowance included.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Relay was replaced and line ratings
SUF 1.2	Engineering, T&C, PM, Indirects for SUF 1.1 (15%)					$ -	$ 75,000	increased to 124/137/158 (NOR/LTE/STE)
SUF 2.1	Shawnee to Swann Reconductor	12.00	Mile		$ 400,000	$ 400,000	**$ 4,800,000**	Rate for reconductor is pro-rated from
SUF 2.2	Engineering, T&C, PM, Indirects FOR SUF 2.2 (15%)					$ -	$ 720,000	National Grid Niagara - Packard
SUF 3	Roll Rd Substation							
SUF 3.1	Restoration of station stone within existing substation fence. Assume spoil materials disposed of on-site.	1.00	Ea		$ 100,000	$ 100,000	**$ 100,000**	Supply & Install
SUF 3.2	Transformer 115-34.5kV 90 MVA	1.00	Ea	$ 700,000	$ 200,000	$ 900,000	**$ 900,000**	
SUF 3.3	Switches 115kV 3Ph	1.00	Ea	$ 15,000	$ 12,000	$ 27,000	**$ 27,000**	
SUF 3.4	Switches 35kV 3Ph	1.00	Ea	$ 6,000	$ 4,000	$ 10,000	**$ 10,000**	
SUF 3.5	Breakers 115kV 1200A	1.00	Ea	$ 150,000	$ 50,000	$ 200,000	**$ 200,000**	
SUF 3.6	Breakers 35kV 2000A	1.00	Ea	$ 75,000	$ 15,000	$ 90,000	**$ 90,000**	
SUF 3.7	CVT's 115kV	3.00	Ea	$ 10,000	$ 8,000	$ 18,000	**$ 54,000**	
SUF 3.8	Arrestors 115kV	6.00	Ea	$ 5,000	$ 700	$ 5,700	**$ 34,200**	
SUF 3.9	Arrestors 35kV (for transformer)	3.00	Ea	$ 2,500	$ 500	$ 3,000	**$ 9,000**	
SUF 3.10	Low Profile Foundations	8.00	Ea		$ 5,000	$ 5,000	**$ 40,000**	Supply & Install
SUF 3.11	Circuit Breaker Foundation 115kV	1.00	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
SUF 3.12	Circuit Breaker Foundation 35kV	1.00	Ea		$ 30,000	$ 30,000	**$ 30,000**	Supply & Install
SUF 3.13	Transformer Foundation with concrete moat and double steel grating	1.00	Ea		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
SUF 3.14	Firewall 30' long x 12' tall x 1' thick with footer	1.00	Ea		$ 100,000	$ 100,000	**$ 100,000**	Supply & Install
SUF 3.15	Control Cables	1.00	Sum		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
SUF 3.16	Protection & Telecom Equipment	3.00	Ea		$ 30,000	$ 30,000	**$ 90,000**	
SUF 3.17	SCADA and Communications	1.00	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
SUF 3.18	Low Voltage AC Distribution	1.00	Sum		$ 30,000	$ 30,000	**$ 30,000**	Supply & Install
SUF 3.19	Control Conduits	1.0	Sum		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
SUF 3.20	Grounding	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
SUF 3.21	Switch Stand 115kV (reuse 1 existing)	1.0	Ea	$ 1,500	$ 800	$ 2,300	**$ 2,300**	
SUF 3.22	CVT Stand	3.0	Ea	$ 1,000	$ 1,000	$ 2,000	**$ 6,000**	
SUF 3.23	Arrestor Stand	3.0	Ea	$ 1,000	$ 1,000	$ 2,000	**$ 6,000**	
SUF 3.24	Misc Materials and Above / Below Ground Works	1.0	Sum		$ 120,000	$ 120,000	**$ 120,000**	Supply & Install
SUF 3.25	Engineering, T&C, PM, Indirects for SUF 3 (15%)					$ -	**$ 333,525**	Assumed 15% to cover all misc costs
SUF 4.1	Lockport to Shaw 115kV Transmsision Line 102. NAT report indicated: Remove all limitations to achieve line conductor ratings as the limit. Terminal allowance included.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	The limiting equipment is not known - scope undefined.
SUF 4.2	Engineering, T&C, PM, Indirects for SUF 4.1 (15%)					$ -	**$ 75,000**	
SUF 5	Gardenville Circuit Breaker Replacement							
SUF 5.1	Circuit Breaker Foundation	12.0	Ea		$ 75,000	$ 75,000	**$ 900,000**	Supply & Install
SUF 5.2	Below Grade Conduit & Grounding	1.0	Sum		$ 1,200,000	$ 1,200,000	**$ 1,200,000**	Supply & Install
SUF 5.3	Circuit breaker - 230kV	12.0	Ea	$ 250,000	$ 75,000	$ 325,000	**$ 3,900,000**	
SUF 5.4	Switches - 230kV	24.0	Ea	$ 20,000	$ 15,000	$ 35,000	**$ 840,000**	
SUF 5.5	Control Cables	1.0	Sum		$ 1,200,000	$ 1,200,000	**$ 1,200,000**	Supply & Install

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
SUF 5.6	Misc Above Ground Works	1.0	Sum		$ 900,000	$ 900,000	**$ 900,000**	
SUF 5.7	Engineering, T&C, PM, Indirects for SUF 5 (15%)					$ -	**$ 1,341,000**	Assumed 15% to cover all misc costs
SUF 6	SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)						**$ 3,750,000**	Contingency for possible additional SUF upgrades
TOTAL - SYSTEM UPGRADE FACILITIES:							**$ 23,258,025**	

PROJECT TITLE WNY PROJECT EVALUATION- ENVIRONMENTAL LICENSING & PERMITTING COST ELEMENTS						ENVIRONMENTAL LICENSING & PERMITTING COST ESTIMATE RANGE FOR PROPOSED WNY TRANSMISSION PROJECT - T007	
FEDERAL						Proposal 2	
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans	Min.	Max.
USACE	Waters of the US under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act (including regulated wetland areas)	Nationwide Permits (NWP) or Individual Permit (IP)	Any work within the boundaries of regulated wetlands (with the exception of isolated wetlands) or waterways to the spring high tide or ordinary high water mark	If project qualifies for a NWP (<0.5 acre disturbance and within NWP project type parameters), a pre-construction notification (PCN) is typically required. NWPs have a 45 day review period starting from when project logged in system (up to 6wk backlog delay in logging projects) If an IP is triggered, USACE will require Alternative Analysis and Public Notice/Hearing. IPs could also trigger restrictive environmental work windows. IPs have a 120 day review period starting from when permit is "deemed complete"	Wetland Delineation; Wetland Function & Value Assessment; Stream Delineation; Restoration Plan	$26,600	$89,000
National Park Service	National Parks	Consultation; Special Use Permit	Only applies if National Park located in project area.	Depending on impact of project request for a special use permit may require a NEPA environmental assessment.			
USFWS	Endangered Species Act Section 7 (ESA) Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act	Consultation (Formal or Informal); Special Use Permit	Any work that may have an affect on listed species or their habitat; or projects within National Wildlife Refuges	USACE coordinates consultation with USFWS for ESA listed species during their permit review. Also includes the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act compliance. Season restrictions on construction could be imposed.	Rare, Threatened & Endangered Species Search; Preparation of Reports and Conservation Plans	$43,600	$125,600
NEPA	National Environmental Policy Act	Categorical Exclusion; EA Finding of No Impact; or EIS Record of Decision	With some exemptions, projects on federally owned lands and/or projects requiring federal permit approvals	Possible NEPA review due if federal agency coordination is required. Federal agency involved to determine if Categorical Exclusion applies. Assumes Article 7 covers NEPA requirements or if an EIS is required it is prepared under SEQRA Task.			
FAA	Airports / Airspace	Federal Aviation Administration (FAA) Notification	New or Replacement Structures near Airports	Depending on construction locations, this permit may only be needed for OP work.	Obstruction Analysis, Mitigation Plan (assumes Engineering Cost)	$3,000	$9,000
STATE							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
NYS Public Service Commission / Department of Public Service (NYSDPS)	Article VII	Article VII: Certificate of Environmental Compatibility and Public Need and Environmental Management & Construction Plan (EM&CP)	Article 7: Major electric transmission facilities with design capacity of 100kV or more extending for at least 10 miles or 125kV and over extending a distance of 1 mile or more (some exclusions for underground transmission applies)	Article 7 will incorporate all of the required State and Local approvals (costed separately), as well as Engineering and Environmental Studies and Public Outreach. Intervenor Fund payment expected to be $100,000. An Environmental Management & Construction Plan (EM&CP) must be prepared and approved by the PSC. (see 16 NYCRR Parts 85 through 88)	Includes Reports and Plans required for State and Federal Agency Permits, as well as EM&CP, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan, Mitigation Plans	$600,000	$3,100,000

NYS Public Service Commission / Department of Public Service (NYSDPS)	Part 102		Construction of a utility overhead transmission facility that will convey electric energy at 65kV or higher for a distance of one mile or longer and are not subject to Article VII of the Public Service Law.	Report may include coordination or studies completed under other line items including: Visual assessment, SHPO determination, OPRHP consultation, Ecological Impacts Assessment Submit to the Commission for 60-day notice period: if no response for a formal investigation project can proceed, if formal investigation ordered project modification may be required	Advantage-Disadvantage Analysis		
NYSDEC	Article 15 Stream Disturbance; Article 24 Wetlands, Open Waters, Wetlands Buffers (100' for Freshwater Wetland)	Individual Permit (IP) (unless developer has General Permit (GP))	Any work within the boundaries of regulated waterways or wetlands, and wetland adjacent areas	Any disturbance within wetlands and/or below mean high tide will require an IP. Areas of temporary disturbance will likely require restoration, including a monitoring and maintenance period. Permanent disturbance will require offsite mitigation up to 3:1 area ratio; also includes a monitoring and maintenance period. GP may only be applicable if project ground disturbance is located outside of wetlands areas (above MHW).	Wetland Delineation; Wetland Restoration/Mitigation Plan	$20,240	$72,575
NYSDEC	Stormwater (If >1 Acre Soil Disturbance)	SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 & SWPPP	Project areas of soil disturbance	If project involves 1 acre or more soil disturbance, then the GP is required. If located within a Regulated MS4 Municipality, additional coordination may be needed. Weekly inspections by a Qualified Inspector during construction will be required.	SWPPP (assumes Engineering Cost includes Sediment & Erosion Control Plan, Hydraulic & Hydrology Studies, Stormwater Management Design)	$11,200	$38,000
Any State or local government agency that issues permits or approvals	State Environmental Quality Review Act (SEQRA)	Environmental Assessment (EA) Determination of Significance	Projects not covered as a Type II Action (Note a project can not be segmented - all phases/tasks must be considered in the review)	Most projects or activities proposed by a state agency, and all discretionary approvals (permits) from a NYS agency or local government, require an environmental impact assessment. SEQR requires the sponsoring or approving governmental body to identify and mitigate the significant environmental impacts of the activity it is proposing or permitting.			
NYSDOS	State Coastal Management Program Mapped Coastal Area Boundary	Coastal Consistency Concurrence	Projects within the NYSDOS designated Coastal Zone; and consistency with Local Waterfront Revitalization Plans (LWRPs); e.g., Town of Grand Island LWRP	Online mapping available to check if within coastal zone, a significant coastal fish & wildlife habitat (SCFWH), a local waterfront revitalization program area (LWRP), or a comprehensive management program areas (CMP)			
NYSHPO	National Historic Preservation Act (NHPA) Section 106: State and Federal Historic Places; State Mapped Archeologically Sensitive Areas	Cultural Resource Information System (CRIS) Determination	Local, State, or Federal eligible or designated historic places and/or areas of archeological sensitivity (in off-road areas and areas that have not been previously disturbed)	NYSDEC EAF Online Mapper identifies State or National Register of Historic Places and archeological sensitive areas within or adjacent to the project site. Formally enter project information and supporting documents into SHPO's online CRIS program. Staff will review and email a determination of impacts letter	Phase 1A & 1B Archaeological Studies	$19,510	$67,930

NYS NHP	Threatened and Endangered Species	Consultation	Activities that may affect T&E species or their habitat.		See USFWS	$1,200	$6,400
NYSDOT/NYS Thruway Authority/FHWA	State Roadways	Highway Work Permit/Utility Permit, Vegetation Management Permit; Easement	Any work within or crossing State highway ROW	May require restoration landscaping coordination. Typically requires compliance with NEPA including SHPO and USFWS effects determination	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$17,000	$200,000
NYS Canal Corporation	Erie Canal - jurisdiction varies along edge	Canal Occupancy & Work Permit (TA-W99072)	Any work involving the Erie Canal	Must coordinate with Division Permit Engineer about particular section of canal being affected. Commercial permit fee = $25 plus $2,000,000 additional General Aggregate Liability Insurance	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)		
NYS Dept. of Agriculture and Markets	All agricultural lands (including Agricultural Districts)	Part of Article 7 & Article 10 Review process	Any work impacting agricultural land	Must minimize impacts and restore damage to agricultural land, and coordinate with County Soil & Water Conservation District; Vineyards are a major concern in WNYS. Pre-application conference with PSC, DEC and Ag& Markets recommended. Must develop EM&CP in conformance with Art. 7/10 Certificate Conditions. Agricultural Monitor must oversee construction & restoration; requisite 2-yrs post restoration monitoring.	Crop/Pasturing Mitigation Plan (not included in costing)	$11,000	$24,000
REGIONAL							
Railroads	Railroad crossings	Consultation-permits may be required; Easement	Access / new structures on RR property		Easement area survey (not included in costs)	$11,000	$200,000
LOCAL/MUNICIPAL							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
County Dept. of Public Works	County Roadways	Lane Closure Permit, Highway Work or Access Permit	Work within county roadways and right-of-ways			$6,000	$40,000
Town, City or Village	Municipal Stormwater (MS4) Review	Approval of SWPPP or EM&CP	Project areas of soil disturbance		See NYSDEC SPDES	$6,000	$35,000
Town, City or Village	Variable	Building Permits	New Structures	Individual Towns/Villages must be consulted on a project specific basis to determine notification and/or permitting procedures. Permit application names vary (e.g. road obstruction permit)		$18,000	$92,000
Town, City or Village	Municipal Roadways	Highway Work Permit; Road Opening Permit	Work within municipal roadways and right-of-ways			$6,000	$35,000
Town, City or Village	Wetlands	Wetland Permit / Conservation Approvals	Mapped wetlands and wetland adjacent areas (buffer width variable)		See USACE / NYSDEC Art. 24	$6,000	$52,000

		Minimum	Maximum
ENVIRONMENTAL LICENSING & PERMITTING COST (EXCLUDING MITIGATION)	**PROJECT T007 TOTAL**	**$806,350**	**$4,186,505**
Excluded cost: Mitigation or restoration for impact to regulated wetlands; agricultural land and tree clearing	**Expected Value**	**$3,120,534.38**	

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T007 - North American Transmission

ENVIRONMENTAL MITIGATION ESTIMATE

Revision: 4

	Offsite Wetland Mitigation*		Farmland**	
	Min.	Max.	Min.	Max.
Area	47 acres	47 acres	18.7 acres	37.3 acres
Cost/Acre	$60,000	$120,000	$503	$503
Ratio	1:1	3:1	1:1	1:1
Total	$2,820,000	$16,920,000	$9,406	$18,762

T007 MITIGATION TOTAL	Minimum	Maximum	Expected Value
	$2,829,406	**$16,938,762**	**$ 9,884,084**

*Offsite wetland mitigation area assumes Highway Alternative Route; clearing of NWI Forested/Shrub Wetland Approx. 3.88 miles (20486 LF) by 100' ROW width; Max. cost per acre assumes additional mitigation required for permanent impacts of proposed structures in non-forested wetlands; costing includes design and installation costs only; does not include land acquisition or long term monitoring
**Farmland mitigation based on corn bushel yield at 129 BU/Acre and $3.9/BU (production numbers from 2016 USDA NYS Agriculture Overview), area assumes 6.16 miles (32525 LF) Adjacent to Agriculture Properties by 25' Wide (Min.) or 50' Wide (Max.); does not include land acquisition

REAL ESTATE ESTIMATE (NEW ROW)

Revision: 4

COUNTY: ERIE

DEVELOPER: NORTH AMERICAN (T007)

SEGMENT: DYSINGER - STOLLE SEGMENT

		Area (Acres)	Total Cost
	Sub Total	0.68	$ 4,376.00

REAL ESTATE ESTIMATE (NEW ROW)

Revision: 4

COUNTY: ERIE

DEVELOPER: NORTH AMERICAN (T007)

SEGMENT: STOLLE TO GARDENVILLE SEGMENT

		Area (Acres)	Total Cost
	Total	167.00	$ 6,838,497.00

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

Revision: 4

COUNTY: NIAGARA & ERIE
DEVELOPER: NORTH AMERICAN (T007)
SEGMENT: DYSINGER - STOLLE - GARDENVILLE SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
T007	North American Transmission (Proposal 2)	Dysinger SS to Stolle Rd SS - 19.98 miles	Niagara	5.74	$ 1,640,000
			Erie	296.31	
		Stolle Rd SS to Gardenville SS - 12.84 miles	Erie	27.55	

REAL ESTATE ESTIMATE (HOUSES)

Revision: 4

COUNTY: ERIE

DEVELOPER: NORTH AMERICAN (T007)

SEGMENT: STOLLE ROAD TO GARDENVILLE

		Total Valuation of Property with 3% Escalation/year (as of 2017)
	Total Valuation Cost	$ 628,349.85

REAL ESTATE ESTIMATE (SUBSTATIONS)

Revision: 4

COUNTY: NIAGARA
DEVELOPER: NORTH AMERICAN (T007)
SEGMENT: DYSINGER SWITCHYARD

		Total Cost
	Total Cost of Proposed Substation Site	$152,750.00

REAL ESTATE ESTIMATE (SUBSTATIONS)

Revision: 4

COUNTY: ERIE
DEVELOPER: NORTH AMERICAN (T007)
SEGMENT: GARDENVILLE SUBSTATION (OPTION 1)

		Total Cost
	Total Cost of Proposed Substation Site	$ 309,483.90

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T007 - North American Transmission

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

a) Cost Estimate is based on 2017 rates.
b) Construction schedule is in accordance with the Developers proposed schedule (approx 12 months) - we have assumed continuous working with no breaks in the schedule. Six months added to construction schedule for PM time for start up and close out works and float.
c) Stringing rates allow for protection over crossings (such as rider poles).
d) We have assumed a typical work week (6 x 10 hour days).
e) We have assumed the Access Road included in Developer Estimate will be Type 1 Gravel Type.
f) Costs will vary for handling and disposal of contaminated spoils, depending on type of contaminants and availability / location of the appropriate tipping facility. Since there is not enough information to provide a quantified estimate for this item, allowance is included in the contingency monies.
g) Costs have been developed based on historical data from Projects of a similar nature (AACE Class 5 and 4 Estimating Practices). We have not engaged any subcontractors or material vendors for formal quotes.
h) Estimated quantities have been used for items in red text in Section 1 of the Estimate (CLEARING & ACCESS FOR T-LINE CONSTRUCTION). These items were not quantified in the Developers Estimate, however we believe that they are necessary for the works.
i) Foundation rates include supply and installation of materials. Drilled Pier rates include supply and testing of concrete, rebar cage and the use of temp or permanent casing.
j) A Contractor Mark-Up (OH&P) of 15% has been included in the Total section.
k)Assumes all environmental data and project details provided are accurate unless noted otherwise.
l) USFWS T&E Assumes that ¼ of the total line in ROW per proposal will require field survey for T&E (Approximately 32.6 miles).
m)NEPA-Assumes no NEPA because Art VII.
n) SHPO-Assumes consultation and Phase 1A/1B archeological studies with field survey for 50% of project route (Approx. 16.31 miles).
o) NYSDOT/FHWA-Assumes any required NEPA coordination/requirements are covered under Article VII or SEQRA review. Max costs includes additional agency coordination (greater than general fixed costing max.) for new ROW Parallel to Highway.
p) Railroad - Max costs includes additional agency coordination (greater than general fixed costing max.) for new ROW Parallel to Railroad.
q) Assumes no coordination with National Parks Service or OPRHP/State Parks.
r) USACE wetland delineation total based on Line Miles in Wetlands - NWI wetland lengths of 3.91 miles (Min.) and 4.01 miles (Max.).
s) DEC wetland delineation total based on Line Miles in Wetlands - DEC wetland lengths of 2.06 miles (Min.) and 2.61 miles (Max.).
t) Offsite wetland mitigation area costs based on impacts anticipated by clearing of NWI Forested/Shrub Wetland of approximately 3.88 miles using the Stolle Road to Gardenville Highway alternative (calculated by GEI based on NWI mapper legend categories). Assumes clearing an additional 100 feet within Right of Way. Minimum costs at $60,000/acre, maximum costs at $120,000/acre for additional permanent impacts of proposed structures in non-forested wetlands. Costing includes design and installation costs only and does not include land acquisition or long term monitoring.

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

u) Agricultural mitigation assumes timber matting impacts and pad impacts on adjacent agriculture land (6.16 miles) requires crop damage payments based on USDA 2016 NYS Agriculture Overview corn yield and bushel price/acre. Minimum assumes 25-foot-wide impact, Maximum assumes 50-foot-
v) No tree survey or replanting required outside regulated wetlands areas.
w) Article VII Intervenor Fund payment expected to be $100,000.
x) Mitigation costs for landscaping only (no paving, sidewalks, sound walls, etc.)
y) Expected value of environmental licensing and permitting cost is estimated to be 25% higher than the mean of the range based upon the addition of the new Gardenville to Stolle 345kV line.
z) NAT did not provide estimates from Options 2 and 3 (for connection to Gardenville). Our estimate only includes Option 1.
aa) SUF pricing includes 35% to cover Contractor markup (15%) and contingency (20%)
ab) SUF reconductor rate is based on Niagara-Packard (National Grid) reconductor estimate, pro-rated to a rate / mile. Note that this is based on conductor, shieldwire and hardware pricing only and does not include structure or foundation works.
ac) System Upgrade Facilities Contingency is allowance for potential additional system upgrades including overdutied breakers, protection changes, unidentified thermal issues, etc that may be identified as detailed studies are completed.

INDEPENDENT ESTIMATES

ATTACHMENT B3

T008 – NORTH AMERICAN TRANSMISSION

SUBSTATION ENGINEERING COMPANY
8/11/2017

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T008 - North American Transmission

Revision: 4

SUMMARY OF COST ESTIMATE

	Description		Total Amount
1	CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION	$	22,772,195
2	TRANSMISSION LINE FOUNDATIONS	$	28,417,010
3	STRUCTURES - TRANSMISSION LINE	$	39,158,699
4	CONDUCTOR, SHIELDWIRE, OPGW	$	13,710,320
5	TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE	$	3,821,694
6	NEW DYSINGER SWITCHYARD	$	20,868,000
7	STOLLE ROAD SUBSTATION WORKS	$	14,263,000
8	GARDENVILLE 345/230kV SUBSTATION WORKS	$	12,822,500
9	MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS	$	69,918,737
	CONTRACTOR MARK-UP (OH&P) 15%	$	33,862,823
	SUBTOTAL:	$	259,614,979
	CONTINGENCY (25%)	$	64,903,745
	TOTAL (A):	**$**	**324,518,723**

10	SYSTEM UPGRADE FACILITIES	$	23,258,025
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$	8,140,309
	TOTAL (B):	**$**	**31,398,334**

TOTAL PROJECT COST (A+B):	**$**	**355,917,057**

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

Revision: 4

Description of Work: Proposal 1 - A new 345kV Dysinger Switchyard located approximately 8 miles southeast of the city of Lockport, New York. The Project also includes a new ~20 mile 345kV Transmission Line from Dysinger Switchyard to Stolle Road Substation near Marilla, New York. Proposal 2 - Includes Proposal 1 Scope of Work, with the addition of a single circuit 345kV Transmission Line from the Stolle Road 345kV Substation to the existing Gardenville Substation, and a new 345/230kV Transformer at the existing Gardenville Substation. This cost estimate uses Option 1 routing (as per NAT estimate). Proposal 3 includes an additional 345kV single circuit transmission line from the Dysinger Switchyard to the existing Stolle Road 345kV Substation.

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
1. CLEARING & ACCESS FOR T-LINE CONSTRUCTION								
1.1	Clearing the ROW (mowing & clearing)	350.00	Acre		$ 15,000	$ 15,000	**$ 5,250,000**	
1.2	Access Road	104,060.30	LF		$ 45	$ 45	**$ 4,682,713**	Assumes Type 1 Type Gravel Road
1.3	Silt Fence	104,060.30	LF		$ 4	$ 4	**$ 416,241**	
1.4	Matting	84,695.00	LF		$ 70	$ 70	**$ 5,928,650**	
1.5	Snow Removal	1.00	Sum		$ 825,000	$ 825,000	**$ 825,000**	
1.6	ROW Restoration	52.79	Mile		$ 10,000	$ 10,000	**$ 527,921**	
1.7	Work Pads	1,040,625.00	SF		$ 4	$ 4	**$ 3,663,000**	
1.8	Restoration for Work Pad areas	104,062.50	SF		$ 0.2	$ 0.2	**$ 15,609**	
1.9	Temporary Access Bridge	30.0	EA		$ 20,035	$ 20,035	**$ 601,050**	
1.10	Air Bridge	8.0	EA		$ 14,445	$ 14,445	**$ 115,560**	
1.11	Stabilized Construction Entrance	15.0	EA		$ 4,580	$ 4,580	**$ 68,700**	
1.12	Maintenance and Protection of Traffic on Public Roads	1.0	LS		$ 500,000	$ 500,000	**$ 500,000**	
1.13	Culverts / Misc. Access	1.0	LS		$ 150,000	$ 150,000	**$ 150,000**	
1.14	Concrete Washout Station	15.0	EA		$ 1,850	$ 1,850	**$ 27,750**	
TOTAL - CLEARING & ACCESS FOR T-LINE:							**$ 22,772,195**	
2. T-LINE FOUNDATIONS								
2.1	Direct Embed Foundations - 23ft deep x 6ft dia.	263.00	Structure		$ 18,000	$ 18,000	**$ 4,734,000**	Supply & Install
2.2	Direct Embed Foundations - 28ft deep x 7ft dia.	10.00	Structure		$ 20,000	$ 20,000	**$ 200,000**	Supply & Install
2.3	Direct Embed Foundations - 30ft deep x 6ft dia.	41.00	Structure		$ 20,000	$ 20,000	**$ 820,000**	Supply & Install
2.4	Direct Embed Foundations - 37ft deep x 7ft dia.	6.00	Structure		$ 22,000	$ 22,000	**$ 132,000**	Supply & Install
2.5	Drilled Pier 38ft deep x 9ft dia.	1,477.41	CUY		$ 1,500	$ 1,500	**$ 2,216,115**	
2.6	Drilled Pier 45ft deep x 9ft dia.	349.90	CUY		$ 1,500	$ 1,500	**$ 524,849**	
2.7	Drilled Pier 47ft deep x 8ft dia.	1,347.49	CUY		$ 1,500	$ 1,500	**$ 2,021,231**	
2.8	Drilled Pier 57ft deep x 9ft dia.	443.20	CUY		$ 1,500	$ 1,500	**$ 664,800**	
2.9	Drilled Pier 64ft deep x 8ft dia.	393.19	CUY		$ 1,500	$ 1,500	**$ 589,782**	
2.10	Drilled Pier 71ft deep x 9ft dia.	4,416.45	CUY		$ 1,500	$ 1,500	**$ 6,624,676**	
2.11	Drilled Pier 43ft deep x 8ft dia.	1,585.04	CUY		$ 1,500	$ 1,500	**$ 2,377,557**	
2.12	Rock Excavation Adder	3,756.00	CUY		$ 2,000	$ 2,000	**$ 7,512,000**	
TOTAL - T-LINE FOUNDATIONS:							**$ 28,417,010**	
3. STRUCTURES - T-LINE								
3.1	Single Steel Pole Tangent Delta - 00- 10 (Ht. 100')	36.00	EA	$ 31,401	$ 18,841	$ 50,242	**$ 1,808,698**	
3.2	Single Steel Pole Tangent Delta - 00- 10 (Ht. 115')	227.00	EA	$ 38,376	$ 23,026	$ 61,402	**$ 13,938,163**	
3.3	Single Steel Pole Tangent Delta - 00- 10 (Ht. 130')	34.00	EA	$ 44,150	$ 26,490	$ 70,641	**$ 2,401,782**	
3.4	Single Steel Pole Tangent Delta - 00- 10 (Ht. 145')	7.00	EA	$ 50,029	$ 30,018	$ 80,047	**$ 560,327**	
3.5	Single Steel Pole Small Angle Delta - 10- 15 (Ht. 115')	10.00	Pole	$ 66,881	$ 40,128	$ 107,009	**$ 1,070,093**	
3.6	Single Steel Pole Small Angle Delta - 10- 15 (Ht. 130)	4.00	Pole	$ 78,872	$ 47,323	$ 126,196	**$ 504,783**	
3.7	Single Steel Pole Small Angle Delta - 10- 15 (Ht. 145)	2.00	Pole	$ 94,927	$ 56,956	$ 151,883	**$ 303,765**	
3.8	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 115')	18.00	Pole	$ 93,524	$ 56,115	$ 149,639	**$ 2,693,503**	
3.9	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 130')	7.00	Pole	$ 120,604	$ 72,362	$ 192,966	**$ 1,350,760**	
3.10	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 145')	7.00	Pole	$ 153,391	$ 92,034	$ 245,425	**$ 1,717,975**	
3.11	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 185')	3.00	Pole	$ 187,828	$ 112,697	$ 300,525	**$ 901,575**	
3.12	Single Steel Pole Large Angle DE Vertical - 60- 90 (Ht. 115')	15.00	Pole	$ 111,476	$ 66,885	$ 178,361	**$ 2,675,419**	

SECO SUBSTATION ENGINEERING COMPANY

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
3.13	Single Steel Pole Large Angle DE Vertical - 60- 90 (Ht. 130')	16.00	Pole	$ 140,249	$ 84,149	$ 224,398	**$ 3,590,369**	
3.14	Single Steel Pole Large Angle DE Vertical - 60- 90 (Ht. 145')	8.00	Pole	$ 177,172	$ 106,303	$ 283,476	**$ 2,267,804**	
3.15	Large Angle DE (Ht. 195')	3.00	Pole	$ 169,360	$ 101,616	$ 270,976	**$ 812,929**	
3.16	Tangent DE (Ht. 195')	3.00	Pole	$ 116,824	$ 70,094	$ 186,918	**$ 560,753**	
3.17	Install Grounding	400.00	Structure		$ 5,000	$ 5,000	**$ 2,000,000**	Supply & Install
TOTAL - STRUCTURES T-LINE:							**$ 39,158,699**	
4. CONDUCTOR, SHIELDWIRE, OPGW								
4.1	(2)/Phase - 795kcmil 26/7 Stranded "Drake" ACSR	52.79	Circuit Mile	$ 53,856	$ 158,400	$ 212,256	**$ 11,205,444**	
4.2	(1) OPGW 36 Fiber AC-33/38/571	52.79	Mile	$ 19,404	$ 27,720	$ 47,124	**$ 2,487,776**	
4.3	(1) 3/8" HS Steel (2nd SW where required)	3,000.00	Ft	$ 1	$ 5	$ 6	**$ 17,100**	
TOTAL: CONDUCTOR, SHIELDWIRE, OPGW:							**$ 13,710,320**	
5. T-LINE INSULATOR, FITTINGS, HARDWARE								
5.1	Tangent - Polymer V-String	915.00	Set	$ 900	$ 720	$ 1,620	**$ 1,482,300**	
5.2	Angle - Polymer V-String	48.00	Set	$ 1,300	$ 1,040	$ 2,340	**$ 112,320**	
5.3	Deadend - Polymer Double Deadend including Jumper	444.00	Set	$ 1,500	$ 1,350	$ 2,850	**$ 1,265,400**	
5.4	OPGW Assembly - Tangent	305.00	Set	$ 200	$ 150	$ 350	**$ 106,750**	
5.5	OPGW Assembly - Angle / DE	180.00	Set	$ 250	$ 150	$ 400	**$ 72,000**	
5.6	OHSW Assembly - Angle / DE	12.00	Set	$ 250	$ 150	$ 400	**$ 4,800**	
5.7	OPGW Splice Boxes	23.00	Set	$ 1,500	$ 1,000	$ 2,500	**$ 57,500**	
5.8	OPGW Splice & Test	1.00	Sum		$ 27,600	$ 27,600	**$ 27,600**	
5.9	Spacer Dampers	4,752.00	Ea	$ 50	$ 35	$ 85	**$ 403,920**	
5.10	Vibration Dampers - Conductor	4,752.00	Ea	$ 32	$ 20	$ 52	**$ 247,104**	
5.11	Shieldwire / OPGW Dampers, Misc Fittings	1.00	Sum	$ 30,000	$ 12,000	$ 42,000	**$ 42,000**	
TOTAL: T-LINE INSULATORS, FITTINGS, HARDWARE:							**$ 3,821,694**	
6. NEW DYSINGER SWITCHYARD								
6.1	Site Works including sediment controls, access roads, rough grading, final	1.00	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
6.2	Substation Fence	2,450.00	LF		$ 200	$ 200	**$ 490,000**	Supply & Install
6.3	SSVT	1.00	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
6.4	Switches 3ph	18.00	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 126,000**	
6.5	Fuses 1ph	3.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
6.6	Line Switches 3 ph	6.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 180,000**	
6.7	Instrument Transformers	1.00	Sum		$ 1,130,000	$ 1,130,000	**$ 1,130,000**	
6.8	Breakers	9.00	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 3,420,000**	
6.9	Arrestors (3 per line)	18.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 135,000**	
6.10	Line Traps	6.00	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 126,000**	
6.11	Two (2) 345 kV buses	2.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
6.12	Auxillary Power Generator - 500kW	1.00	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	Supply & Install
6.13	Low Profile Foundations	250.00	Ea		$ 5,000	$ 5,000	**$ 1,250,000**	Supply & Install
6.14	Caisson DE Foundations	24.00	Ea		$ 50,000	$ 50,000	**$ 1,200,000**	Supply & Install
6.15	Circuit Breaker Foundations	9.00	Ea		$ 75,000	$ 75,000	**$ 675,000**	Supply & Install
6.16	Lightning Mast Foundations	15.00	Ea		$ 15,000	$ 15,000	**$ 225,000**	Supply & Install
6.17	SST Foundation	1.00	Ea		$ 75,000	$ 75,000	**$ 75,000**	
6.18	Control House and Pad (30' x 90')	1.0	Sum	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	Supply & Install
6.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	
6.20	Control Cables	1.00	Sum	$ 110,000	$ 110,000	$ 220,000	**$ 220,000**	
6.21	125VDC Batteries	2.00	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
6.22	Station Services	2.00	Ea		$ 25,000	$ 25,000	**$ 50,000**	Supply & Install
6.23	Protection, Telecom and Metering Equipment (Panels)	33.00	Ea		$ 30,000	$ 30,000	**$ 990,000**	Supply & Install

SECO SUBSTATION ENGINEERING COMPANY

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
6.24	SCADA and Communications	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.25	Low Voltage AC Distribution	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
6.26	Control Conduits from Cable Tray to Equipment	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.27	Cable Trench Systems for Control Cables	1.00	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
6.28	Grounding	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	
6.29	Bus Support 1 Ph	93.00	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 279,000**	
6.30	Switch Stands	18.00	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 198,000**	
6.31	Fuse Stand	1.00	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
6.32	Misc. Structures	1.0	Sum		$ 60,000	$ 60,000	**$ 60,000**	
6.33	Substation A-Frame Structures Standalone	6.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 150,000**	
6.34	Lightning Masts	15.00	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 180,000**	
6.35	Arrestor Stands	18.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 63,000**	
6.36	Miscellaneous Materials and Above / Below Ground Works	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
6.37	Connection of Existing Lines to Dysinger Switchyard	1.00	Sum		$ 3,400,000	$ 3,400,000	**$ 3,400,000**	Supply & Install
TOTAL - DYSINGER SWITCHYARD:							**$ 20,868,000**	
7. STOLLE ROAD SUBSTATION WORKS:								
7.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
7.2	Substation Fence	715.00	LF		$ 200	$ 200	**$ 143,000**	Supply & Install
7.3	Switches 3ph	14.00	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 98,000**	
7.4	Line Switches 3 ph w/ motor-operators	4.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 120,000**	
7.5	Instrument Transformers	1.00	Sum		$ 691,000	$ 691,000	**$ 691,000**	
7.6	Breakers	8.00	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 3,040,000**	
7.7	Arrestors (3 per line)	12.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 90,000**	
7.8	Line Traps	4.00	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 84,000**	
7.9	345 kV buses	2.00	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
7.10	Low Profile Foundations	183.00	Ea		$ 5,000	$ 5,000	**$ 915,000**	Supply & Install
7.11	Caisson DE Foundations	16.00	Ea		$ 50,000	$ 50,000	**$ 800,000**	Supply & Install
7.12	Circuit Breaker Foundations	8.00	Ea		$ 75,000	$ 75,000	**$ 600,000**	Supply & Install
7.13	Lightning Mast Foundations	8.00	Ea		$ 15,000	$ 15,000	**$ 120,000**	Supply & Install
7.13	Control House and Pad (25' x 50' - 1250 sq. ft)	1.00	Ea	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	Supply & Install
7.14	Control Cables	1.00	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
7.14	125VDC Batteries	2.00	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
7.15	Protection, Telecom and Metering Equipment (Panels)	27.00	Ea		$ 30,000	$ 30,000	**$ 810,000**	Supply & Install
7.16	SCADA and Communications	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
7.16	Low Voltage AC Distribution & DC Panels & Switches	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
7.17	Control Conduits from Cable Tray to Equipment	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
7.18	Cable Trench Systems for Control Cables	1.00	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
7.19	Grounding	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	
7.20	Bus Support 1 Ph	66.00	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 198,000**	
7.21	Switch Stands	14.00	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 154,000**	
7.22	Misc. Structures	1.0	Sum		$ 42,000	$ 42,000	**$ 42,000**	
7.23	Substation A-Frame Structures Standalone	4.00	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 100,000**	
7.24	Lightning Masts	8.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 96,000**	
7.25	Arrestor Stands	12.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 42,000**	
7.26	Miscellaneous Materials and Above / Below Ground Works	1.00	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
7.27	Interconnection arrangement at Stolle Rd Substation	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
TOTAL - STOLLE RD SUBSTATION WORKS:							**$ 14,263,000**	

SECO SUBSTATION ENGINEERING COMPANY

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
8. GARDENVILLE 345/230kV SUBSTATION WORKS								
8.1	Site Works including sediment controls, access roads, rough grading, final	1.0	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
8.2	Substation Fence	1,400.0	LF		$ 200	$ 200	**$ 280,000**	Supply & Install
8.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
8.4	Switches 3ph	1.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 7,000**	Supply & Install
8.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	Supply & Install
8.6	Line Switches 3 ph w/ motor-operators	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	Supply & Install
8.7	Instrument Transformers	1.0	Sum		$ 271,000	$ 271,000	**$ 271,000**	Supply & Install
8.8	Breakers	1.0	Ea	$ 250,000	$ 75,000	$ 325,000	**$ 325,000**	Supply & Install
8.9	Arrestors (3 per line)	12.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 90,000**	
8.10	Line Traps	1.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 21,000**	
8.11	230 kV buses	1.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 60,000**	
8.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
8.13	Low Profile Foundations	40.0	Ea		$ 5,000	$ 5,000	**$ 200,000**	
8.14	Caisson DE Foundations	12.0	Ea		$ 50,000	$ 50,000	**$ 600,000**	
8.15	Circuit Breaker Foundations	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	
8.16	Lightning Mast Foundations	1.0	Ea		$ 15,000	$ 15,000	**$ 15,000**	
8.17	SST Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	
8.18	Control House and Pad (14' x 70' - 980 sq. ft)	1.0	Ea	$ 350,000	$ 100,000	$ 450,000	**$ 450,000**	Supply & Install
8.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	
8.20	Control Cables	1.0	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
8.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	Supply & Install
8.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	
8.23	Protection, Telecom and Metering Equipment (Panels)	11.0	Ea		$ 30,000	$ 30,000	**$ 330,000**	Supply & Install
8.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
8.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
8.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
8.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 350,000	$ 350,000	**$ 350,000**	Supply & Install
8.28	Grounding	1.0	Sum		$ 125,000	$ 125,000	**$ 125,000**	
8.29	Bus Support 1 Ph	18.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 54,000**	
8.30	Switch Stands	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
8.31	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
8.32	Misc. Structures	1.0	Sum		$ 27,000	$ 27,000	**$ 27,000**	
8.33	Substation A-Frame Structures Standalone	3.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 75,000**	
8.34	Lightning Masts	1.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 12,000**	
8.35	Arrestor Stands	6.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 21,000**	
8.36	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 725,000	$ 725,000	**$ 725,000**	
8.37	345kV - 230kV 480/540/600 MVA Transformer	1.0	Ea	$ 4,750,000	$ 750,000	$ 5,500,000	**$ 5,500,000**	
8.38	Transformer Foundation with concrete moat and double steel grating	1.0	Ea		$ 150,000	$ 150,000	**$ 150,000**	
TOTAL - GARDENVILLE SUBSTATION WORKS:							**$ 12,822,500**	
9. MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:								
	Contractor Mobilization / Demobilization							
9.1	Mob / Demob	1.00	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	
	Project Management, Material Handling & Amenities					$ -	**$ -**	
9.2	Project Management & Staffing (includes PM, Field Engineers / Supervision,	30.00	Months		$ 400,000	$ 400,000	**$ 12,000,000**	
9.3	Site Accommodation, Facilities, Storage	1.00	Sum		$ 2,200,000	$ 2,200,000	**$ 2,200,000**	
	Engineering					$ -	**$ -**	
9.4	Design Engineering	1.00	Sum		$ 8,400,000	$ 8,400,000	**$ 8,400,000**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
9.5	LiDAR	1.00	Sum		$ 600,000	$ 600,000	**$ 600,000**	
9.6	Geotech	1.00	Sum		$ 1,100,000	$ 1,100,000	**$ 1,100,000**	
9.7	Surveying/Staking	1.00	Sum		$ 450,000	$ 450,000	**$ 450,000**	
	Testing & Commissioning							
9.8	Testing & Commissioning of T-Line and Equipment	1.00	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
	Permitting and Additional Costs					$ -	**$ -**	
9.9	Environmental Licensing & Permitting Costs	1.00	Sum		$ 3,608,602	$ 3,608,602	**$ 3,608,602**	
9.10	Environmental Mitigation	1.00	Sum		$ 16,814,084	$ 16,814,084	**$ 16,814,084**	
9.11	Warranties / LOC's	1.00	Sum		$ 970,163	$ 970,163	**$ 970,163**	
9.12	Real Estate Costs (New)	1.00	Sum		$ 7,623,974	$ 7,623,974	**$ 7,623,974**	
9.13	Real Estate Costs (Incumbent Utility ROW)	1.00	Sum		$ 3,168,924	$ 3,168,924	**$ 3,168,924**	
9.14	Legal Fees	1.00	Sum		$ 3,000,000	$ 3,000,000	**$ 3,000,000**	
9.15	Allowance for Funds Used During Construction (AFUDC)	1.00	Sum			$ -	**$ -**	
9.16	Carrying Charges	1.00	Sum			$ -	**$ -**	
9.17	Sales Tax on Materials	1.00	Sum	$ 6,282,990		$ 6,282,990	**$ 6,282,990**	
9.18	Fees for permits, including roadway, railroad, building or other local permits	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
TOTAL - MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:							**$ 69,918,737**	
10. SYSTEM UPGRADE FACILITIES								
SUF 1.1	Depew to Erie Street 115kV Transmission Line 921. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	$ 500,000	Relay was replaced and line ratings increased to 124/137/158 (NOR/LTE/STE) resulting ratings are below line conductor ratings. Scope is to remove
SUF 1.2	Engineering, T&C, PM, Indirects for SUF 1.1 (15%)					$ -	$ 75,000	
SUF 2.1	Shawnee to Swann Reconductor	12.00	Mile		$ 400,000	$ 400,000	$ 4,800,000	Rate for reconductor is pro-rated from National
SUF 2.2	Engineering, T&C, PM, Indirects FOR SUF 2.2 (15%)					$ -	$ 720,000	Grid Niagara - Packard reconductor. Note that rate
SUF 3	Roll Rd Substation							
SUF 3.1	Restoration of station stone within existing substation fence. Assume spoil materials disposed of on-site.	1.00	Ea		$ 100,000	$ 100,000	$ 100,000	Supply & Install
SUF 3.2	Transformer 115-34.5kV 90 MVA	1.00	Ea	$ 700,000	$ 200,000	$ 900,000	$ 900,000	
SUF 3.3	Switches 115kV 3Ph	1.00	Ea	$ 15,000	$ 12,000	$ 27,000	$ 27,000	
SUF 3.4	Switches 35kV 3Ph	1.00	Ea	$ 6,000	$ 4,000	$ 10,000	$ 10,000	
SUF 3.5	Breakers 115kV 1200A	1.00	Ea	$ 150,000	$ 50,000	$ 200,000	$ 200,000	
SUF 3.6	Breakers 35kV 2000A	1.00	Ea	$ 75,000	$ 15,000	$ 90,000	$ 90,000	
SUF 3.7	CVT's 115kV	3.00	Ea	$ 10,000	$ 8,000	$ 18,000	$ 54,000	
SUF 3.8	Arrestors 115kV	6.00	Ea	$ 5,000	$ 700	$ 5,700	$ 34,200	
SUF 3.9	Arrestors 35kV (for transformer)	3.00	Ea	$ 2,500	$ 500	$ 3,000	$ 9,000	
SUF 3.10	Low Profile Foundations	8.00	Ea		$ 5,000	$ 5,000	$ 40,000	Supply & Install
SUF 3.11	Circuit Breaker Foundation 115kV	1.00	Ea		$ 75,000	$ 75,000	$ 75,000	Supply & Install
SUF 3.12	Circuit Breaker Foundation 35kV	1.00	Ea		$ 30,000	$ 30,000	$ 30,000	Supply & Install
SUF 3.13	Transformer Foundation with concrete moat and double steel grating	1.00	Ea		$ 150,000	$ 150,000	$ 150,000	Supply & Install
SUF 3.14	Firewall 30' long x 12' tall x 1' thick with footer	1.00	Ea		$ 100,000	$ 100,000	$ 100,000	Supply & Install
SUF 3.15	Control Cables	1.00	Sum		$ 50,000	$ 50,000	$ 50,000	Supply & Install
SUF 3.16	Protection & Telecom Equipment	3.00	Ea		$ 30,000	$ 30,000	$ 90,000	
SUF 3.17	SCADA and Communications	1.00	Sum		$ 25,000	$ 25,000	$ 25,000	Supply & Install
SUF 3.18	Low Voltage AC Distribution	1.00	Sum		$ 30,000	$ 30,000	$ 30,000	Supply & Install
SUF 3.19	Control Conduits	1.0	Sum		$ 50,000	$ 50,000	$ 50,000	Supply & Install
SUF 3.20	Grounding	1.0	Sum		$ 25,000	$ 25,000	$ 25,000	Supply & Install
SUF 3.21	Switch Stand 115kV (reuse 1 existing)	1.0	Ea	$ 1,500	$ 800	$ 2,300	$ 2,300	
SUF 3.22	CVT Stand	3.0	Ea	$ 1,000	$ 1,000	$ 2,000	$ 6,000	
SUF 3.23	Arrestor Stand	3.0	Ea	$ 1,000	$ 1,000	$ 2,000	$ 6,000	

COST ESTIMATE

Revision: 4

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
SUF 3.24	Misc Materials and Above / Below Ground Works	1.0	Sum		$ 120,000	$ 120,000	$ 120,000	Supply & Install
SUF 3.25	Engineering, T&C, PM, Indirects for SUF 3 (15%)					$ -	$ 333,525	Assumed 15% to cover all misc costs
SUF 4.1	Lockport to Shaw 115kV Transmsision Line 102. NAT report indicated:	1.00	Sum		$ 500,000	$ 500,000	$ 500,000	The limiting equipment is not known - scope
SUF 4.2	Engineering, T&C, PM, Indirects for SUF 4.1 (15%)					$ -	$ 75,000	undefined.
SUF 5	Gardenville Circuit Breaker Replacement							
SUF 5.1	Circuit Breaker Foundation	12.0	Ea		$ 75,000	$ 75,000	$ 900,000	Supply & Install
SUF 5.2	Below Grade Conduit & Grounding	1.0	Sum		$ 1,200,000	$ 1,200,000	$ 1,200,000	
SUF 5.3	Circuit breaker - 230kV	12.0	Ea	$ 250,000	$ 75,000	$ 325,000	$ 3,900,000	
SUF 5.4	Switches - 230kV	24.0	Ea	$ 20,000	$ 15,000	$ 35,000	$ 840,000	
SUF 5.5	Control Cables	1.0	Sum		$ 1,200,000	$ 1,200,000	$ 1,200,000	Supply & Install
SUF 5.6	Misc Above Ground Works	1.00	Sum		$ 900,000	$ 900,000	$ 900,000	Assumed 15% to cover all misc costs
SUF 5.7	Engineering, T&C, PM, Indirects for SUF 5 (15%)					$ -	$ 1,341,000	
SUF 6	SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)						$ 3,750,000	Contingency for possible additional SUF upgrades
TOTAL - SYSTEM UPGRADE FACILITIES:							**$ 23,258,025**	

PROJECT TITLE WNY PROJECT EVALUATION- ENVIRONMENTAL LICENSING & PERMITTING COST ELEMENTS						ENVIRONMENTAL LICENSING & PERMITTING COST ESTIMATE RANGE FOR PROPOSED WNY TRANSMISSION PROJECT - T008	
FEDERAL						Proposal 3	
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans	Min.	Max.
USACE	Waters of the US under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act (including regulated wetland areas)	Nationwide Permits (NWP) or Individual Permit (IP)	Any work within the boundaries of regulated wetlands (with the exception of isolated wetlands) or waterways to the spring high tide or ordinary high water mark	If project qualifies for a NWP (<0.5 acre disturbance and within NWP project type parameters), a pre-construction notification (PCN) is typically required. NWPs have a 45 day review period starting from when project logged in system (up to 6wk backlog delay in logging projects) If an IP is triggered, USACE will require Alternative Analysis and Public Notice/Hearing. IPs could also trigger restrictive environmental work windows. IPs have a 120 day review period starting from when permit is "deemed complete"	Wetland Delineation; Wetland Function & Value Assessment; Stream Delineation; Restoration Plan	$41,320	$116,675
USFWS	Endangered Species Act Section 7 (ESA) Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act	Consultation (Formal or Informal); Special Use Permit	Any work that may have an affect on listed species or their habitat; or projects within National Wildlife Refuges	USACE coordinates consultation with USFWS for ESA listed species during their permit review. Also includes the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act compliance. Season restrictions on construction could be imposed.	Rare, Threatened & Endangered Species Search; Preparation of Reports and Conservation Plans	$43,600	$125,600
FAA	Airports / Airspace	Federal Aviation Administration (FAA) Notification	New or Replacement Structures near Airports	Depending on construction locations, this permit may only be needed for OP work.	Obstruction Analysis, Mitigation Plan (assumes Engineering Cost)	$3,000	$9,000
STATE							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
NYS Public Service Commission / Department of Public Service (NYSDPS)	Article VII	Article VII: Certificate of Environmental Compatibility and Public Need and Environmental Management & Construction Plan (EM&CP)	Article 7: Major electric transmission facilities with design capacity of 100kV or more extending for at least 10 miles or 125kV and over extending a distance of 1 mile or more (some exclusions for underground transmission applies)	Article 7 will incorporate all of the required State and Local approvals (costed separately), as well as Engineering and Environmental Studies and Public Outreach. Intervenor Fund payment expected to be $350,000. An Environmental Management & Construction Plan (EM&CP) must be prepared and approved by the PSC. (see 16 NYCRR Parts 85 through 88)	Includes Reports and Plans required for State and Federal Agency Permits, as well as EM&CP, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan, Mitigation Plans	$850,000	$3,350,000

NYSDEC	Article 15 Stream Disturbance; Article 24 Wetlands, Open Waters, Wetlands Buffers (100' for Freshwater Wetland)	Individual Permit (IP) (unless developer has General Permit (GP))	Any work within the boundaries of regulated waterways or wetlands, and wetland adjacent areas	Any disturbance within wetlands and/or below mean high tide will require an IP. Areas of temporary disturbance will likely require restoration, including a monitoring and maintenance period. Permanent disturbance will require offsite mitigation up to 3:1 area ratio; also includes a monitoring and maintenance period. GP may only be applicable if project ground disturbance is located outside of wetlands areas (above MHW).	Wetland Delineation; Wetland Restoration/Mitigation Plan	$25,960	$83,300
NYSDEC	Stormwater (If >1 Acre Soil Disturbance)	SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 & SWPPP	Project areas of soil disturbance	If project involves 1 acre or more soil disturbance, then the GP is required. If located within a Regulated MS4 Municipality, additional coordination may be needed. Weekly inspections by a Qualified Inspector during construction will be required.	SWPPP (assumes Engineering Cost includes Sediment & Erosion Control Plan, Hydraulic & Hydrology Studies, Stormwater Management Design)	$11,200	$38,000
NYSHPO	National Historic Preservation Act (NHPA) Section 106: State and Federal Historic Places; State Mapped Archeologically Sensitive Areas	Cultural Resource Information System (CRIS) Determination	Local, State, or Federal eligible or designated historic places and/or areas of archeological sensitivity (in off-road areas and areas that have not been previously disturbed)	NYSDEC EAF Online Mapper identifies State or National Register of Historic Places and archeological sensitive areas within or adjacent to the project site. Formally enter project information and supporting documents into SHPO's online CRIS program. Staff will review and email a determination of impacts letter	Phase 1A & 1B Archaeological Studies (not included in costing)	$19,510	$67,930
NYS NHP	Threatened and Endangered Species	Consultation	Activities that may affect T&E species or their habitat.		See USFWS	$1,200	$6,400
NYSDOT/NYS Thruway Authority/FHWA	State Roadways	Highway Work Permit/Utility Permit, Vegetation Management Permit; Easement	Any work within or crossing State highway ROW	May require restoration landscaping coordination. Typically requires compliance with NEPA including SHPO and USFWS effects determination	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$17,000	$200,000
NYS Dept. of Agriculture and Markets	All agricultural lands (including Agricultural Districts)	Part of Article 7 & Article 10 Review process	Any work impacting agricultural land	Must minimize impacts and restore damage to agricultural land, and coordinate with County Soil & Water Conservation District; Vineyards are a major concern in WNYS. Pre-application conference with PSC, DEC and Ag& Markets recommended. Must develop EM&CP in conformance with Art. 7/10 Certificate Conditions. Agricultural Monitor must oversee construction & restoration; requisite 2-yrs post restoration monitoring.	Crop/Pasturing Mitigation Plan (not included in costing)	$11,000	$24,000

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T008 - North American Transmission

ENVIRONMENTAL LICENSING AND PERMITTING

Revision: 4

REGIONAL							
Railroads	Railroad crossings	Consultation-permits may be required; Easement	Access / new structures on RR property		Easement area survey (not included in costs)	$11,000	$200,000
LOCAL/MUNICIPAL							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
County Dept. of Public Works	County Roadways	Lane Closure Permit, Highway Work or Access Permit	Work within county roadways and right-of-ways			$6,000	$40,000
Town, City or Village	Municipal Stormwater (MS4) Review	Approval of SWPPP or EM&CP	Project areas of soil disturbance		See NYSDEC SPDES	$6,000	$35,000
Town, City or Village	Variable	Building Permits	New Structures	Individual Towns/Villages must be consulted on a project specific basis to determine notification and/or permitting procedures. Permit application names vary (e.g. road obstruction permit)		$18,000	$92,000
Town, City or Village	Municipal Roadways	Highway Work Permit; Road Opening Permit	Work within municipal roadways and right-of-ways			$6,000	$35,000
Town, City or Village	Wetlands	Wetland Permit / Conservation Approvals	Mapped wetlands and wetland adjacent areas (buffer width variable)		See USACE / NYSDEC Art. 24	$6,000	$52,000

		Minimum	Maximum
ENVIRONMENTAL LICENSING & PERMITTING COST (EXCLUDING MITIGATION)	**PROJECT T008 TOTAL**	**$1,076,790**	**$4,474,905**
Excluded cost: Mitigation or restoration for impact to regulated wetlands; agricultural land and tree clearing	**Expected Value**	**$3,608,601.75**	

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T008 - North American Transmission

ENVIRONMENTAL MITIGATION ESTIMATE

Revision: 4

WNY TRANSMISSION PROJECT - ENVIRONMENTAL MITIGATION COST ESTIMATE FOR T008

	Offsite Wetland Mitigation*		Farmland**	
	Min.	Max.	Min.	Max.
Area	96 acres	96 acres	18.7 acres	37.3 acres
Cost/Acre	$50,000	$100,000	$503	$503
Ratio	1:1	3:1	1:1	1:1
Total	$4,800,000	$28,800,000	$9,406	$18,762

T008 MITIGATION TOTAL	Minimum	Maximum	Expected Value
	$4,809,406	**$28,818,762**	**$ 16,814,084**

*Offsite wetland mitigation area assumes Highway Alternative Route; clearing of NWI Forested/Shrub Wetland Approx. 0.65 miles (3432 LF) by 100' ROW width and 3.24 miles (17107 LF) by 225' ROW width; Max. cost per acre assumes additional mitigation required for permanent impacts of proposed structures in non-forested wetlands; cost per acre Min. and Max. reduced due to area total over 50 acres; costing includes design and installation costs only; does not include land acquisition or long term monitoring

**Farmland mitigation based on corn bushel yield at 129 BU/Acre and $3.9/BU (production numbers from 2016 USDA NYS Agriculture Overview), area assumes 6.16 miles (32525 LF) Adjacent to Agriculture Properties by 25' Wide (Min.) or 50' Wide (Max.); does not include land acquisition

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T008 - North American Transmission

REAL ESTATE ESTIMATE
(NEW ROW)

Revision: 4

COUNTY: NIAGARA & ERIE

DEVELOPER: NORTH AMERICAN (T008)

SEGMENT: NIAGARA - DYSINGER - STOLLE SEGMENT

	Address	Area (Acres)	Total Cost
A	**NIAGARA COUNTY**		
	Sub Total (A)	2.38	$ 51,560.00

B	**ERIE COUNTY**		
	Sub Total (A)	0.68	$ 4,376.00
	Total (A + B)	3.06	$ 55,936.00

REAL ESTATE ESTIMATE (NEW ROW)

Revision: 4

COUNTY: ERIE

DEVELOPER: NORTH AMERICAN (T008)

SEGMENT: STOLLE TO GARDENVILLE SEGMENT

		Area (Acres)	Total Cost
	Total	167.00	$ 6,838,497.00

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

COUNTY: NIAGARA & ERIE
DEVELOPER: NORTH AMERICAN (T008)
SEGMENT: DYSINGER - STOLLE - GARDENVILLE SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
T008	North American Transmission (Proposal 3)	Dysinger SS to Stolle Rd SS - 2x19.98 miles	Niagara	10.33	$ 2,846,000
			Erie	534.58	
		Stolle Rd SS to Gardenville SS - 12.84 miles	Erie	27.55	

REAL ESTATE ESTIMATE (HOUSES)

Revision: 4

COUNTY: ERIE

DEVELOPER: NORTH AMERICAN (T008)

SEGMENT: STOLLE ROAD TO GARDENVILLE

		Total Valuation of Property with 3% Escalation/year (as of 2017)
	Total Valuation Cost	$ 628,349.85

REAL ESTATE ESTIMATE (SUBSTATIONS)

Revision: 4

COUNTY: NIAGARA
DEVELOPER: NORTH AMERICAN (T008)
SEGMENT: DYSINGER SWITCHYARD

		Total Cost
	Total Cost of Proposed Substation Site	$152,750.00

REAL ESTATE ESTIMATE (SUBSTATIONS)

Revision: 4

COUNTY: ERIE
DEVELOPER: NORTH AMERICAN (T008)
SEGMENT: STOLLE ROAD SUBSTATION

		Total Cost
	Total Cost of Proposed Substation Site	$19,440.00

REAL ESTATE ESTIMATE (SUBSTATIONS)

Revision: 4

COUNTY: ERIE
DEVELOPER: NORTH AMERICAN (T008)
SEGMENT: GARDENVILLE SUBSTATION (OPTION 1)

		Total Cost
	Total Cost of Proposed Substation Site	$ 309,483.90

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

a) Cost Estimate is based on 2017 rates.
b) Construction schedule is in accordance with the Developers proposed schedule (approx 15 months) - we have assumed continuous working with no breaks in the schedule. Six months have been added to the construction schedule PM time for start up and close out works and float.
c) Stringing rates allow for protection over crossings (such as rider poles).
d) We have assumed a typical work week (6 x 10 hour days).
e) We have assumed the Access Road included in Developer Estimate will be Type 1 Gravel Type.
f) Costs will vary for handling and disposal of contaminated spoils, depending on type of contaminants and availability / location of the appropriate tipping facility. Since there is not enough information to provide a quantified estimate for this item, allowance is included in the contingency monies.
g) Costs have been developed based on historical data from Projects of a similar nature (AACE Class 5 and 4 Estimating Practices). We have not engaged any subcontractors or material vendors for formal quotes.
h) The equipment types listed for Dysinger Substation have been taken from a recently completed 345kV switchyard project, using current pricing. Gardenville Transformer is assumed to be 250MVA.
i) Estimated quantities have been used for items in red text in Section 1 of the Estimate (CLEARING & ACCESS FOR T-LINE CONSTRUCTION). These items were not quantified in the Developers Estimate, however we believe that they are necessary for the works.
j) Foundation rates include supply and installation of materials. Drilled Pier rates include supply and testing of concrete, rebar cage and the use of temp
k) A Contractor Mark-Up (OH&P) of 15% has been included in the Total section.
l) Assumes all environmental data and project details provided are accurate unless noted otherwise.
m) Dysinger to Stolle Road Circuit 2 ROW length (19.85 miles) not included in project route total since parallels already accounted for length of Dysinger
n) USFWS T&E Assumes that ¼ of the Total Line in Right of Way will require field survey for T&E (Approx. 8.16 miles).
o) NEPA-Assumes no NEPA because Art VII.
p) SHPO-Assumes consultation and Phase 1A/1B archeological studies with field survey for 50% of Total Line in Right of Way (Approx. 16.31 miles).
q) NYSDOT/FHWA-Assumes any required NEPA coordination/requirements are covered under Article VII or SEQRA review. Max costs includes additional agency coordination (greater than general fixed costing max.) for new ROW Parallel to Highway.
s) Railroad - Max costs includes additional agency coordination (greater than general fixed costing max.) for new ROW Parallel to Railroad.
t) Assumes no coordination with National Parks Service or OPRHP/State Parks
u) USACE wetland delineation total based on Line Miles in Wetlands - NWI wetland lengths of 7.58 miles (Min.) and 7.69 miles (Max.)
v) DEC wetland delineation total based on Line Miles in Wetlands - DEC wetland lengths of 3.49 miles (Min.) and 4.04 miles (Max.)

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

w) Offsite wetland mitigation area costs based on impacts anticipated by clearing of NWI Forested/Shrub Wetland of approximately 3.88 miles (calculated by GEI based on NWI mapper legend categories). using the Stolle Road to Gardenville Highway alternative. Assumes clearing an additional 125 within the Dysinger to Stolle Road Right of Way (for a total of 225 feet). Minimum costs at $50,000/acre, maximum costs at $100,000/acre for additional permanent impacts of proposed structures in non-forested wetlands. Costing includes design and installation costs only and does not include land acquisition or long term monitoring. Minimum and maximum costs for this proposal assumes a reduced mitigation cost/acre due to size of
x) Agricultural mitigation assumes timber matting impacts and pad impacts on adjacent agriculture land (6.16 miles) requires crop damage payments based on USDA 2016 NYS Agriculture Overview corn yield and bushel price/acre. Minimum assumes 25-foot-wide impact, Maximum assumes 50-foot-
y) No tree survey or replanting required outside regulated wetlands areas.
z) Article VII Intervenor Fund payment expected to be $350,000.
aa) Mitigation costs for landscaping only (no paving, sidewalks, sound walls, etc.).
ab) Expected value of environmental licensing and permitting cost is estimated to be 30% higher than the mean of the range based upon the addition of the new Gardenville to Stolle 345kV line and a second Dysinger to Stolle line.
ac) SUF pricing includes 35% to cover Contractor markup (15%) and contingency (20%)
ad) SUF reconductor rate is based on Niagara-Packard (National Grid) reconductor estimate, pro-rated to a rate / mile. Note that this is based on conductor, shieldwire and hardware pricing only and does not include structure or foundation works.
ae) System Upgrade Facilities Contingency is allowance for potential additional system upgrades including overdutied breakers, protection changes, unidentified thermal issues, etc that may be identified as detailed studies are completed.

INDEPENDENT ESTIMATES

ATTACHMENT B4

T009 – NORTH AMERICAN TRANSMISSION

SUBSTATION ENGINEERING COMPANY
8/11/2017

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T009 - North American Transmission

Revision: 4

SUMMARY OF COST ESTIMATE

	Description	Total Amount
1	CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION	$ 48,929,055
2	TRANSMISSION LINE FOUNDATIONS	$ 40,444,048
3	STRUCTURES - TRANSMISSION LINE	$ 57,905,468
4	CONDUCTOR, SHIELDWIRE, OPGW	$ 21,865,190
5	TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE	$ 5,828,824
6	NEW DYSINGER SWITCHYARD	$ 23,229,000
7	STOLLE ROAD SUBSTATION WORKS:	$ 14,263,000
8	GARDENVILLE 345/230kV SUBSTATION WORKS	$ 12,822,500
9	NIAGARA SUBSTATION WORK	$ 4,246,500
10	MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS	$ 87,506,380
	CONTRACTOR MARK-UP (OH&P) 15%	$ 47,555,995
	SUBTOTAL:	$ 364,595,961
	CONTINGENCY ON ENTIRE PROJECT (25%)	$ 91,148,990
	TOTAL (A):	**$ 455,744,952**
11	SYSTEM UPGRADE FACILITIES	$ 23,258,025
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 8,140,309
	TOTAL (B):	**$ 31,398,334**
	TOTAL PROJECT COST (A+B):	**$ 487,143,285**

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

Revision: 4

Description of Work: Proposal 1 - A new 345kV Dysinger Switchyard located approximately 8 miles southeast of the city of Lockport, New York. The Project also includes a new ~20 mile 345kV Transmission Line from Dysinger Switchyard to Stolle Road Substation near Marilla, New York. Proposal 2 - Includes Proposal 1 Scope of Work, with the addition of a single circuit 345kV Transmission Line from the Stolle Road 345kV Substation to the existing Gardenville Substation, and a new 345/230kV Transformer at the existing Gardenville Substation. This cost estimate uses Option 1 routing (as per NAT estimate). Proposal 3 includes an additional 345kV single circuit transmission line from the Dysinger Switchyard to the existing Stolle Road 345kV Substation. Proposal 4 includes the addition of a 27 mile 345kV Transmission Line from Niagara to Dysinger Switchyard.

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
1. CLEARING & ACCESS FOR T-LINE CONSTRUCTION								
1.1	Clearing the ROW (mowing & clearing)	515.0	Acre		$ 15,000	$ 15,000	**$ 7,725,000**	
1.2	Access Road	197,895.0	LF		$ 45	$ 45	**$ 8,905,275**	Assumes Type 1 Type Gravel Road
1.3	Silt Fence	197,895.0	LF		$ 4	$ 4	**$ 791,580**	
1.4	Matting	187,069.0	LF		$ 70	$ 70	**$ 13,094,830**	
1.5	Snow Removal	1.0	Sum		$ 1,200,000	$ 1,200,000	**$ 1,200,000**	
1.6	ROW Restoration	80.0	Mile		$ 10,000	$ 10,000	**$ 800,000**	
1.7	Work Pads	3,650,000.0	SF		$ 4	$ 4	**$ 12,848,000**	
1.8	Restoration for Work Pad areas	365,000.0	SF		$ 0.2	$ 0.2	**$ 54,750**	
1.9	Temporary Access Bridge	60.0	EA		$ 20,035	$ 20,035	**$ 1,202,100**	
1.10	Air Bridge	20.0	EA		$ 14,445	$ 14,445	**$ 288,900**	
1.11	Stabilized Construction Entrance	34.0	EA		$ 4,580	$ 4,580	**$ 155,720**	
1.12	Maintenance and Protection of Traffic on Public Roads	1.0	LS		$ 1,200,000	$ 1,200,000	**$ 1,200,000**	
1.13	Culverts / Misc. Access	1.0	LS		$ 600,000	$ 600,000	**$ 600,000**	
1.14	Concrete Washout Station	34.0	EA		$ 1,850	$ 1,850	**$ 62,900**	
TOTAL - CLEARING & ACCESS FOR T-LINE:							**$ 48,929,055**	
2. T-LINE FOUNDATIONS								
2.1	Direct Embed Foundations - 23ft deep x 6ft dia.	416.0	Structure		$ 18,000	$ 18,000	**$ 7,488,000**	Supply & Install
2.2	Direct Embed Foundations - 28ft deep x 7ft dia.	15.0	Structure		$ 20,000	$ 20,000	**$ 300,000**	Supply & Install
2.3	Direct Embed Foundations - 30ft deep x 6ft dia.	63.0	Structure		$ 20,000	$ 20,000	**$ 1,260,000**	Supply & Install
2.4	Direct Embed Foundations - 37ft deep x 7ft dia.	8.0	Structure		$ 22,000	$ 22,000	**$ 176,000**	Supply & Install
2.5	Drilled Pier 38ft deep x 9ft dia.	1,477.3	CUY		$ 1,500	$ 1,500	**$ 2,216,001**	
2.6	Drilled Pier 45ft deep x 9ft dia.	699.8	CUY		$ 1,500	$ 1,500	**$ 1,049,685**	
2.7	Drilled Pier 47ft deep x 8ft dia.	2,310.0	CUY		$ 1,500	$ 1,500	**$ 3,464,967**	
2.8	Drilled Pier 57ft deep x 9ft dia.	1,772.8	CUY		$ 1,500	$ 1,500	**$ 2,659,201**	
2.9	Drilled Pier 64ft deep x 8ft dia.	393.2	CUY		$ 1,500	$ 1,500	**$ 589,782**	
2.10	Drilled Pier 71ft deep x 9ft dia.	4,416.5	CUY		$ 1,500	$ 1,500	**$ 6,624,676**	
2.11	Drilled Pier 43ft deep x 8ft dia.	2,113.4	CUY		$ 1,500	$ 1,500	**$ 3,170,076**	
2.12	Drilled Pier 48ft deep x 9ft dia.	746.4	CUY		$ 1,500	$ 1,500	**$ 1,119,660**	
2.13	Rock Excavation Adder	5,163.0	CUY		$ 2,000	$ 2,000	**$ 10,326,000**	
TOTAL - T-LINE FOUNDATIONS:							**$ 40,444,048**	
3. STRUCTURES - T-LINE								
3.1	Single Steel Pole Tangent Delta - 00- 10 (Ht. 100')	104.0	EA	$ 31,401	$ 18,841	$ 50,242	**$ 5,225,126**	
3.2	Single Steel Pole Tangent Delta - 00- 10 (Ht. 115')	312.0	EA	$ 38,376	$ 23,026	$ 61,402	**$ 19,157,299**	
3.3	Single Steel Pole Tangent Delta - 00- 10 (Ht. 130')	52.0	EA	$ 44,150	$ 26,490	$ 70,641	**$ 3,673,313**	
3.4	Single Steel Pole Tangent Delta - 00- 10 (Ht. 145')	11.0	EA	$ 50,029	$ 30,018	$ 80,047	**$ 880,514**	
3.5	Single Steel Pole Small Angle Delta - 10- 15 (Ht. 115')	15.0	pole	$ 66,881	$ 40,128	$ 107,009	**$ 1,605,139**	
3.6	Single Steel Pole Small Angle Delta - 10- 15 (Ht. 130)	5.0	pole	$ 78,872	$ 47,323	$ 126,196	**$ 630,979**	
3.7	Single Steel Pole Small Angle Delta - 10- 15 (Ht. 145)	3.0	pole	$ 94,927	$ 56,956	$ 151,883	**$ 455,648**	
3.8	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 115')	24.0	pole	$ 93,524	$ 56,115	$ 149,639	**$ 3,591,337**	
3.9	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 130')	11.0	pole	$ 120,604	$ 72,362	$ 192,966	**$ 2,122,623**	

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

Revision: 4

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
3.10	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 145')	13.0	pole	$ 153,391	$ 92,034	$ 245,425	**$ 3,190,524**	
3.11	Single Steel Pole Medium Angle Vertical - 15- 60 (Ht. 185')	3.0	pole	$ 187,828	$ 112,697	$ 300,525	**$ 901,575**	
3.12	Single Steel Pole Large Angle DE Vertical - 60- 90 (Ht. 115')	15.0	pole	$ 111,476	$ 66,885	$ 178,361	**$ 2,675,419**	
3.13	Single Steel Pole Large Angle DE Vertical - 60- 90 (Ht. 130')	16.0	pole	$ 140,249	$ 84,149	$ 224,398	**$ 3,590,369**	
3.14	Single Steel Pole Large Angle DE Vertical - 60- 90 (Ht. 145')	8.0	pole	$ 177,172	$ 106,303	$ 283,476	**$ 2,267,804**	
3.15	Large Angle DE - 60- 90 (Ht. 145')	6.0	pole	$ 97,225	$ 58,335	$ 155,560	**$ 933,362**	
3.16	Large Angle DE - 60- 90 (Ht. 165')	3.0	pole	$ 105,869	$ 63,521	$ 169,390	**$ 508,170**	
3.17	Large Angle DE - 60- 90 (Ht. 195')	9.0	pole	$ 169,360	$ 101,616	$ 270,976	**$ 2,438,787**	
3.18	Tangent Dead End (Ht. 165')	3.0	pole	$ 86,818	$ 52,091	$ 138,908	**$ 416,724**	
3.19	Tangent Dead End (Ht. 195')	3.0	pole	$ 116,824	$ 70,094	$ 186,918	**$ 560,753**	
3.20	Install Grounding	616.0	Structure		$ 5,000	$ 5,000	**$ 3,080,000**	
TOTAL - STRUCTURES T-LINE:							**$ 57,905,468**	
4. CONDUCTOR, SHIELDWIRE, OPGW								
4.1	(2)/Phase - 795kcmil 26/7 Stranded "Drake" ACSR	84.2	Circuit Mile	$ 53,856	$ 158,400	$ 212,256	**$ 17,874,078**	
4.2	(1) OPGW 36 Fiber AC-33/38/571	84.2	Mile	$ 19,404	$ 27,720	$ 47,124	**$ 3,968,312**	
4.3	(1) 3/8" HS Steel (2nd SW where required)	4,000.0	Ft	$ 1	$ 5	$ 6	**$ 22,800**	
TOTAL: CONDUCTOR, SHIELDWIRE, OPGW:							**$ 21,865,190**	
5. T-LINE INSULATOR, FITTINGS, HARDWARE								
5.1	Tangent - Polymer V-String	1,446.0	Set	$ 900	$ 720	$ 1,620	**$ 2,342,520**	
5.2	Angle - Polymer V-String	69.0	Set	$ 1,300	$ 1,040	$ 2,340	**$ 161,460**	
5.3	Deadend - Polymer Double Deadend including Jumper	666.0	Set	$ 1,500	$ 1,350	$ 2,850	**$ 1,898,100**	
5.4	OPGW Assembly - Tangent	502.0	Set	$ 200	$ 150	$ 350	**$ 175,700**	
5.5	OPGW Assembly - Angle / DE	222.0	Set	$ 250	$ 150	$ 400	**$ 88,800**	
5.6	OHSW Assembly - Angle / DE	16.0	Set	$ 250	$ 150	$ 400	**$ 6,400**	
5.7	OPGW Splice Boxes	34.0	Set	$ 1,500	$ 1,000	$ 2,500	**$ 85,000**	
5.8	OPGW Splice & Test	1.0	Sum		$ 40,800	$ 40,800	**$ 40,800**	
5.9	Spacer Dampers	7,212.0	Ea	$ 50	$ 35	$ 85	**$ 613,020**	
5.10	Vibration Dampers - Conductor	7,212.0	Ea	$ 32	$ 20	$ 52	**$ 375,024**	
5.11	Shieldwire / OPGW Dampers, Misc Fittings	1.0	Sum	$ 30,000	$ 12,000	$ 42,000	**$ 42,000**	
TOTAL: T-LINE INSULATORS, FITTINGS, HARDWARE:							**$ 5,828,824**	
6. NEW DYSINGER SWITCHYARD								
6.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement	1.0	Sum		$1,500,000.00	$ 1,500,000	**$ 1,500,000**	Supply & Install
6.2	Substation Fence	2,450.0	LF		$200	$ 200	**$ 490,000**	Supply & Install
6.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
6.4	Switches 3ph	22.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 154,000**	
6.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
6.6	Line Switches 3 ph w/ motor operators	7.0	Ea	$ 15,000	$15,000.00	$ 30,000	**$ 210,000**	
6.7	Instrument Transformers	1.0	Sum		$ 1,214,000	$ 1,214,000	**$ 1,214,000**	
6.8	Breakers	11.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 4,180,000**	
6.9	Arrestors (3 per line)	21.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 157,500**	
6.10	Line Traps	7.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 147,000**	
6.11	345 kV buses	2.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
6.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	Supply & Install
6.13	Low Profile Foundations	305.0	Ea		$ 5,000	$ 5,000	**$ 1,525,000**	Supply & Install
6.14	Caisson DE Foundations	28.0	Ea		$ 50,000	$ 50,000	**$ 1,400,000**	Supply & Install
6.15	Circuit Breaker Foundations	11.0	Ea		$ 75,000	$ 75,000	**$ 825,000**	Supply & Install

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
6.16	Lightning Mast Foundations	20.0	Ea		$15,000	$ 15,000	**$ 300,000**	Supply & Install
6.17	SST Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
6.18	Control House and Pad (30' x 90' - 2700 sq. ft)	1.0	Sum	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	
6.19	Generator Foundation	1.0	Ea		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
6.20	Control Cables	1.3	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 260,000**	
6.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
6.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	Supply & Install
6.23	Protection, Telecom and Metering Equipment (Panels)	37.0	Ea		$ 30,000	$ 30,000	**$ 1,110,000**	Supply & Install
6.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
6.26	Control Conduits from Cable Trench to Equipment	1.3	Sum		$ 250,000	$ 250,000	**$ 325,000**	Supply & Install
6.27	Cable Trench Systems for Control Cables	1.3	Sum		$ 750,000	$ 750,000	**$ 975,000**	Supply & Install
6.28	Grounding	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.29	Bus Support 1 Ph	129.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 387,000**	
6.30	Switch Stands	22.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 242,000**	
6.31	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
6.32	Misc. Structures	1.0	Sum		$ 68,000	$ 68,000	**$ 68,000**	
6.33	Substation A-Frame Structures Standalone	7.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 175,000**	
6.34	Lightning Masts	20.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 240,000**	
6.35	Arrestor Stands	21.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 73,500**	Supply & Install
6.36	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
6.37	Connection of Existing Lines to Dysinger Switchyard	1.0	Sum		$ 3,400,000	$ 3,400,000	**$ 3,400,000**	Supply & Install
TOTAL - DYSINGER SWITCHYARD:							**$ 23,229,000**	
7. STOLLE ROAD SUBSTATION WORKS:								
7.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
7.2	Substation Fence	715.00	LF		$ 200	$ 200	**$ 143,000**	Supply & Install
7.3	Switches 3ph	14.00	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 98,000**	
7.4	Line Switches 3 ph w/ motor-operators	4.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 120,000**	
7.5	Instrument Transformers	1.00	Sum		$ 691,000	$ 691,000	**$ 691,000**	
7.6	Breakers	8.00	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 3,040,000**	
7.7	Arrestors (3 per line)	12.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 90,000**	
7.8	Line Traps	4.00	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 84,000**	
7.9	345 kV buses	2.00	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
7.10	Low Profile Foundations	183.00	Ea		$ 5,000	$ 5,000	**$ 915,000**	Supply & Install
7.11	Caisson DE Foundations	16.00	Ea		$ 50,000	$ 50,000	**$ 800,000**	Supply & Install
7.12	Circuit Breaker Foundations	8.00	Ea		$ 75,000	$ 75,000	**$ 600,000**	Supply & Install
7.13	Lightning Mast Foundations	8.00	Ea		$ 15,000	$ 15,000	**$ 120,000**	Supply & Install
7.14	Control House and Pad (25' x 50' - 1250 sq. ft)	1.00	Ea	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	
7.15	Control Cables	1.00	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
7.16	125VDC Batteries	2.00	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
7.17	Protection, Telecom and Metering Equipment (Panels)	27.00	Ea		$ 30,000	$ 30,000	**$ 810,000**	Supply & Install
7.18	SCADA and Communications	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
7.19	Low Voltage AC Distribution & DC Panels & Switches	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
7.20	Control Conduits from Cable Tray to Equipment	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
7.21	Cable Trench Systems for Control Cables	1.00	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
7.22	Grounding	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
7.23	Bus Support 1 Ph	66.00	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 198,000**	
7.24	Switch Stands	14.00	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 154,000**	
7.25	Misc. Structures	1.0	Sum		$ 42,000	$ 42,000	**$ 42,000**	
7.26	Substation A-Frame Structures Standalone	4.00	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 100,000**	
7.27	Lightning Masts	8.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 96,000**	
7.28	Arrestor Stands	12.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 42,000**	
7.29	Miscellaneous Materials and Above / Below Ground Works	1.00	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
7.30	Interconnection arrangement at Stolle Rd Substation	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
TOTAL - STOLLE RD SUBSTATION WORKS:			Ea		$ 100,000		**$ 14,263,000**	
8. GARDENVILLE 345/230kV SUBSTATION WORKS								
8.1	Site Works including sediment controls, access roads, rough grading, final grading	1.0	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
8.2	Substation Fence	1,400.0	LF		$ 200	$ 200	**$ 280,000**	Supply & Install
8.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
8.4	Switches 3ph	1.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 7,000**	
8.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
8.6	Line Switches 3 ph w/ motor-operators	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
8.7	Instrument Transformers	1.0	Sum		$ 271,000	$ 271,000	**$ 271,000**	
8.8	Breakers	1.0	Ea	$ 250,000	$ 75,000	$ 325,000	**$ 325,000**	
8.9	Arrestors (3 per line)	12.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 90,000**	
8.10	Line Traps	1.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 21,000**	
8.11	230 kV buses	1.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 60,000**	
8.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
8.13	Low Profile Foundations	40.0	Ea		$ 5,000	$ 5,000	**$ 200,000**	Supply & Install
8.14	Caisson DE Foundations	12.0	Ea		$ 50,000	$ 50,000	**$ 600,000**	Supply & Install
8.15	Circuit Breaker Foundations	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
8.16	Lightning Mast Foundations	1.0	Ea		$ 15,000	$ 15,000	**$ 15,000**	Supply & Install
8.17	SST Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
8.18	Control House and Pad (14' x 70' - 980 sq. ft)	1.0	Ea	$ 350,000	$ 100,000	$ 450,000	**$ 450,000**	
8.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
8.20	Control Cables	1.0	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
8.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
8.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	Supply & Install
8.23	Protection, Telecom and Metering Equipment (Panels)	11.0	Ea		$ 30,000	$ 30,000	**$ 330,000**	Supply & Install
8.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
8.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
8.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
8.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 350,000	$ 350,000	**$ 350,000**	Supply & Install
8.28	Grounding	1.0	Sum		$ 125,000	$ 125,000	**$ 125,000**	Supply & Install
8.29	Bus Support 1 Ph	18.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 54,000**	
8.30	Switch Stands	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
8.31	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
8.32	Misc. Structures	1.0	Sum		$ 27,000	$ 27,000	**$ 27,000**	
8.33	Substation A-Frame Structures Standalone	3.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 75,000**	
8.34	Lightning Masts	1.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 12,000**	
8.35	Arrestor Stands	6.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 21,000**	
8.36	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 725,000	$ 725,000	**$ 725,000**	Supply & Install
8.37	345kV - 230kV 480/540/600 MVA Transformer	1.0	Ea	$ 4,750,000	$ 750,000	$ 5,500,000	**$ 5,500,000**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
8.38	Transformer Foundation with concrete moat and double steel grating	1.0	Ea		$ 150,000	$ 150,000	**$ 150,000**	
TOTAL - GARDENVILLE SUBSTATION WORKS:							**$ 12,822,500**	
9. NIAGARA SUBSTATION WORK								
9.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement	0.6	Sum		$ 1,000,000	$ 1,000,000	**$ 600,000**	Supply & Install
9.2	Substation Fence	320.0	LF		$ 200	$ 200	**$ 64,000**	Supply & Install
9.3	Switches 3ph	2.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 14,000**	
9.4	Line Switches 3 ph w/ motor operators	1.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 30,000**	
9.5	Instrument Transformers	1.0	Sum		$ 163,000	$ 163,000	**$ 163,000**	
9.6	Breakers	1.0	Ea	$ 250,000	$ 75,000	$ 325,000	**$ 325,000**	
9.7	Arrestors (3 per line)	6.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 45,000**	
9.8	Line Traps	1.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 21,000**	
9.9	345 kV buses	0.5	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 30,000**	
9.10	Low Profile Foundations	37.0	Ea		$ 5,000	$ 5,000	**$ 185,000**	Supply & Install
9.11	Caisson DE Foundations	4.0	Ea		$ 50,000	$ 50,000	**$ 200,000**	Supply & Install
9.12	Circuit Breaker Foundations	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
9.13	Control Cables	1.0	Sum	$50,000	$ 50,000	$ 100,000	**$ 100,000**	
9.14	Protection, Telecom and Metering Equipment (Panels)	3.0	Ea		$ 30,000	$ 30,000	**$ 90,000**	Supply & Install
9.15	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
9.16	Control Conduits from Cable Trench to Equipment	1.0	Sum		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
9.17	Cable Trench Systems for Control Cables	1.0	Sum		$ 350,000	$ 350,000	**$ 350,000**	Supply & Install
9.18	Grounding	1.0	Sum		$ 125,000	$ 125,000	**$ 125,000**	Supply & Install
9.19	Underground Riser Structures	6.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 21,000**	
9.20	Bus Support 1 Ph	6.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 18,000**	
9.21	Switch Stands	2.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 22,000**	
9.22	Misc. Structures	1.0	Ea		$ 8,000	$ 8,000	**$ 8,000**	
9.23	Substation A-Frame Structures Standalone	1.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 25,000**	
9.24	Arrestor Stands	3.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 10,500**	
9.25	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 200,000	$ 200,000	**$ 200,000**	Supply & Install
9.26	345kV underground cable with terminations. (680 Circuit Ft.)	1.0	Ea		$ 1,200,000	$ 1,200,000	**$ 1,200,000**	Supply & Install
TOTAL - NIAGARA SUBSTATION WORKS:							**$ 4,246,500**	
10. MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:								
	Contractor Mobilization / Demobilization							
10.1	Mob / Demob	1.0	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
	Project Management, Material Handling & Amenities					$ -	**$ -**	
10.2	Project Management & Staffing (includes PM, Field Engineers / Supervision,	36.0	Months		$ 450,000	$ 450,000	**$ 16,200,000**	
10.3	Site Accommodation, Facilities, Storage	1.0	Sum		$ 2,500,000	$ 2,500,000	**$ 2,500,000**	
	Engineering					$ -	**$ -**	
10.4	Design Engineering	1.0	Sum		$ 10,500,000	$ 10,500,000	**$ 10,500,000**	
10.5	LiDAR	1.0	Sum		$ 800,000	$ 800,000	**$ 800,000**	
10.6	Geotech	1.0	Sum		$ 1,700,000	$ 1,700,000	**$ 1,700,000**	
10.7	Surveying/Staking	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
	Testing & Commissioning							
10.8	Testing & Commissioning of T-Line and Equipment	1.0	Sum		$ 2,500,000	$ 2,500,000	**$ 2,500,000**	
	Permitting and Additional Costs					$ -	**$ -**	
10.9	Environmental Licensing & Permitting Costs	1.0	Sum		$ 4,336,429	$ 4,336,429	**$ 4,336,429**	
10.10	Environmental Mitigation	1.0	Sum		$ 20,514,989	$ 20,514,989	**$ 20,514,989**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
10.11	Warranties / LOC's	1.0	Sum		$ 1,358,623	$ 1,358,623	**$ 1,358,623**	
10.12	Real Estate Costs (New)	1.0	Sum		$ 7,675,534	$ 7,675,534	**$ 7,675,534**	
10.13	Real Estate Costs (Incumbent Utility ROW)	1.0	Sum		$ 4,555,924	$ 4,555,924	**$ 4,555,924**	
10.14	Legal Fees	1.0	Sum		$ 3,500,000	$ 3,500,000	**$ 3,500,000**	
10.15	Sales Tax on Materials	1.0	Sum	$ 8,164,882		$ 8,164,882	**$ 8,164,882**	
10.16	Fees for permits, including roadway, railroad, building or other local permits	1.0	Sum		$ 200,000	$ 200,000	**$ 200,000**	
TOTAL - MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:							**$ 87,506,380**	
11. SYSTEM UPGRADE FACILITIES								
SUF 1.1	Depew to Erie Street 115kV Transmission Line 921. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	$ 500,000	Relay was replaced and line ratings increased to 124/137/158 (NOR/LTE/STE) resulting ratings are below line conductor
SUF 1.2	Engineering, T&C, PM, Indirects for SUF 1.1 (15%)					$ -	$ 75,000	
SUF 2.1	Shawnee to Swann Reconductor	12.00	Mile		$ 400,000	$ 400,000	$ 4,800,000	Rate for reconductor is pro-rated from
SUF 2.2	Engineering, T&C, PM, Indirects FOR SUF 2.2 (15%)					$ -	$ 720,000	National Grid Niagara - Packard
SUF 3	Roll Rd Substation							
SUF 3.1	Restoration of station stone within existing substation fence. Assume spoil	1.00	Ea		$ 100,000	$ 100,000	$ 100,000	Supply & Install
SUF 3.2	Transformer 115-34.5kV 90 MVA	1.00	Ea	$ 700,000	$ 200,000	$ 900,000	$ 900,000	
SUF 3.3	Switches 115kV 3Ph	1.00	Ea	$ 15,000	$ 12,000	$ 27,000	$ 27,000	
SUF 3.4	Switches 35kV 3Ph	1.00	Ea	$ 6,000	$ 4,000	$ 10,000	$ 10,000	
SUF 3.5	Breakers 115kV 1200A	1.00	Ea	$ 150,000	$ 50,000	$ 200,000	$ 200,000	
SUF 3.6	Breakers 35kV 2000A	1.00	Ea	$ 75,000	$ 15,000	$ 90,000	$ 90,000	
SUF 3.7	CVT's 115kV	3.00	Ea	$ 10,000	$ 8,000	$ 18,000	$ 54,000	
SUF 3.8	Arrestors 115kV	6.00	Ea	$ 5,000	$ 700	$ 5,700	$ 34,200	
SUF 3.9	Arrestors 35kV (for transformer)	3.00	Ea	$ 2,500	$ 500	$ 3,000	$ 9,000	
SUF 3.10	Low Profile Foundations	8.00	Ea		$ 5,000	$ 5,000	$ 40,000	Supply & Install
SUF 3.11	Circuit Breaker Foundation 115kV	1.00	Ea		$ 75,000	$ 75,000	$ 75,000	Supply & Install
SUF 3.12	Circuit Breaker Foundation 35kV	1.00	Ea		$ 30,000	$ 30,000	$ 30,000	Supply & Install
SUF 3.13	Transformer Foundation with concrete moat and double steel grating	1.00	Ea		$ 150,000	$ 150,000	$ 150,000	Supply & Install
SUF 3.14	Firewall 30' long x 12' tall x 1' thick with footer	1.00	Ea		$ 100,000	$ 100,000	$ 100,000	Supply & Install
SUF 3.15	Control Cables	1.00	Sum		$ 50,000	$ 50,000	$ 50,000	Supply & Install
SUF 3.16	Protection & Telecom Equipment	3.00	Ea		$ 30,000	$ 30,000	$ 90,000	Supply & Install
SUF 3.17	SCADA and Communications	1.00	Sum		$ 25,000	$ 25,000	$ 25,000	Supply & Install
SUF 3.18	Low Voltage AC Distribution	1.00	Sum		$ 30,000	$ 30,000	$ 30,000	Supply & Install
SUF 3.19	Control Conduits	1.0	Sum		$ 50,000	$ 50,000	$ 50,000	Supply & Install
SUF 3.20	Grounding	1.0	Sum		$ 25,000	$ 25,000	$ 25,000	Supply & Install
SUF 3.21	Switch Stand 115kV (reuse 1 existing)	1.0	Ea	$ 1,500	$ 800	$ 2,300	$ 2,300	
SUF 3.22	CVT Stand	3.0	Ea	$ 1,000	$ 1,000	$ 2,000	$ 6,000	
SUF 3.23	Arrestor Stand	3.0	Ea	$ 1,000	$ 1,000	$ 2,000	$ 6,000	
SUF 3.24	Misc Materials and Above / Below Ground Works	1.0	Sum		$ 120,000	$ 120,000	$ 120,000	Supply & Install
SUF 3.25	Engineering, T&C, PM, Indirects for SUF 3 (15%)					$ -	$ 333,525	Assumed 15% to cover all misc costs
SUF 4.1	Lockport to Shaw 115kV Transmsision Line 102. NAT report indicated: Remove all limitations to achieve line conductor ratings as the limit. Terminal allowance included.	1.00	Sum		$ 500,000	$ 500,000	$ 500,000	The limiting equipment is not known - scope undefined.
SUF 4.2	Engineering, T&C, PM, Indirects for SUF 4.1 (15%)					$ -	$ 75,000	
SUF 5	Gardenville Circuit Breaker Replacement							
SUF 5.1	Circuit Breaker Foundation	12.0	Ea		$ 75,000	$ 75,000	$ 900,000	Supply & Install
SUF 5.2	Below Grade Conduit & Grounding	1.0	Sum		$ 1,200,000	$ 1,200,000	$ 1,200,000	Supply & Install
SUF 5.3	Circuit breaker - 230kV	12.0	Ea	$ 250,000	$ 75,000	$ 325,000	$ 3,900,000	

COST ESTIMATE

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
SUF 5.4	Switches - 230kV	24.0	Ea	$ 20,000	$ 15,000	$ 35,000	$ 840,000	
SUF 5.5	Control Cables	1.0	Sum		$ 1,200,000	$ 1,200,000	$ 1,200,000	Supply & Install
SUF 5.6	Misc Above Ground Works	1.00	Sum		$ 900,000	$ 900,000	$ 900,000	Supply & Install
SUF 5.7	Engineering, T&C, PM, Indirects for SUF 5 (15%)						$ 1,341,000	Assumed 15% to cover all misc costs
SUF 6	SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)						$ 3,750,000	Contingency for possible additional SUF upgrades
TOTAL - SYSTEM UPGRADE FACILITIES:							**$ 23,258,025**	

ENVIRONMENTAL LICENSING AND PERMITTING

PROJECT TITLE WNY PROJECT EVALUATION- ENVIRONMENTAL LICENSING & PERMITTING COST ELEMENTS						ENVIRONMENTAL LICENSING & PERMITTING COST ESTIMATE RANGE FOR PROPOSED WNY TRANSMISSION PROJECT - T009	
FEDERAL						Proposal 4	
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans	Min.	Max.
USACE	Waters of the US under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act (including regulated wetland areas)	Nationwide Permits (NWP) or Individual Permit (IP)	Any work within the boundaries of regulated wetlands (with the exception of isolated wetlands) or waterways to the spring high tide or ordinary high water mark	If project qualifies for a NWP (<0.5 acre disturbance and within NWP project type parameters), a pre-construction notification (PCN) is typically required. NWPs have a 45 day review period starting from when project logged in system (up to 6wk backlog delay in logging projects) If an IP is triggered, USACE will require Alternative Analysis and Public Notice/Hearing. IPs could also trigger restrictive environmental work windows. IPs have a 120 day review period starting from when permit is "deemed complete"	Wetland Delineation; Wetland Function & Value Assessment; Stream Delineation; Restoration Plan	$52,240	$137,075
USFWS	Endangered Species Act Section 7 (ESA) Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act	Consultation (Formal or Informal); Special Use Permit	Any work that may have an affect on listed species or their habitat; or projects within National Wildlife Refuges	USACE coordinates consultation with USFWS for ESA listed species during their permit review. Also includes the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act compliance. Season restrictions on construction could be imposed.	Rare, Threatened & Endangered Species Search; Preparation of Reports and Conservation Plans	$77,600	$193,600
FAA	Airports / Airspace	Federal Aviation Administration (FAA) Notification	New or Replacement Structures near Airports	Depending on construction locations, this permit may only be needed for OP work.	Obstruction Analysis, Mitigation Plan (assumes Engineering Cost)	$3,000	$9,000
STATE							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
NYS Public Service Commission / Department of Public Service (NYSDPS)	Article VII	Article VII: Certificate of Environmental Compatibility and Public Need and Environmental Management & Construction Plan (EM&CP)	Article 7: Major electric transmission facilities with design capacity of 100kV or more extending for at least 10 miles or 125kV and over extending a distance of 1 mile or more (some exclusions for underground transmission applies)	Article 7 will incorporate all of the required State and Local approvals (costed separately), as well as Engineering and Environmental Studies and Public Outreach. Intervenor Fund payment expected to be $350,000. An Environmental Management & Construction Plan (EM&CP) must be prepared and approved by the PSC. (see 16 NYCRR Parts 85 through 88)	Includes Reports and Plans required for State and Federal Agency Permits, as well as EM&CP, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan, Mitigation Plans	$850,000	$3,350,000

ENVIRONMENTAL LICENSING AND PERMITTING

NYSDEC	Article 15 Stream Disturbance; Article 24 Wetlands, Open Waters, Wetlands Buffers (100' for Freshwater Wetland)	Individual Permit (IP) (unless developer has General Permit (GP))	Any work within the boundaries of regulated waterways or wetlands, and wetland adjacent areas	Any disturbance within wetlands and/or below mean high tide will require an IP. Areas of temporary disturbance will likely require restoration, including a monitoring and maintenance period. Permanent disturbance will require offsite mitigation up to 3:1 area ratio; also includes a monitoring and maintenance period. GP may only be applicable if project ground disturbance is located outside of wetlands areas (above MHW).	Wetland Delineation; Wetland Restoration/Mitigation Plan	$31,160	$94,550
NYSDEC	Stormwater (If >1 Acre Soil Disturbance)	SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 & SWPPP	Project areas of soil disturbance	If project involves 1 acre or more soil disturbance, then the GP is required. If located within a Regulated MS4 Municipality, additional coordination may be needed. Weekly inspections by a Qualified Inspector during construction will be required.	SWPPP (assumes Engineering Cost includes Sediment & Erosion Control Plan, Hydraulic & Hydrology Studies, Stormwater Management Design)	$11,200	$38,000
NYSDOS	State Coastal Management Program Mapped Coastal Area Boundary	Coastal Consistency Concurrence	Projects within the NYSDOS designated Coastal Zone; and consistency with Local Waterfront Revitalization Plans (LWRPs); e.g., Town of Grand Island LWRP	Online mapping available to check if within coastal zone, a significant coastal fish & wildlife habitat (SCFWH), a local waterfront revitalization program area (LWRP), or a comprehensive management program areas (CMP)		$3,400	$15,000
NYSHPO	National Historic Preservation Act (NHPA) Section 106: State and Federal Historic Places; State Mapped Archeologically Sensitive Areas	Cultural Resource Information System (CRIS) Determination	Local, State, or Federal eligible or designated historic places and/or areas of archeological sensitivity (in off-road areas and areas that have not been previously disturbed)	NYSDEC EAF Online Mapper identifies State or National Register of Historic Places and archeological sensitive areas within or adjacent to the project site. Formally enter project information and supporting documents into SHPO's online CRIS program. Staff will review and email a determination of impacts letter	Phase 1A & 1B Archaeological Studies (not included in costing)	$33,120	$108,760
NYS NHP	Threatened and Endangered Species	Consultation	Activities that may affect T&E species or their habitat.		See USFWS	$1,200	$6,400
NYSDOT/NYS Thruway Authority/FHWA	State Roadways	Highway Work Permit/Utility Permit, Vegetation Management Permit; Easement	Any work within or crossing State highway ROW	May require restoration landscaping coordination. Typically requires compliance with NEPA including SHPO and USFWS effects determination	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$17,000	$200,000
NYS Canal Corporation	Erie Canal - jurisdiction varies along edge	Canal Occupancy & Work Permit (TA-W99072)	Any work involving the Erie Canal	Must coordinate with Division Permit Engineer about particular section of canal being affected. Commercial permit fee = $25 plus $2,000,000 additional General Aggregate Liability Insurance	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$3,800	$3,800

ENVIRONMENTAL LICENSING AND PERMITTING

NYS Dept. of Agriculture and Markets	All agricultural lands (including Agricultural Districts)	Part of Article 7 & Article 10 Review process	Any work impacting agricultural land	Must minimize impacts and restore damage to agricultural land, and coordinate with County Soil & Water Conservation District; Vineyards are a major concern in WNYS. Pre-application conference with PSC, DEC and Ag& Markets recommended. Must develop EM&CP in conformance with Art. 7/10 Certificate Conditions. Agricultural Monitor must oversee construction & restoration; requisite 2-yrs post restoration monitoring.	Crop/Pasturing Mitigation Plan (not included in costing)	$11,000	$24,000
REGIONAL							
Railroads	Railroad crossings	Consultation-permits may be required; Easement	Access / new structures on RR property		Easement area survey (not included in costs)	$11,000	$200,000
LOCAL/MUNICIPAL							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
County Dept. of Public Works	County Roadways	Lane Closure Permit, Highway Work or Access Permit	Work within county roadways and right-of-ways			$6,000	$40,000
Town, City or Village	Municipal Stormwater (MS4) Review	Approval of SWPPP or EM&CP	Project areas of soil disturbance		See NYSDEC SPDES	$6,000	$35,000
Town, City or Village	Variable	Building Permits	New Structures	Individual Towns/Villages must be consulted on a project specific basis to determine notification and/or permitting procedures. Permit application names vary (e.g. road obstruction permit)		$18,000	$92,000
Town, City or Village	Municipal Roadways	Highway Work Permit; Road Opening Permit	Work within municipal roadways and right-of-ways			$6,000	$35,000
Town, City or Village	Wetlands	Wetland Permit / Conservation Approvals	Mapped wetlands and wetland adjacent areas (buffer width variable)		See USACE / NYSDEC Art. 24	$6,000	$52,000

		Minimum	Maximum
ENVIRONMENTAL LICENSING & PERMITTING COST (EXCLUDING MITIGATION)	**PROJECT T009 TOTAL**	**$1,147,720**	**$4,634,185**
Excluded cost: Mitigation or restoration for impact to regulated wetlands; agricultural land and tree clearing	**Expected Value**	**$4,336,428.75**	

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T009 - North American Transmission

ENVIRONMENTAL MITIGATION ESTIMATE

Revision: 4

	Offsite Wetland Mitigation*		Farmland**	
	Min.	Max.	Min.	Max.
Area	117 acres	117 acres	53 acres	106 acres
Cost/Acre	$50,000	$100,000	$503	$503
Ratio	1:1	3:1	1:1	1:1
Total	$5,850,000	$35,100,000	$26,659	$53,318

T009 MITIGATION TOTAL	**Minimum**	**Maximum**	**Expected Value**
	$5,876,659	**$35,153,318**	**$ 20,514,989**

*Offsite wetland mitigation area assumes Highway Alternative Route; clearing of NWI Forested/Shrub Wetland Approx. 2.37 miles (12517 LF) by 100' ROW width and 3.24 miles (17107 LF) by 225' ROW width; Max. cost per acre assumes additional mitigation required for permanent impacts of proposed structures in non-forested wetlands; cost per acre Min. and Max. reduced due to area total over 50 acres; includes design and installation costs only; does not include land acquisition or long term monitoring.

**Farmland mitigation based on corn bushel yield at 129 BU/Acre and $3.9/BU (production numbers from 2016 USDA NYS Agriculture Overview), area assumes 17.58 miles (92822 LF) Adjacent to Agriculture Properties by 25' Wide (Min.) or 50' Wide (Max.); does not include land acquisition

REAL ESTATE ESTIMATE (NEW ROW)

Revision: 4

COUNTY: NIAGARA & ERIE

DEVELOPER: NORTH AMERICAN (T009)

SEGMENT: NIAGARA - DYSINGER - STOLLE SEGMENT

	Address	Area (Acres)	Total Cost
A	**NIAGARA COUNTY**		
	Sub Total (A)	2.38	$ 51,560.00

B	**ERIE COUNTY**		
	Sub Total (A)	0.68	$ 4,376.00
	Total (A + B)	3.06	$ 55,936.00

REAL ESTATE ESTIMATE (NEW ROW)

Revision: 4

COUNTY: ERIE

DEVELOPER: NORTH AMERICAN (T009)

SEGMENT: STOLLE TO GARDENVILLE SEGMENT

		Area (Acres)	Total Cost
	Total	167.00	$ 6,838,497.00

SUBSTATION ENGINEERING COMPANY

Revision: 4

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

COUNTY: NIAGARA & ERIE
DEVELOPER: NORTH AMERICAN (T009)
SEGMENT: NIAGARA-DYSINGER - STOLLE - GARDENVILLE SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
T009	North American Transmission (Proposal 4)	Dysinger SS to Stolle Rd SS - 2x19.98 miles	Niagara	10.33	$ 4,234,000
			Erie	534.58	
		Stolle Rd SS to Gardenville SS - 12.84 miles	Erie	27.55	
		Niagara to Dysinger - 27.16	Niagara	408.32	

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T009 - North American Transmission

REAL ESTATE ESTIMATE (HOUSES)

Revision: 4

COUNTY: ERIE

DEVELOPER: NORTH AMERICAN (T009)

SEGMENT: STOLLE ROAD TO GARDENVILLE

		Total Valuation of Property with 3% Escalation/year (as of 2017)
	Total Valuation Cost	$ 628,349.85

REAL ESTATE ESTIMATE (SUBSTATIONS)

Revision: 4

COUNTY: NIAGARA
DEVELOPER: NORTH AMERICAN (T009)
SEGMENT: DYSINGER SWITCHYARD

		Total Cost
	Total Cost of Proposed Substation Site	$152,750.00

REAL ESTATE ESTIMATE (SUBSTATIONS)

Revision: 4

COUNTY: ERIE
DEVELOPER: NORTH AMERICAN (T009)
SEGMENT: STOLLE ROAD SUBSTATION

		Total Cost
	Total Cost of Proposed Substation Site	$19,440.00

REAL ESTATE ESTIMATE (SUBSTATIONS)

Revision: 4

COUNTY: ERIE
DEVELOPER: NORTH AMERICAN (T009)
SEGMENT: GARDENVILLE SUBSTATION (OPTION 1)

		Total Cost
	Total Cost of Proposed Substation Site	$ 309,483.90

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

a) Cost Estimate is based on 2017 rates.
b)We have assumed a construction schedule of 24 months, with no breaks in the schedule. Six months have been added to the construction schedule PM time for start up and close out works and float.
c) Stringing rates allow for protection over crossings (such as rider poles).
d) We have assumed a typical work week (6 x 10 hour days).
e) We have assumed the Access Road included in Developer Estimate will be Type 1 Gravel Type.
f) Costs will vary for handling and disposal of contaminated spoils, depending on type of contaminants and availability / location of the appropriate tipping facility. Since there is not enough information to provide a quantified estimate for this item, allowance is included in the contingency monies.
g) Costs have been developed based on historical data from Projects of a similar nature (AACE Class 5 and 4 Estimating Practices). We have not engaged any subcontractors or material vendors for formal quotes.
h) Estimated quantities have been used for items in Section 1 of the Estimate (CLEARING & ACCESS FOR T-LINE CONSTRUCTION). These items were not quantified in the Developers Estimate, however we believe that they are necessary for the works.
i) Foundation rates include supply and installation of materials. Driller Pier rates include supply and testing of concrete, rebar cage and the use of temp or permanent casing.
j) A Contractor Mark-Up (OH&P) of 15% has been included in the Total section.
k) Dysinger to Stolle Road Circuit 2 ROW length (19.85 miles) not included in project route total since parallels already accounted for length of Dysinger to Stolle Road (19.97 miles).
l) USFWS T&E Assumes that ¼ of the Total Line in Right of Way will require field survey for T&E (Approx. 14.96 miles).
m) NEPA-Assumes no NEPA because Art VII.
o) SHPO-Assumes consultation and Phase 1A/1B archeological studies with field survey for 50% of Total Line in Right of Way (Approx. 29.92 miles).
p) NYSDOT/FHWA-Assumes any required NEPA coordination/requirements are covered under Article VII or SEQRA review. Max costs includes additional agency coordination (greater than general fixed costing max.) for new ROW Parallel to Highway.
q) Railroad - Max costs includes additional agency coordination (greater than general fixed costing max.) for new ROW Parallel to Railroad.
r) Assumes no coordination with National Parks Service or OPRHP/State Parks
s) USACE wetland delineation total based on Line Miles in Wetlands - NWI wetland lengths of 10.31 miles (Min.) and 10.41 miles (Max.)
t) DEC wetland delineation total based on Line Miles in Wetlands - DEC wetland lengths of 4.99 miles (Min.) and 5.54 miles (Max.)

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

u) Offsite wetland mitigation area costs based on a total of approximately 5.6 miles of impacts anticipated by clearing of NWI Forested/Shrub Wetland (calculated by GEI based on NWI mapper legend categories) using the Stolle Road to Gardenville Highway alternative (0.65 miles). Assumes clearing an additional 125 feet within the 3.24 mile Dysinger to Stolle Road Right of Way (for a total of 225 feet width) and 100 feet of additional clearing in the 1.72 mile Dysinger to Niagara segment. Minimum costs at $50,000/acre, maximum costs at $100,000/acre for additional permanent impacts of proposed structures in non-forested wetlands. Costing includes design and installation costs only and does not include land acquisition or long term monitoring. Minimum and maximum costs for this proposal assumes a reduced mitigation cost/acre due to size of mitigation.
v) Agricultural mitigation assumes timber matting impacts and pad impacts on a total of 17.6 miles of adjacent agriculture land (22.86 miles for the Stolle to Gardenville Highway route and Dysinger to Niagara minus 5.28 of duplicate miles for the second circuit from Dysinger to Stolle Rd) requires crop damage payments based on USDA 2016 NYS Agriculture Overview corn yield and bushel price/acre. Minimum assumes 25-foot-wide impact, Maximum assumes 50-foot-wide impact.
w) No tree survey or replanting required outside regulated wetlands areas.
x) Article VII Intervenor Fund payment expected to be $350,000.
y) Mitigation costs for landscaping only (no paving, sidewalks, sound walls, etc.).
z) Did not calculate for any real estate acquisition cost of public or private lands or fees associated for property rights for railroad crossings, town road crossings etc.
aa) Expected value of environmental licensing and permitting cost is estimated to be 50% higher than the mean of the range based upon the addition of the new Gardenville to Stolle 345kV line, a second Dysinger to Stolle line and a new Niagara to Dysinger 345kV line.
ab) SUF pricing includes 35% to cover Contractor markup (15%) and contingency (20%)
ac) SUF reconductor rate is based on Niagara-Packard (National Grid) reconductor estimate, pro-rated to a rate / mile. Note that this is based on conductor, shieldwire and hardware pricing only and does not include structure or foundation works.
ad) System Upgrade Facilities Contingency is allowance for potential additional system upgrades including overdutied breakers, protection changes, unidentified thermal issues, etc that may be identified as detailed studies are completed.

INDEPENDENT ESTIMATES

ATTACHMENT B5

T011 – NATIONAL GRID

SUBSTATION ENGINEERING COMPANY
8/11/2017

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T011 - National Grid Moderate Power Transfer Solution

Revision: 4

SUMMARY OF COST ESTIMATE

Segment	Description	Total Amount
	CLEARING & ACCESS WORKS FOR T-LINE CONSTRUCTION	$ 28,554,443
1	WG D2 -IDENTIFIED LINE WORK 180, 181, 182 (MINIMAL SOLUTION)	$ 45,533,358
	WG E NEW BUS TIE BREAKER AT PACKARD STATION TO BE PLACED IN SERIES WITH EXISTING BREAKER R342	$ 880,000
	WG F REPLACE THERMALLY LIMITING EQUIPMENT AT PACKARD STATION FOR LINE 181	$ 200,000
2	WG-H IDENTIFIED LINE WORK 130, 133	$ 7,261,318
	WG-I REPLACE THERMALLY LIMITING EQUIPMENT AT HUNTLEY STATION	$ 235,000
3	WG-J IDENTIFIED LINE WORK 191	$ 3,670,736
4	WG-M IDENTIFIED LINE WORK 103, 104	$ 486,376
	WG-N REPLACE THERMALLY LIMITING EQUIPMENT AT LOCKPORT STATION FOR LINES 101,102	$ 500,000
5	WG-O - NYSEG/NYPA/N GRID - ELIMINATE DOUBLE CIRCUIT CONTINGENCY FOR LINE 61/64	$ 1,570,740
	WG-P2 - IDENTIFIED 181 LINE WORK (URBAN SWITCH TO ERIE, NYSEG)	$ 3,564,852
	WG-Q - REPLACE THERMALLY LIMITING EQUIPMENT AT ERIE STN FOR LINE 181	$ 1,250,000
	WG-R - REPLACE THERMALLY LIMITING EQUIPMENT LINE 54 (NYSEG 921)	$ 1,250,000
	WG-U - REPLACE THERMALLY LIMITING EQUIPMENT ROBINSON STN LINE 64	$ 1,700,000
	WG-V - REPLACE THERMALLY LIMITING EQUIPMENT NIAGARA STN LINE 102	$ 500,000
	MOBILIZATION, ACCESS, CIVILS, PROJECT MANAGEMENT, OVERHEADS, MISC:	$ 27,447,225
	CONTRACTOR MARK UP (OH&P) 15%	$ 18,690,607
	SUBTOTAL (A):	$ 143,294,655
	CONTINGENCY ON ENTIRE PROJECT (20%)	$ 28,658,931
	TOTAL (A):	**$ 171,953,585**

SYSTEM UPGRADE FACILITIES	$ 3,750,000
CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 1,312,500
SUBTOTAL (B):	**$ 5,062,500**

TOTAL PROJECT COST (A+B):	**$ 177,016,085**

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
Clearing & Access Works for T-Line Construction								
	Access, Matting, ROW Maintenance					$ -	$ -	
1.1	Gravel Access Road Improvement	17,000.00	LF		$ 7	$ 7	**$ 119,000**	Assumes Type 1 Gravel Road
1.2	Temporary Matting	250,000.00	LF		$ 70	$ 70	**$ 17,500,000**	
1.3	Work Pads	108,500.00	SF		$ 4	$ 4	**$ 381,920**	
1.4	Restoration for Work Pad areas	10,850.00	SF		$ 0.2	$ 0.2	**$ 1,628**	
1.5	New Access Roads	21,000.00	LF		$ 250	$ 250	**$ 5,250,000**	
1.6	Air Bridge	6.00	EA		$ 14,445	$ 14,445	**$ 86,670**	
1.7	Stabilized Construction Entrance	240.00	EA		$ 4,580	$ 4,580	**$ 1,099,200**	
1.8	Maintenance and Protection of Traffic on Public Roads	1.00	LS		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	
1.9	Temporary Access Bridges	15.00	EA		$ 20,035	$ 20,035	**$ 300,525**	
1.10	Concrete Washout Station	30.00	EA		$ 1,850	$ 1,850	**$ 55,500**	
1.11	Rock Coring Allowance for Foundations (say 5ft / caisson for 60 caissons)	300.00	FT		$ 4,200	$ 4,200	**$ 1,260,000**	
1.12	Snow Removal & Maintenance	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
TOTAL CLEARING & ACCESS:							**$ 28,554,443**	
SEGMENT 1	**D2, E & F**							
WG D2 -Identified Line Work 180, 181, 182 (Minimal Solution)								
2	**Removal of Existing 115kV Line**							
	Wire Removal Work							
	Line 181/105 – Remove approximately 26.6 circuit miles, 115kV/69kV (Packard Substation to Ellicott Junction):							
2.1	Remove 13.3 circuit miles (typically 350 MCM 19 strand Copper) - Line 105	13.30	Mile		$ 15,000	$ 15,000	**$ 199,500**	
2.2	Remove13.3 circuit miles (typically 350 MCM 19 strand Copper) - Line 181	13.30	Mile		$ 15,000	$ 15,000	**$ 199,500**	
2.3	Remove 26.6 miles of existing 3/8” x 7 steel EHS shieldwire	26.60	Mile		$ 12,000	$ 12,000	**$ 319,200**	
2.4	Conductor attachment assembly at Packard Substation	1.00	Lot		$ 20,000	$ 20,000	**$ 20,000**	
	Line 180/181 – Remove approximately 7.2 circuit miles, 115kV (Ellicott Junction to Youngman Substation):					$ -		
2.5	Remove 7.2 circuit miles (typically 400 MCM 19 strand Copper) - Line 180	7.20	Mile		$ 15,000	$ 15,000	**$ 108,000**	
2.6	Remove 7.2 circuit miles (typically 350 MCM 19 strand Copper) - Line 181	7.20	Mile		$ 15,000	$ 15,000	**$ 108,000**	
2.7	Remove 14.4 miles of existing 3/8” x 7 steel EHS shieldwire	14.40	Mile		$ 12,000	$ 12,000	**$ 172,800**	
2.8	Conductor attachment assembly at Urban Switch	1.00	Lot		$ 20,000	$ 20,000	**$ 20,000**	
	Line 180/182 – Remove approximately 12.4 circuit miles, 115kV (Structure 280 at Packard to Grand Island Substation):							
2.9	Remove 12.4 circuit miles (typically 400 MCM 19 strand Copper) - Line 182	12.40	Mile		$ 15,000	$ 15,000	**$ 186,000**	
2.10	Remove 12.4 miles of existing 3/8” x 7 steel EHS shieldwire	12.40	Mile		$ 12,000	$ 12,000	**$ 148,800**	
	Line 182/92 – Remove approximately 7.2 circuit miles, 115kV/69kV (Ellicott Junction to Youngman Substation):							
2.11	Remove 7.2 circuit miles (typically 400 MCM 19 strand Copper) - Line 182	7.20	Mile		$ 15,000	$ 15,000	**$ 108,000**	
2.12	Remove 7.2 circuit miles (typically 400 MCM 19 strand Copper) - Line 92	7.20	Mile		$ 15,000	$ 15,000	**$ 108,000**	
2.13	Remove 14.4 miles of existing 3/8” x 7 steel EHS shieldwire	14.40	Mile		$ 12,000	$ 12,000	**$ 172,800**	
	Structure Removal Work							
	Line 181/105 – Remove 181 structures (Packard Substation to Ellicott Junction)							
	Remove 37 deadend structures:							
2.14	Remove 34 double circuit lattice deadend towers	34.00	Structure		$ 9,000	$ 9,000	**$ 306,000**	
2.15	Remove 3 single pole wood deadend structures	3.00	Structure		$ 5,000	$ 5,000	**$ 15,000**	
	144 suspension structures:							
2.16	Remove 11 double circuit steel suspension towers	11.00	Structure		$ 7,500	$ 7,500	**$ 82,500**	
2.17	Remove 10 double circuit suspension flex towers	10.00	Structure		$ 8,000	$ 8,000	**$ 80,000**	
2.18	Remove 6 H-Frame wood suspension structures	6.00	Structure		$ 6,000	$ 6,000	**$ 36,000**	
2.19	Remove 117 2 pole-wood suspension structures	117.00	Structure		$ 6,000	$ 6,000	**$ 702,000**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
	Line 180/181 – Remove 39 Structures (Ellicott Junction to Youngman Substation):							
	Remove 18 deadend structures:							
2.20	Remove 14 double circuit lattice deadend towers	14.00	Structure		$ 9,000	$ 9,000	**$ 126,000**	
2.21	Remove 4 double circuit single pole steel deadend structures	4.00	Structure		$ 8,000	$ 8,000	**$ 32,000**	
	Remove 21 suspension structures:							
2.22	Remove 19 double circuit flex towers suspension structures	19.00	Structure		$ 7,000	$ 7,000	**$ 133,000**	
2.23	Remove 1 H-frame suspension structure	1.00	Structure		$ 6,000	$ 6,000	**$ 6,000**	
2.24	Remove 1 double circuit single pole steel suspension structure	1.00	Structure		$ 7,000	$ 7,000	**$ 7,000**	
	Line 180/182 – Remove 65 structures (Structure 280 at Packard to Grand Island Substation):							
	Remove 53 structures – Ellicott Junction to Pack Club Lane Substation							
	Remove 20 deadend structures							
2.25	Remove 8 double circuit lattice deadend towers	8.00	Structure		$ 9,000	$ 9,000	**$ 72,000**	
2.26	Remove 1 single pole wood deadend structure	1.00	Structure		$ 5,000	$ 5,000	**$ 5,000**	
2.27	Remove 5 double circuit steel pole deadend structures	5.00	Structure		$ 9,000	$ 9,000	**$ 45,000**	
2.28	Remove 1 H-frame wood deadend structure	1.00	Structure		$ 6,000	$ 6,000	**$ 6,000**	
	Remove 38 suspension structures:							
2.29	Remove 29 double circuit suspension flex towers	29.00	Structure		$ 7,000	$ 7,000	**$ 203,000**	
2.30	Remove 1 double circuit steel suspension towers	1.00	Structure		$ 6,000	$ 6,000	**$ 6,000**	
2.31	Remove 8 2-pole wood suspension structures	8.00	Structure		$ 8,000	$ 8,000	**$ 64,000**	
	Line 182 – Remove 12 structures (Near Urban Switch):							
	Remove 4 deadend structures:							
2.32	Remove 2 double circuit lattice deadend towers	2.00	Structure		$ 16,000	$ 16,000	**$ 32,000**	
2.33	Remove 2 3-pole wood deadend structures	2.00	Structure		$ 8,000	$ 8,000	**$ 16,000**	
	Remove 8 suspension structures:							
2.34	Remove 3 double circuit steel suspension towers	3.00	Structure		$ 8,000	$ 8,000	**$ 24,000**	
2.35	Remove 3 double circuit suspension flex towers	3.00	Structure		$ 7,000	$ 7,000	**$ 21,000**	
2.36	Remove 2 H-frame suspension structures	2.00	Structure		$ 6,000	$ 6,000	**$ 12,000**	
	Line 182/92 – Remove 39 structures (Ellicott Junction to Youngman Substation):							
	Remove 18 deadend structures:							
2.37	Remove 14 double circuit lattice deadend towers	14.00	Structure		$ 9,000	$ 9,000	**$ 126,000**	
2.38	Remove 4 double circuit single pole steel deadend structures	4.00	Structure		$ 8,000	$ 8,000	**$ 32,000**	
	Remove 21 suspension structures:							
2.39	Remove 19 double circuit flex towers suspension structures	19.00	Structure		$ 7,000	$ 7,000	**$ 133,000**	
2.40	Remove 1 H-frame suspension structure	1.00	Structure		$ 6,000	$ 6,000	**$ 6,000**	
2.41	Remove 1 double circuit single pole steel suspension structure	1.00	Structure		$ 8,000	$ 8,000	**$ 8,000**	
2.42	Remove (2) Crossing Rail Road (3) Crossing Niagara River 300 ft. (3) offshore after Niagara River Crossing	8.00	Structure		$ 10,000	$ 10,000	**$ 80,000**	
	Proposed Rebuild of 115kV Lines							
2.43	Install Davit Arm Steel 1P suspension DCSS 115kV Structure Type P	63.00	Structure	$ 9,000.00	$ 8,100	$ 17,100	**$ 1,077,300**	
2.44	Install DE DCSS 115kV Structure Type Q	32.00	Structure	$ 29,700.00	$ 26,730	$ 56,430	**$ 1,805,760**	
2.45	Install Davit Arm Wood Restrained Suspension 115kV Structure Type R	165.00	Structure	$ 3,500.00	$ 26,000	$ 29,500	**$ 4,867,500**	
2.46	Install Davit Arm Steel DE 115kV Structure Type S	57.00	Structure	$ 18,000.00	$ 16,200	$ 34,200	**$ 1,949,400**	
2.47	Install 6' Dia x 23' deep reinforced concrete foundation caisson (cylindrical) Structure Type S (35 Nos)	1,100.00	CY		$ 1,500	$ 1,500	**$ 1,650,000**	
2.48	Direct Embedment foundation 36" Dia x 14' Deep Structure Type R (165 Nos)	165.00	Structure		$ 22,000	$ 22,000	**$ 3,630,000**	
2.49	Direct Embedment foundation 36" Dia x 20' Deep Structure Type P (63 Nos)	63.00	Structure		$ 25,000	$ 25,000	**$ 1,575,000**	
2.50	Install 6' Dia x 31' deep reinforced concrete foundation caisson (cylindrical) Structure Type Q (24 Nos)	980.00	CY		$ 1,500	$ 1,500	**$ 1,470,000**	
2.51	Install 8' Dia x 38' deep reinforced concrete foundation caisson (cylindrical) Structure Type S/Q Angle DE (30 Nos)	2,100.00	CY		$ 1,500	$ 1,500	**$ 3,150,000**	
	Install Wire Work							
	Line 181 – Install approximately 13.3 circuit miles, 115kV (Packard Substation to Ellicott Junction)							
2.52	Install 13.3 circuit miles of 1590 kcmil ACSR "FALCON" conductor	13.30	Mile	$ 55,440.00	$ 79,200	$ 134,640	**$ 1,790,712**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
2.53	Install 13.3 miles of 3/8" x 7 strand EHS steel shieldwire	13.30	Mile	$ 7,920.00	$ 15,840	$ 23,760	**$ 316,008**	
2.54	Conductor attachment assembly at Packard Substation	1.00	Lot		$ 20,000	$ 20,000	**$ 20,000**	
	Line 182 – Install approximately 3.6 circuit miles, 115kV (Ellicott Junction to Youngman Substation)							
	Install 3.6 circuit miles of 1590 kcmil ACSR "FALCON" conductor:							
2.55	Install 3.6 circuit miles of 1590 kcmil ACSR "FALCON" conductor-Line 182	3.60	Mile	$ 55,440.00	$ 79,200	$ 134,640	**$ 484,704**	
2.56	Install 3.6 miles of 3/8" x 7 strand EHS steel shieldwire	3.60	Mile	$ 7,920.00	$ 15,840	$ 23,760	**$ 85,536**	
2.57	Conductor attachment assembly at Park Club Lane Substation	1.00	Lot		$ 30,000	$ 30,000	**$ 30,000**	
	Line 182/180 – Install approximately 6.2 circuit miles, 115kV (Structure 280 at Packard to Grand Island Substation)							
2.58	Install 12.4 circuit miles of 1590 kcmil ACSR "FALCON" conductor							
2.59	Install 6.2 circuit miles of 1590 kcmil ACSR "FALCON" conductor-Line 182	6.20	Mile	$ 55,440.00	$ 79,200	$ 134,640	**$ 834,768**	
2.60	Install 6.2 circuit miles of 1590 kcmil ACSR "FALCON" conductor-Line 180	6.20	Mile	$ 55,440.00	$ 79,200	$ 134,640	**$ 834,768**	
2.61	Install 12.4 miles of 3/8" x 7 strand EHS steel shieldwire	12.40	Mile	$ 7,920.00	$ 15,840	$ 23,760	**$ 294,624**	
2.62	Conductor attachment assembly at Park Club Lane Substation	1.00	Lot		$ 30,000	$ 30,000	**$ 30,000**	
	Line 180/181 – Install approximately 3.6 circuit miles, 115kV (Ellicott Junction to Youngman Substation)							
	Install 7.2 circuit miles of 1590 kcmil ACSR "FALCON" conductor:							
2.63	Install 3.6 circuit miles of 1590 kcmil ACSR "FALCON" conductor- Line 181	3.20	Mile	$ 55,440.00	$ 79,200	$ 134,640	**$ 430,848**	
2.64	Install 3.6 circuit miles of 1590 kcmil ACSR "FALCON" conductor- Line 182	3.20	Mile	$ 55,440.00	$ 79,200	$ 134,640	**$ 430,848**	
2.65	Install 7.2 miles of 3/8" x 7 strand EHS steel shieldwire	7.20	Mile	$ 7,920.00	$ 15,840	$ 23,760	**$ 171,072**	
2.66	Conductor attachment assembly at American Standard Tap	1.00	Lot		$ 10,000	$ 10,000	**$ 10,000**	Supply & Install
2.67	OGW Overhead Ground Wire 5/8" Dia (3/8" x 7 Strand EHS Shieldwire)	36.50	Mile	$ 7,920.00	$ 15,840	$ 23,760	**$ 867,240**	
2.68	Install 11 temporarily DE structures to support Line 180 or Line 182.	11.00	Structure		$ 25,000	$ 25,000	**$ 275,000**	Supply & Install
	Insulator & Hardware Work							
2.69	Tangent - Porcelain String (10 Discs Assembly)	66.00	Set	$ 900.00	$ 720	$ 1,620	**$ 106,920**	
2.70	Angle & Deadend Porcelain String (10 Disc Assembly)	120.00	Set	$ 1,300.00	$ 1,040	$ 2,340	**$ 280,800**	
2.71	Jumper Post Porcelain String (Assembly)	66.00	Set	$ 500.00	$ 400	$ 900	**$ 59,400**	
2.72	Allowances for Group M and W with no details	1.00	Sum		$ 100,000	$ 100,000	**$ 100,000**	Supply & Install
	River Crossing 1.2 Miles extra allowance							
2.73	Install River Crossing Structures (2 Structures)	100,000.00	Lbs.	$ 1.80	$ 2	$ 4	**$ 354,000**	
2.74	Install off shore structures (3 Structures)	60,000.00	Lbs.	$ 1.80	$ 2	$ 4	**$ 212,400**	
2.75	Install on land structures (1 Structure)	50,000.00	Lbs.	$ 1.80	$ 2	$ 4	**$ 177,000**	
2.76	Rental of 2 barges with 150 Ton Cranes each for 180 days	12.00	Months		$ 110,000	$ 110,000	**$ 1,320,000**	Supply & Install
2.77	Safety Plan and Coast Guard	1.00	Sum		$ 100,000	$ 100,000	**$ 100,000**	Supply & Install
2.78	Mobilization/Demobilization of Barges and equipment operators	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
2.79	8' Dia x 70 Deep Reinforced Concrete foundation caisson (cylindrical) -river crossing	150.00	CY		$ 1,500	$ 1,500	**$ 225,000**	Supply & Install
2.80	Install reinforced concrete slabs to connect all precast piles	513.00	CY		$ 850	$ 850	**$ 436,050**	Supply & Install
2.81	Precast Concrete Slab	1.00	Sum		$ 700,000	$ 700,000	**$ 700,000**	Supply & Install
2.82	Precast Concrete piers per Str. (4' Dia x 100' depth) 66CY per each pile, 6 per structure	2.00	Structure		$ 475,200	$ 475,200	**$ 950,400**	Supply & Install
2.83	Precast Concrete piers per Str. (2' Dia x 80' depth) 13CY per each pile, 4 per structure	3.00	Structure		$ 62,400	$ 62,400	**$ 187,200**	Supply & Install
2.84	Pile Driving Equipment B-21 Bumminghammer Diesel Hammer	360.00	Day		$ 3,000	$ 3,000	**$ 1,080,000**	Supply & Install
2.85	Boring under water	10.00	Bores		$ 500,000	$ 500,000	**$ 5,000,000**	Supply & Install
2.86	Drilling/casing 1840 LF	1,840.00	VLF	$ 200.00		$ 200	**$ 368,000**	
2.87	Rock drilling 240 LF	240.00	VLF		$ 4,200	$ 4,200	**$ 1,008,000**	Supply & Install

COST ESTIMATE

Revision: 4

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
WG D2 - TOTAL SUPPLY & INSTALL:							**$ 45,533,358**	
WG E New Bus Tie Breaker at Packard Station to be placed in series with existing Breaker R342								
3	**New Bus Breaker at Packard Station**							
3.1	GCB 115kV - 3000A, 63kA	1.00	Unit		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
3.2	115LB1WV1 1 Way Loadbreak Switch Vertical (Located at Structure T and includes the pole)	1.00	Structure		$ 250,000	$ 250,000	**$ 250,000**	
3.3	Relocate 1 No. existing 115kV 3000A disconnect switch 343 to the right of tie breaker R342	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	
3.4	Install one new 115kV 123kV , 63kA 3000A SF6 bus tie breaker in series with existing 115kV Areva bus tie R342 breaker	1.00	Sum	$ 150,000.00	$ 50,000	$ 200,000	**$ 200,000**	
3.5	Install new cable and conduit between new tie breaker and control house and associated shield cables	1.00	Sum		$ 35,000	$ 35,000	**$ 35,000**	Supply & Install
3.6	Install new set of AL power conductors and AL four hole pad connectors	1.00	Sum		$ 12,000	$ 12,000	**$ 12,000**	
3.7	Install new AL bus and a 5" upper bus extension to existing breaker R2103 and associated disconnect switches	1.00	Sum		$ 18,000	$ 18,000	**$ 18,000**	
3.8	Structures for Switch and Bus Support	1.00	Sum		$ 30,000	$ 30,000	**$ 30,000**	
3.9	Relocate 115kV disconnect switch 2104 and R2103	1.00	Sum		$ 15,000	$ 15,000	**$ 15,000**	
3.10	Grounding all new electrical equipment	1.00	Sum		$ 10,000	$ 10,000	**$ 10,000**	
3.11	Reconnect, control and integration, test and commissioning	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	
3.12	Supply and Install new 115kV switch R2101	1.00	Sum		$ 100,000	$ 100,000	**$ 100,000**	
3.13	Allowance for all secondary electrical works including DC power, AC power and system protection	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	
WG E - TOTAL SUPPLY & INSTALL:							**$ 880,000**	
WG F Replace Thermally Limiting Equipment at Packard Station for Line 181								
4	**Replace existing components by suitable aluminum conductor.**							
4.1	Allowance for Thermally Limiting Equipment Upgrade	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	Supply & Install
WG F - TOTAL SUPPLY & INSTALL:							**$ 200,000**	
SEGMENT 2	**H & I**							
WG-H Identified Line Work 130, 133								
5	**Wire Removal Work**							
	Line 130/133 – Remove approximately 18.2 circuit miles, 115kV/69kV (Packard Structures 140 and -Huntley Substation):							
5.1	Remove 18.2 circuit miles (typically 350 MCM 19 strand Copper)	18.20	Mile		$ 15,000	$ 15,000	**$ 273,000**	Supply & Install
5.2	Transfer existing 3/8" x 7 steel EHS shieldwire on 6 structures	26.60	Per Structure		$ 24,000	$ 24,000	**$ 638,400**	
	Structure Removal Work							
	Line 130/133 – Remove 7 double circuit steel deadend lattice towers, 115kV/69kV (Packard Structures 140 and -Huntley Substation):							
	Remove 11 deadend structures:							
5.3	Remove 7 double circuit lattice deadend towers	7.00	Structure		$ 12,000	$ 12,000	**$ 84,000**	
5.4	Remove 4 single pole wood deadend structures	4.00	Structure		$ 6,000	$ 6,000	**$ 24,000**	
5.5	Remove 1 double circuit steel suspension flex tower	1.00	Structure		$ 14,000	$ 14,000	**$ 14,000**	
	Structure Re-inforce Work							
5.6	Install 8 concrete foundation caissons	8.00	Structure		$ 150,000	$ 150,000	**$ 1,200,000**	
5.7	Install 4 wood 3-pole deadend pole structures in kind	4.00	Structure	$ 25,000.00	$ 25,000	$ 50,000	**$ 200,000**	
5.8	Replace seven double circuit steel deadend lattice towers with double circuit steel deadend single pole structures on concrete foundations.	7.00	Structure		$ 85,000	$ 85,000	**$ 595,000**	
5.9	Replace one double circuit steel suspension flex tower with double circuit steel deadend single pole structure on concrete foundation.	1.00	Structure		$ 85,000	$ 85,000	**$ 85,000**	Supply & Install
5.10	Replace steel members on (16) deadend lattice towers	16.00	Structure		$ 10,000	$ 10,000	**$ 160,000**	
5.11	Replace hardware on (30) double circuit deadend structures	30.00	Structure		$ 4,000	$ 4,000	**$ 120,000**	
5.12	Install longitudinal guys on two flex towers	2.00	Structure		$ 25,000	$ 25,000	**$ 50,000**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
	Install (4) temporary wood single pole deadend structures at every deadend structure to be replaced	44.00	Unit		$ 15,000	$ 15,000	**$ 660,000**	
	Wire Installation							
5.13	*Line 130/133 – Reconductoring, 115kV/69kV (Packard Structures 140 and -Huntley Substation):*							
5.14	Transfer 4 double circuit miles of 1590 kcmil ACSR "FALCON" conductor	4.00	Mile	$ 28,000.00	$ 40,000	$ 68,000	**$ 272,000**	
5.15	Install 18.2 miles of 3/8" x 7 strand EHS steel shieldwire	18.20	Mile	$ 7,920.00	$ 15,840	$ 23,760	**$ 432,432**	
5.16	Miscellaneous assemblies	1.00	Lot		$ 30,000	$ 30,000	**$ 30,000**	
5.17	OPGW- 18.2 miles and accessories	18.20	Mile	$ 21,632.00	$ 29,220	$ 50,852	**$ 925,506**	Supply & Install, Splicing, Accessories etc.
	Insulator & Hardware Work							
5.18	Tangent - Porcelain String (10 Discs Assembly)	390.00	Set	$ 900.00	$ 720	$ 1,620	**$ 631,800**	
5.19	Angle & Deadend Porcelain String (10 Disc Assembly)	192.00	Set	$ 1,300.00	$ 1,040	$ 2,340	**$ 449,280**	
5.20	Jumper Post Porcelain String (Assembly)	81.00	Set	$ 500.00	$ 400	$ 900	**$ 72,900**	
5.21	Shieldwire Suspension Clamps	32.00	Set	$ 500.00	$ 400	$ 900	**$ 28,800**	
5.22	Shieldwire DE Clamps	80.00	Set	$ 800.00	$ 640	$ 1,440	**$ 115,200**	
5.23	Miscellaneous materials, dampers, grounding etc.	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
WG H - TOTAL SUPPLY & INSTALL:							**$ 7,261,318**	
WG-I Replace Thermally Limiting Equipment at Huntley Station								
6.1	Upgrade ampacity of Lines 130 & 133 at Huntley Substation	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
6.2	Remove the span between Structures 80 and 414 on the denergized Beck – Terminal Station C 105 sub-transmission line in the vicinity of Structure 167 per input from NY-TLS. A temporary wood single pole structure may be needed in the vicinity of Structure 80 to mitigate any concerns with unbalanced load at the structure. The section of the Beck – Terminal Station C 105 sub-transmission line sharing the ROW with the 130/133 D/C line will be removed as part of the 115 kV Packard –Urban 181 line proposed scope of work for the Western New York Project.	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	
6.3	Mitigation works to lower the edge of ROW magnetic fields on the Packard – Huntley 130 line between Structures 140 and 160. The scope of work consists of transposing the top and bottom conductor phases on the 130 line outside Huntley Substation and Walck Road Switch Station in the span between Structure 242 and the bus structures at Huntley Substation and between Walck Road Switch and Structure 132 at Walck Road Switch Station.	1.00	Sum		$ 15,000	$ 15,000	**$ 15,000**	
WG-I - TOTAL SUPPLY & INSTALL:							**$ 235,000**	
SEGMENT 3	**J, K & L**							
WG-J Identified Line Work 191								
7	**Reconductor the Niagara- Packard 191 line with 2156 kcmil ACSS "Bluebird" conductor.**							
	Wire work:							
7.1	Reconductor 3.6 circuit miles with 2156 kcmil ACSS "Bluebird" conductor.	3.60	Mile	$ 55,440.00	$ 79,200	$ 134,640	**$ 484,704**	Supply & Install
7.2	Replace 3.2 miles of existing shieldwire with 7/16" EHS shieldwire.	3.20	Mile	$ 7,920.00	$ 15,840	$ 23,760	**$ 76,032**	
7.3	Transfer conductor, shieldwire and hardware on existing 101, 102, 61 lines to new suspension structures.	13.00	Structure		$ 20,000	$ 20,000	**$ 260,000**	
7.4	Transfer conductor, shieldwire and hardware on existing 101, 102, 61 lines to new deadend structures.	16.00	Structure		$ 25,000	$ 25,000	**$ 400,000**	
7.5	Replace deadend hardware attachment assemblies at the bus structures on the Niagara Substation and Packard Substation.	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	
	Structure work:							
7.6	Replace six double circuit deadend lattice towers with 6 D/C deadend steel davit arm structures.	6.00	Structure	$ 37,500.00	$ 37,500	$ 75,000	**$ 450,000**	Supply & Install
7.7	Replace tower members and bolts on 12 lattice towers	12.00	Structure	$ 25,000.00	$ 25,000	$ 50,000	**$ 600,000**	
7.8	Install 6 caisson foundations (8'x20') for D/C deadend steel davit are structures	6.00	Structure	$ 75,000.00	$ 75,000	$ 150,000	**$ 900,000**	
7.9	Remove concrete footers at 6 structure locations (4 footers per structure)	24.00	Units		$ 20,000	$ 20,000	**$ 480,000**	
WG-J - TOTAL SUPPLY & INSTALL:							**$ 3,670,736**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
SEGMENT 4	**M & N**							
WG-M Identified Line Work 103, 104								
8	**Wire and Hardware Work**							
8.1	Reconductor with 795MCM ACRS conductor to sections of lines 103 & 104 of 636MCM ACC	4,000.00	Ft	$ 3.50	$ 5	$ 9	**$ 34,000**	
8.2	Install 0.1 miles of 3/8" x 7 strand EHS steel shieldwire	0.10	Mile	$ 7,920.00	$ 15,840	$ 23,760	**$ 2,376**	
	Structure work:							
8.3	Remove existing structures 55A1, 55A2, 55A3, 55B1, 55B2, 55B3, 55B4 and 55B5	5.00	Structure		$ 10,000	$ 10,000	**$ 50,000**	
8.4	Remove existing conductor and 1/2" EHS	5.00	Structure		$ 5,000	$ 5,000	**$ 25,000**	
8.5	Install new steel vertical deadend pulloff structures	2.00	Structure		$ 50,000	$ 50,000	**$ 100,000**	Supply & Install
8.6	Install new steel three pole deadend pullof structure	1.00	Structure		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
	Foundation Work							
8.7	Install 2 foundations using a vibratory caisson, helical pile or other methods	2.00	Structure		$ 75,000	$ 75,000	**$ 150,000**	Supply & Install
8.8	Install 1 new vibratory caisson foundation	1.00	Structure		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
WG-M - TOTAL SUPPLY & INSTALL:							**$ 486,376**	
WG-N Replace Thermally Limiting Equipment at Lockport Station for Lines 101,102								
9	**Upgrade ampacity of Lines 101, 102**							
9.1	Replace Thermally Limiting Equipment at Lockport Station for Lines 101, 102	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
WG-N TOTAL SUPPLY & INSTALL:							**$ 500,000**	
SEGMENT 5	**O, P2, Q, R, S, T, U and V**							
WG-O - NYSEG/NYPA/N GRID - ELIMINATE DOUBLE CIRCUIT CONTINGENCY FOR LINE 61/64								
10	**Eliminate Double Circuit Contingency for Line 61/64**							
10.1	Install "A" Delta Davit Arm Steel Suspension 230kV	1.00	Structure		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
10.2	Install "B" Davit Arm Steel DE 230kV	3.00	Structure					
10.3	Conductoring 0.70 circuit miles of 1590 ACSR for the 64 Line.	8,500.00	Ft	$ 5.00	$ 8	$ 13	**$ 110,500**	
10.4	Replace OGW overhead ground wire 5/8" Dia (230kV)	2.00	Mile	$ 7,920.00	$ 15,840	$ 23,760	**$ 47,520**	
10.5	Install 8' Dia x 26' deep reinforced concrete foundation caisson (cylindrical) Structure Type S/Q Angle DE (3 Nos)	50.00	CY		$ 1,500	$ 1,500	**$ 75,000**	Supply & Install
10.6	Direct embedment foundation 72" dia x 20' deep	1.00	EA		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
10.7	96" Dia Hole Rock Coring/ Removal	15.00	LF		$ 6,400	$ 6,400	**$ 96,000**	Supply & Install
10.8	*Group O-61/64, P1-181:*							
10.9	Tangent - Porcelain String (10 Discs Assembly)	159.00	Set	$ 900.00	$ 720	$ 1,620	**$ 257,580**	
10.10	Angle & Deadend Porcelain String (10 Disc Assembly)	66.00	Set	$ 1,300.00	$ 1,040	$ 2,340	**$ 154,440**	
10.11	Jumper Post Porcelain String (Assembly)	33.00	Set	$ 500.00	$ 400	$ 900	**$ 29,700**	
WG-O TOTAL SUPPLY & INSTALL:							**$ 1,570,740**	
WG-P2 - IDENTIFIED 181 LINE WORK (URBAN SWITCH TO ERIE, NYSEG)								
11.1	Reconductor approximately 3 miles from Urban Switch to NYSEG owned Erie Substation with 1113 kcmil ACSR conductor (existing is 477 ACSR)	54,648.00	Ft	$ 3.50	$ 5	$ 9	**$ 464,508**	
11.2	Replace 3 miles of double shieldwire	36,432.00	Ft	$ 1.50	$ 3	$ 5	**$ 163,944**	
11.3	Assume full rebuild to support new conductor for strength and clearance purposes	3.00	Miles		$ 50,000	$ 50,000	**$ 150,000**	Supply & Install
11.4	Assuming an approximate ruling span of 600', there will be 27 total structures to replace	27.00	Structure		$ 35,000	$ 35,000	**$ 945,000**	Supply & Install
11.5	Assuming a deadend every 1.5 miles and a few extra deadends for angles = 3 Deadends	3.00	Structure		$ 75,000	$ 75,000	**$ 225,000**	Supply & Install
11.6	Remaining 24 structures will be suspension structures	24.00	Structure		$ 30,000	$ 30,000	**$ 720,000**	Supply & Install
11.7	Suspension: Single circuit wood H-frame suspension structures direct embed (Str. Qty 24)	24.00	Structure	$ 8,000.00	$ 15,000	$ 23,000	**$ 552,000**	
11.8	Deadend: Single circuit steel H-frame steel deadend structures on concrete foundations (Str. Qty 3, Foundation Qty:6)	3.00	Per Structure	$ 42,000.00	$ 37,800	$ 79,800	**$ 239,400**	
11.9	Existing structures are single circuit wood h-frame suspension and deadends	1.00	Sum		$ 5,000	$ 5,000	**$ 5,000**	
11.10	Miscellaneous materials, dampers, grounding etc.	1.00	Sum	$ 50,000.00	$ 50,000	$ 100,000	**$ 100,000**	
WG-P2 TOTAL SUPPLY & INSTALL:							**$ 3,564,852**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
WG-Q - REPLACE THERMALLY LIMITING EQUIPMENT AT ERIE STN FOR LINE 181								
12	**Replace Thermally Limiting Equipment at Erie Station for Line 181 (NYSEG 922 Line)**							
12.1	Replacing one 115kV circuit breaker	1.00	Unit	$ 150,000.00	$ 50,000	$ 200,000	**$ 200,000**	Supply & Install
12.2	Instrument Transformers	1.00	Unit		$ 200,000	$ 200,000	**$ 200,000**	
12.3	New disconnect switches	1.00	Lot		$ 100,000	$ 100,000	**$ 100,000**	
12.4	New A&B relay packages	1.00	Lot		$ 50,000	$ 50,000	**$ 50,000**	
12.5	Conductor and insulator replacement	1.00	Lot		$ 200,000	$ 200,000	**$ 200,000**	
12.6	New cabling (control, instrument, power and panel wiring)	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
12.7	Miscellaneous assemblies	1.00	Sum		$ 300,000	$ 300,000	**$ 300,000**	
WG-Q TOTAL SUPPLY & INSTALL:							**$ 1,250,000**	
WG-R - REPLACE THERMALLY LIMITING EQUIPMENT LINE 54 (NYSEG 921)								
13	**Replace Thermally Limiting Equipment at Erie Station for line 54 (NYSEG 921)**							
13.1	Replacing one 115kV circuit breaker	1.00	Unit	$ 150,000.00	$ 50,000	$ 200,000	**$ 200,000**	Supply & Install
13.2	Instrument Transformers	1.00	Unit		$ 200,000	$ 200,000	**$ 200,000**	
13.3	New disconnect switches	1.00	Lot		$ 100,000	$ 100,000	**$ 100,000**	
13.4	New A&B relay packages	1.00	Lot		$ 50,000	$ 50,000	**$ 50,000**	
13.5	Conductor and insulator replacement	1.00	Lot		$ 200,000	$ 200,000	**$ 200,000**	Supply & Install
13.6	New cabling (control, instrument, power and panel wiring)	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
13.7	Miscellaneous assemblies	1.00	Sum		$ 300,000	$ 300,000	**$ 300,000**	
WG-R TOTAL SUPPLY & INSTALL:							**$ 1,250,000**	
WG-U - REPLACE THERMALLY LIMITING EQUIPMENT ROBINSON STN LINE 64								
14	**Replace Thermally Limiting Equipment at Robinson Station for Line 64**							
14.1	Replacing two 230kV gang operated circuit breaker	2.00	Unit	$ 250,000.00	$ 75,000	$ 325,000	**$ 650,000**	
14.2	Instrument Transformers	1.00	Unit		$ 200,000	$ 200,000	**$ 200,000**	Supply & Install
14.3	New disconnect switches	1.00	Lot		$ 100,000	$ 100,000	**$ 100,000**	
14.4	New A&B relay packages	1.00	Lot		$ 50,000	$ 50,000	**$ 50,000**	
14.5	Conductor and insulator replacement	1.00	Lot		$ 200,000	$ 200,000	**$ 200,000**	
14.6	New cabling (control, instrument, power and panel wiring)	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
14.7	Miscellaneous assemblies	1.00	Sum		$ 300,000	$ 300,000	**$ 300,000**	
WG-U - REPLACE THERMALLY LIMITING EQUIPMENT ROBINSON STN LINE 64							**$ 1,700,000**	
WG-V - REPLACE THERMALLY LIMITING EQUIPMENT NIAGARA STN LINE 102								
15	**Replace Thermally Limiting Equipment at Niagara Station for Line 102**							
15.1	Substation Equipment Replacement	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
WG-V TOTAL SUPPLY & INSTALL:							**$ 500,000**	
MOBILIZATION, ACCESS, CIVILS, PROJECT MANAGEMENT, OVERHEADS, MISC:								
16	**Contractor Mobilization / Demobilization**							
16.1	Mob / Demob	1.00	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	
	Project Management, Material Handling & Amenities					$ -	**$ -**	
16.2	Project Management & Staffing (includes PM, Field Engineers / Supervision, Scheduler and Cost Manager, SHEQ Staff, Materials Management Staff)	36.00	Months		$ 220,000	$ 220,000	**$ 7,920,000**	
16.3	Site Accommodations, Storage, Amenities, Laydown Yards	1.00	Sum		$ 1,700,000	$ 1,700,000	**$ 1,700,000**	
	Engineering					$ -	**$ -**	
16.4	Design Engineering	1.00	Sum		$ 5,000,000	$ 5,000,000	**$ 5,000,000**	
16.5	LiDAR	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	
16.6	Geotech	1.00	Sum		$ 1,100,000	$ 1,100,000	**$ 1,100,000**	
16.7	Surveying/Staking	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	
	Testing and Commissioning					$ -	**$ -**	
16.8	Testing & Commissioning of T-Line and Equipment	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	

COST ESTIMATE

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
	Permitting and Additional Costs					$ -	**$ -**	
16.9	Environmental Licensing & Permitting Costs (see separate tab for breakdown)	1.00	Sum		$ 3,984,698	$ 3,984,698	**$ 3,984,698**	
16.10	Environmental Mitigation Costs (see separate tab for breakdown)	1.00	Sum		$ 227	$ 227	**$ 227**	
16.11	Warranties / LOC's	1.00	Sum		$ 515,916	$ 515,916	**$ 515,916**	
16.12	Legal Fees	1.00	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
16.13	Sales Tax on Materials	1.00	Sum	$ 1,526,384		$ 1,526,384	**$ 1,526,384**	Includes 8.75% sales tax
16.14	Allowance for Funds Used During Construction (AFUDC)	1.00	Sum			$ -	**$ -**	
16.15	Carrying Charges	1.00	Sum			$ -	**$ -**	
16.16	Fees for easements or permits, including roadway, railroad, building or other local permits	1.00	Sum			$ 200,000	**$ 200,000**	
PM, OVERHEADS, ACCESS, MISC TOTAL:							**$ 27,447,225**	
SYSTEM UPGRADE FACILITIES								
SUF 1	**SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)**						**$ 3,750,000**	Contingency for possible additional SUF upgrades
SYSTEM UPGRADE FACILITY TOTAL:							**$ 3,750,000**	

ENVIRONMENTAL LICENSING PERMITTING

PROJECT TITLE WNY PROJECT EVALUATION- ENVIRONMENTAL LICENSING & PERMITTING COST ELEMENTS						ENVIRONMENTAL LICENSING & PERMITTING COST ESTIMATE RANGE FOR PROPOSED WNY TRANSMISSION PROJECT - T011							
FEDERAL						Segment 1		Segment 2		Segment 3		Segment 4	
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
USACE	Waters of the US under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act (including regulated wetland areas)	Nationwide Permits (NWP) or Individual Permit (IP)	Any work within the boundaries of regulated wetlands (with the exception of isolated wetlands) or waterways to the spring high tide or ordinary high water mark	If project qualifies for a NWP (<0.5 acre disturbance and within NWP project type parameters), a pre-construction notification (PCN) is typically required. NWPs have a 45 day review period starting from when project logged in system (up to 6wk backlog delay in logging projects) If an IP is triggered, USACE will require Alternative Analysis and Public Notice/Hearing. IPs could also trigger restrictive environmental work windows. IPs have a 120 day review period starting from when permit is "deemed complete"	Wetland Delineation; Wetland Function & Value Assessment; Stream Delineation; Restoration Plan	$38,600	$110,750	$16,200	$68,750			$11,920	$60,725
USFWS	Endangered Species Act Section 7 (ESA) Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act	Consultation (Formal or Informal); Special Use Permit; Incidental Take Permit	Any work that may have an affect on listed species or their habitat; or projects within National Wildlife Refuges	USACE coordinates consultation with USFWS for ESA listed species during their permit review. Also includes the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act compliance. Season restrictions on construction could be imposed.	Rare, Threatened & Endangered Species Search; Preparation of Reports and Conservation Plans	$100,000	$1,000,000	$14,200	$66,800	$11,550	$61,500		
FAA	Airports / Airspace	Federal Aviation Administration (FAA) Notification	New or Replacement Structures near Airports	Depending on construction locations, this permit may only be needed for OP work.	Obstruction Analysis, Mitigation Plan (assumes Engineering Cost)					$3,000	$9,000		
STATE													
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans								
NYS Public Service Commission / Department of Public Service (NYSDPS)	Article VII	Article VII: Certificate of Environmental Compatibility and Public Need and Environmental Management & Construction Plan (EM&CP)	Article 7: Major electric transmission facilities with design capacity of 100kV or more extending for at least 10 miles or 125kV and over extending a distance of 1 mile or more (some exclusions for underground transmission applies)	Article 7 will incorporate all of the required State and Local approvals (costed separately), as well as Engineering and Environmental Studies and Public Outreach. Intervenor Fund payment expected to be $100,000. An Environmental Management & Construction Plan (EM&CP) must be prepared and approved by the PSC. (see 16 NYCRR Parts 85 through 88)	Includes Reports and Plans required for State and Federal Agency Permits, as well as EM&CP, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan, Mitigation Plans	$600,000	$3,100,000						
NYS Public Service Commission / Department of Public Service (NYSDPS)	Part 102		Construction of a utility overhead transmission facility that will convey electric energy at 65kV or higher for a distance of one mile or longer and are not subject to Article VII of the Public Service Law.	Report may include coordination or studies completed under other line items including: Visual assessment, SHPO determination, OPRHP consultation, Ecological Impacts Assessment Submit to the Commission for 60-day notice period: if no response for a formal investigation project can proceed, if formal investigation ordered project modification may be required	Advantage-Disadvantage Analysis	$13,000	$60,000						
NYSDEC	Article 15 Stream Disturbance; Article 24 Wetlands, Open Waters, Wetlands Buffers (100' for Freshwater Wetland)	Individual Permit (IP) (unless developer has General Permit (GP))	Any work within the boundaries of regulated waterways or wetlands, and wetland adjacent areas	Any disturbance within wetlands and/or below mean high tide will require an IP. Areas of temporary disturbance will likely require restoration, including a monitoring and maintenance period. Permanent disturbance will require offsite mitigation up to 3:1 area ratio; also includes a monitoring and maintenance period. GP may only be applicable if project ground disturbance is located outside of wetlands areas (above MHW).	Wetland Delineation; Wetland Restoration/Mitigation Plan	$12,000	$53,000	$12,000	$53,000			$12,000	$53,000

ENVIRONMENTAL LICENSING PERMITTING

NYSDEC	Stormwater (If >1 Acre Soil Disturbance)	SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 & SWPPP	Project areas of soil disturbance	If project involves 1 acre or more soil disturbance, then the GP is required. If located within a Regulated MS4 Municipality, additional coordination may be needed. Weekly inspections by a Qualified Inspector during construction will be required.	SWPPP (assumes Engineering Cost includes Sediment & Erosion Control Plan, Hydraulic & Hydrology Studies, Stormwater Management Design)	$11,200	$38,000	$11,200	$38,000	$11,200	$38,000		
Any State or local government agency that issues permits or approvals	State Environmental Quality Review Act (SEQRA)	Environmental Assessment (EA) Determination of Significance	Projects not covered as a Type II Action (Note a project can not be segmented - all phases/tasks must be considered in the review)	Most projects or activities proposed by a state agency, and all discretionary approvals (permits) from a NYS agency or local government, require an environmental impact assessment. SEQR requires the sponsoring or approving governmental body to identify and mitigate the significant environmental impacts of the activity it is proposing or permitting.	Includes Reports and Plans required for State and Federal Agency Permits, as well as, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan			$10,000	$500,000	$10,000	$500,000	$10,000	$10,000
NYSDOS	State Coastal Zone/ Management Areas	Coastal Consistency Concurrence	Projects within the NYSDOS designated Coastal Zone; and consistency with Local Waterfront Revitalization Plans (LWRPs); e.g., Town of Grand Island LWRP	Online mapping available to check if within coastal zone, a significant coastal fish & wildlife habitat (SCFWH), a local waterfront revitalization program area (LWRP), or a comprehensive management program areas (CMP)		$3,400	$15,000						
NYSHPO	National Historic Preservation Act (NHPA) Section 106: State and Federal Historic Places; State Mapped Archeologically Sensitive Areas	Cultural Resource Information System (CRIS) Determination	Local, State, or Federal eligible or designated historic places and/or areas of archeological sensitivity (in off-road areas and areas that have not been previously disturbed)	NYSDEC EAF Online Mapper identifies State or National Register of Historic Places and archeological sensitive areas within or adjacent to the project site. Formally enter project information and supporting documents into SHPO's online CRIS program. Staff will review and email a determination of impacts letter	Phase 1A & 1B Archaeological Studies	$14,700	$53,500	$7,750	$32,650	$6,700	$29,500		
NYS NHP	Threatened and Endangered Species	Consultation	Activities that may affect T&E species or their habitat.		See USFWS	$1,200	$6,400	$1,200	$6,400	$1,200	$6,400		
NYSDOT/NYS Thruway Authority/FHWA	State Roadways	Highway Work Permit/Utility Permit, Vegetation Management Permit; Easement	Any work within or crossing State highway ROW	May require restoration landscaping coordination. Typically requires compliance with NEPA including SHPO and USFWS effects determination	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$17,000	$69,000			$17,000	$69,000		
NYSOGS	State-owned Underwater Land	Request for Information	Projects includes use of NYS underwater lands	OGS Real Estate staff do respond to email inquiries to determine based on project location and scope if permit application is applicable.	Easement area survey (not included in costs)	$1,200	$6,400						
NYS Canal Corporation	Erie Canal - jurisdiction varies along edge	Canal Occupancy & Work Permit (TA-W99072)	Any work involving the Erie Canal	Must coordinate with Division Permit Engineer about particular section of canal being affected. Commercial permit fee = $25 plus $2,000,000 additional General Aggregate Liability Insurance	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$3,800	$3,800	$3,800	$3,800				
NYS Dept. of Agriculture and Markets	All agricultural lands (including Agricultural Districts)	Part of Article 7 & Article 10 Review process	Any work impacting agricultural land	Must minimize impacts and restore damage to agricultural land, and coordinate with County Soil & Water Conservation District; Vineyards are a major concern in WNYS. Pre-application conference with PSC, DEC and Ag& Markets recommended. Must develop EM&CP in conformance with Art. 7/10 Certificate Conditions. Agricultural Monitor must oversee construction & restoration; requisite 2-yrs post restoration monitoring.	Crop/Pasturing Mitigation Plan (not included in costing)	$11,000	$24,000	$11,000	$24,000				

ENVIRONMENTAL LICENSING PERMITTING

REGIONAL													
Railroads	Railroad crossings	Consultation-permits may be required; Easement	Access / new structures on RR property		Easement area survey (not included in costs)	$11,000	$76,000			$11,000	$76,000		
LOCAL/MUNICIPAL													
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans								
County Dept. of Public Works	County Roadways	Lane Closure Permit, Highway Work or Access Permit	Work within county roadways and right-of-ways			$6,000	$40,000	$6,000	$40,000	$6,000	$40,000		
Town, City or Village	Municipal Stormwater (MS4) Review	Approval of SWPPP or EM&CP	Project areas of soil disturbance		See NYSDEC SPDES	$6,000	$35,000	$6,000	$35,000	$6,000	$35,000		
Town, City or Village	Municipal Roadways	Highway Work Permit; Road Opening Permit	Work within municipal roadways and right-of-ways			$6,000	$35,000	$6,000	$35,000	$6,000	$35,000		
Town, City or Village	Wetlands	Wetland Permit / Conservation Approvals	Mapped wetlands and wetland adjacent areas (buffer width variable)		See USACE / NYSDEC Art. 24	$6,000	$52,000	$6,000	$52,000	$6,000	$52,000	$6,000	$52,000
					Total Cost Range by Segment	$862,100	$4,777,850	$111,350	$955,400	$95,650	$951,400	$39,920	$175,725

	Minimum	Maximum	Expected Value
ENVIRONMENTAL LICENSING & PERMITTING COST (EXCLUDING MITIGATION)	**PROJECT TOII TOTAL**	**$1,109,020**	**$6,860,375**	**$3,984,698**

Excluded cost: Mitigation or restoration for impact to regulated wetlands; agricultural land and tree clearing

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ENVIRONMENTAL MITIGATION ESTIMATE

	Offsite Wetland Mitigation*		Farmland**	
	Min.	Max.	Min.	Max.
Area	0 acres	0 acres	0.3 acres	0.6 acres
Cost/Acre	$60,000	$120,000	$503	$503
Ratio	1:1	3:1	1:1	1:1
Total	$0	$0	$151	$302

T011 MITIGATION TOTAL	Minimum	Maximum	Expected Value
	$151	**$302**	**$227**

*Assumes no offsite wetland mitigation since no clearing of NWI Forested/Shrub Wetland is proposed - all work within existing maintained/cleared ROWs; assumes timber matting impacts to emergent wetlands is considered temporary and restoration seeding costs are accounted for in construction costs

**Farmland mitigation based on corn bushel yield at 129 BU/Acre and $3.9/BU (production numbers from 2016 USDA NYS Agriculture Overview), area assumes 538 LF Matting Impacts to Active Agriculture Land by 25' Wide (Min.) or 50' Wide (Max.); does not include land acquisition

ASSUMPTIONS AND CLARIFICATIONS

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a) Cost Estimate is based on 2017 rates.
b) Construction Schedule is in accordance with the Developers proposed schedule - we have assumed continuous working with no breaks in the schedule.
c) Stringing rates allow for protection over crossings (such as rider poles).
d) We have assumed a typical work week (6 x 10 hour days).
e) We have assumed that pole weights include anchor bolts.
f) The Developer has assumed gravel work pads. During our ROW visit it was determined that matted work pads are required.
g) Costs will vary for handling and disposal of contaminated spoils, depending on type of contaminants and availability / location of the appropriate tipping facility. Since there is not enough information to provide a quantified estimate for this item, allowance is included in the contingency monies.
h) Costs have been developed based on historical data from Projects of a similar nature (AACE Class 5 and 4 Estimating Practices). We have not engaged any subcontractors or material vendors for formal quotes.
i) We have assumed Contractor Mark Up (OH&P) of 15%
j) Assumes all environmental data and project details provided are accurate unless noted otherwise
k) Article 7 required for Segment 1 (excluding Grand Island work)
l) Part 102 Authorization is required for Grand Island if it is not included in the Article 7 scope. If Grand Island work is considered independently from Article 7, separate USACE, NYSDEC, SWPPP, NYSDOS, SHPO, and local permits and costs will apply.
m) Segment 1 USFWS T&E Investigation assumes survey and potential incidental take with Habitat Conservation Plan. Minimum and maximum amounts represent variable coordination efforts
n) USFWS T&E for segments 2 and 3 Assumes that ¼ of the total project route per segment will require field survey for T&E (Segment 2 – 2.28 miles, Segment 3 – 1.75 miles)
o) NEPA-Assumes no NEPA because Art VII (Segments 1) and SEQRA (Segments 2, 3, 4)
p)Article 7 Intervenor Fund payment expected to be $100,000
q) SHPO-Assumes consultation and Phase 1A/1B archeological studies with field survey for 50% of project route (Segment 1 – 11.5 miles, Segment 2 – 4.55 miles, Segment 3 – 3.5 miles, Segment 4 – no survey)
r) NYSDOT/FHWA-Assumes any required NEPA coordination/requirements are covered under Article VII or SEQRA review
s) SEQRA for Segments 2, 3 and 4 assumes applicant is not lead agent. Minimum costs assume FEAF Part I with no additional studies. Maximum assumes an expanded EA. SEQRA for Segment 4 assumes minimum only costs.
t) Assumes no coordination with National Parks Service
u) NYSDOS – Assumes only Segment 1

ASSUMPTIONS AND CLARIFICATIONS

v) USACE wetland delineation totals assumed length of NWI wetland estimates on Permitting Summary Table (Segment 1 – 6.9 miles, Segment 2 – 0.62 miles, Segment 3 – no wetlands, Segment 4 – 0.22 miles). Assumes work group line segment length not duplicated. Assumes NYSDEC delineations overlap and are accounted for in USACE costing.
w) Assumes no permanent wetland impacts and no wetland mitigation required
z) Assumes no agricultural project impacts and no mitigation
aa) No tree survey or replanting required outside regulated wetlands areas
ab) System Upgrade Facilities Contingency is allowance for potential additional system upgrades including overdutied breakers, protection changes, unidentified thermal issues, etc that may be identified as detailed studies are completed.

INDEPENDENT ESTIMATES

ATTACHMENT B6

T012 – NATIONAL GRID

SUBSTATION ENGINEERING COMPANY
8/11/2017

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T012 - National Grid High Power Transfer Solution

Revision: 4

SUMMARY OF COST ESTIMATE

Segment	Description	Total Amount
	CLEARING & ACCESS WORKS FOR T-LINE CONSTRUCTION	$ 77,418,870
1	WG A - NEW 230kV NIAGARA TO GARDENVILLE LINE & RELOCATIONS	$ 70,767,955
	WG B NEW 230kV LINE ASSOCIATED WORK AT GARDENVILLE SUBSTATION	$ 1,105,500
	WG C NEW 230kV LINE - NIAGARA SUBSTATION CONNECTION	$ 1,075,000
2	WG-D1 REBUILD & RE-CONDUCTOR	$ 55,276,810
	WG-E NEW BUS BREAKER AT PACKARD STATION	$ 880,000
	WG-F REPLACE THERMALLY LIMITING EQUIPMENT AT PACKARD SUBSTATION FOR LINE 181	$ 200,000
	WG-G NEW 115kV SWITCHING STATION	$ 11,169,000
3	WG-H PACKARD-HUNTLEY & WALCK-HUNTLEY DOUBLE CIRCUIT LINE WORKS	$ 7,261,318
	WG-I - UPGRADE AMPACITY OF LINES 130 AND 133 AT HUNTLEY SUBSTATION	$ 235,000
4	WG-J - REFURBISHMENT WORKS ON LINES 191	$ 3,670,736
5	WG-M - LINE WORK 103,104	$ 486,376
	WG-N - LINE WORK 101, 102, 103, 104	$ 500,000
6	WG-O - NYSEG/NYPA/N GRID - ELIMINATE DOUBLE CIRCUIT CONTINGENCY FOR LINE 61/64	$ 1,570,740
	WG-P1 - IDENTIFIED 181 LINE WORK (URBAN SWITCH TO ERIE, NYSEG)	$ 5,366,640
	WG-Q - REPLACE THERMALLY LIMITING EQUIPMENT AT ERIE STN FOR LINE 181	$ 1,250,000
	WG-R - REPLACE THERMALLY LIMITING EQUIPMENT LINE 54 (NYSEG 921)	$ 1,250,000
	WG-U - REPLACE THERMALLY LIMITING EQUIPMENT ROBINSON STN LINE 64	$ 1,700,000
	WG-V - REPLACE THERMALLY LIMITING EQUIPMENT NIAGARA STN LINE 102	$ 500,000
	MOB/DEMOB, ACCESS, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:	$ 56,143,133
	CONTRACTOR MARK UP (OH&P) 15%	$ 44,674,062
	SUBTOTAL:	$ 342,501,140
	CONTINGENCY ON ENTIRE PROJECT (25%)	$ 85,625,285
	TOTAL:	**$ 428,126,425**

SYSTEM UPGRADE FACILITIES	$ 3,750,000
CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 1,312,500
TOTAL (B):	**$ 5,062,500**

TOTAL PROJECT COST (A+B):	**$ 433,188,925**

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
Clearing & Access Works for T-Line Construction								
1.1	Gravel Road	34,084.00	LF		$ 45	$ 45	**$ 1,533,780**	Assumes Type 1 Gravel Road
1.2	Gravel Road Improvement	4,757.00	LF		$ 7	$ 7	**$ 33,299**	
1.3	Temporary Matting (temp access roads)	246,623.00	LF		$ 70	$ 70	**$ 17,263,610**	
1.4	Mowing & Clearing	135.00	Acre		$ 15,000	$ 15,000	**$ 2,025,000**	
1.5	Work Pads	13,308,750.00	SF		$ 4	$ 4	**$ 46,846,800**	
1.6	Restoration for Work Pad areas	1,340,875.00	SF		$ 0.15	$ 0.15	**$ 201,131**	
1.7	Temporary Access Bridge	200.00	EA		$ 20,035	$ 20,035	**$ 4,007,000**	
1.8	Air Bridge	50.00	EA		$ 14,445	$ 14,445	**$ 722,250**	
1.9	Stabilized Construction Entrance	200.00	EA		$ 4,580	$ 4,580	**$ 916,000**	
1.1	Maintenance and Protection of Traffic on Public Roads	1.00	LS		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	
1.11	Culverts / Misc. Access	1.00	LS		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
1.12	Concrete Washout Station	200.00	EA		$ 1,850	$ 1,850	**$ 370,000**	
1.13	Snow Removal & Maintenance	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
TOTAL CLEARING & ACCESS:							**$ 77,418,870**	
SEGMENT 1	**WGA**							
WG A - NEW 230kV NIAGARA TO GARDENVILLE LINE & RELOCATIONS								
2	**Foundations (New 230kV Transmission Line)**							
2.1	Direct embedment holes - 6 feet diameter, embedment depth of 20 feet for Type A structure (66 Nos)	66.00	Structure		$ 18,000	$ 18,000	**$ 1,188,000**	
2.2	Concrete caisson foundations - 6 feet diameter, depth of 24 feet for Type C structure (144 Nos)	4,350.00	CY		$ 1,500	$ 1,500	**$ 6,525,000**	
2.3	Direct embedment holes - 3 feet diameter, embedment depth of 13.5 feet for Type E structure (154 Nos)	155.00	Structure		$ 15,000	$ 15,000	**$ 2,325,000**	
2.4	Concrete caisson foundations - 8 feet diameter, depth of 26 feet for Type B structure (14Nos)	820.00	CY		$ 1,500	$ 1,500	**$ 1,230,000**	
2.5	Concrete caisson foundation - 8 feet diameter, depth of 38 feet for Type G structure (1 No)	85.00	CY		$ 1,500	$ 1,500	**$ 127,500**	
2.6	Concrete caisson foundations - 8 feet diameter, depth of 26 feet for Type D structure (25 Nos)	1,500.00	CY		$ 1,500	$ 1,500	**$ 2,250,000**	Supply & Install
2.7	Concrete caisson foundations - 8 feet diameter, depth of 48 feet for Type D vertical structure (5 Nos)	550.00	CY		$ 1,500	$ 1,500	**$ 825,000**	
2.8	Concrete caisson foundations - 6 feet diameter, depth of 29 feet for Type F structure (24 Nos)	880.00	CY		$ 1,500	$ 1,500	**$ 1,320,000**	
2.9	Concrete caisson foundations - 8 feet diameter, depth of 36 feet for Type F 90 degree structure (12 Nos)	970.00	CY		$ 1,500	$ 1,500	**$ 1,455,000**	
2.10	Concrete caisson foundations – 7 feet diameter, depth of 34 feet for Type O structure (2 Nos)	120.00	CY		$ 1,500	$ 1,500	**$ 180,000**	
2.11	Concrete caisson foundation – 5 diameter, depth of 21 feet for Type N structure (1 No)	20.00	CY		$ 1,500	$ 1,500	**$ 30,000**	
2.12	Rock Coring Allowance for Foundations (say 5ft / caisson for 200 caissons)	1,000.00	VF		$ 4,200	$ 4,200	**$ 4,200,000**	Based on 6ft dia
3	**Structures (New 230kV Transmission Line)**							
3.1	230kV (Type A - Single circuit steel delta davit arm suspension structure)	66.00	Structure	$ 11,250	$ 10,125	$ 21,375	**$ 1,410,750**	
3.2	230kV (Type C - Single circuit steel vertical suspension structure)	148.00	Structure	$ 17,100	$ 15,390	$ 32,490	**$ 4,808,520**	
3.3	230kV (Type E - Single circuit wood H-frame suspension structure)	77.00	Structure	$ 3,500	$ 26,000	$ 29,500	**$ 2,271,500**	
3.4	230kV (Type B - Single circuit steel delta davit arm deadend structure)	14.00	Structure	$ 32,400	$ 29,160	$ 61,560	**$ 861,840**	
3.5	230kV (Type G - Double circuit steel davit arm deadend structure)	1.00	Structure	$ 42,000	$ 37,800	$ 79,800	**$ 79,800**	
3.6	230kV (Type D - Single circuit steel vertical deadend structure)	30.00	Structure	$ 39,600	$ 35,640	$ 75,240	**$ 2,257,200**	
3.7	230kV (Type F - Single circuit steel 3-pole deadend structure)	12.00	Structure	$ 56,700	$ 51,030	$ 107,730	**$ 1,292,760**	
3.8	230kV/115kV (Type O – Double circuit steel davit arm deadend structure)	2.00	Structure	$ 42,000	$ 37,800	$ 79,800	**$ 159,600**	
3.9	230kV/115kV (Type N – Double circuit steel davit arm suspension structure)	1.00	Structure	$ 19,000	$ 17,100	$ 36,100	**$ 36,100**	
3.10	115kV (Type W – Single circuit steel vertical deadend structure)	2.00	Structure	$ 50,000	$ 45,000	$ 95,000	**$ 190,000**	
3.11	115kV (Type V – Single circuit steel vertical deadend tap structure)	2.00	Structure	$ 52,000	$ 46,800	$ 98,800	**$ 197,600**	
3.12	115kV (Type Q – Double circuit steel davit arm deadend structure)	2.00	Structure	$ 29,700	$ 26,730	$ 56,430	**$ 112,860**	
4	**Conductors, Shieldwire, Hardware, Misc. (New 230kV Transmission Line)**							
4.1	Conductor-36.2 miles of 1590 kcmil ACSR Falcon	659,400.00	Ft	$ 4	$ 5	$ 9	**$ 5,604,900**	
4.2	Static cable-49 miles of 3/8" x 7 strand EHS steel shieldwire	297,500.00	Ft	$ 2	$ 3	$ 5	**$ 1,338,750**	
4.3	Tangent - Porcelain String (10 Discs Assembly)	876.00	Set	$ 900	$ 720	$ 1,620	**$ 1,419,120**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
4.4	Angle & Deadend Porcelain String (10 Disc Assembly)	384.00	Set	$ 1,300	$ 1,040	$ 2,340	**$ 898,560**	
4.5	Jumper Post Porcelain String (Assembly)	192.00	Set	$ 500	$ 400	$ 900	**$ 172,800**	
4.6	Miscellaneous Materials (Dampers, Grounding & Signage)	36.20	Mile		$ 30,000	$ 30,000	**$ 1,086,000**	Supply & Install
4.7	FAA Lightings/ Marking Systems	30.00	Structure		$ 15,000	$ 15,000	**$ 450,000**	Supply & Install
5	**New 36/37 Ayer Tap**							
5.1	Remove 1.1 circuit miles of 400 MCM 19-strand copper conductor (typical) on the 36 Tap	1.10	Mile		$ 8,500	$ 8,500	**$ 9,350**	
5.2	Remove 1.1 circuit miles of 636 MCM 26/7 ACSR conductor (typical) on the 37 Tap	1.10	Mile		$ 9,000	$ 9,000	**$ 9,900**	
5.3	Remove 2.2 circuit miles of 3/8" x 7 strand steel HS shieldwire	2.20	Mile		$ 6,000	$ 6,000	**$ 13,200**	
5.4	Remove single circuit wood 3-pole deadend structures	2.00	Structure		$ 5,000	$ 5,000	**$ 10,000**	
5.5	Remove single circuit lattice deadend towers	4.00	Structure		$ 6,000	$ 6,000	**$ 24,000**	
5.6	Remove single circuit lattice suspension towers	15.00	Structure		$ 5,500	$ 5,500	**$ 82,500**	
6	**Lines Removal & Reconfiguration of 38/39 Lines**							
6.1	Remove 636 MCM 26/7 ACSR conductor (typical) on the 37 line	0.20	Mile		$ 9,000	$ 9,000	**$ 1,800**	
6.2	Remove 3/8" x 7 strand steel HS shieldwire	0.20	Mile		$ 6,000	$ 6,000	**$ 1,200**	
6.3	Remove single circuit wood 3-pole deadend structure	1.00	Structure		$ 5,000	$ 5,000	**$ 5,000**	
6.4	Remove double circuit lattice suspension tower	1.00	Mile		$ 8,000	$ 8,000	**$ 8,000**	
6.5	Remove double circuit suspension lattice flex tower	1.00	Mile		$ 7,000	$ 7,000	**$ 7,000**	
6.6	Install 0.2 circuit miles of 1590 kcmil ACSR "FALCON" conductor on the 38 line	0.20	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 26,928**	
6.7	Install 0.2 miles of 3/8" x 7 strand steel EHS shieldwire	0.20	Mile	$ 7,920	$ 15,840	$ 23,760	**$ 4,752**	
	Install 13 structures (12 deadend structures and 1 suspension structure:							
6.8	115kV (Type U – Single circuit steel 3-pole deadend structure)	6.00	Structure	$ 70,000	$ 40,000	$ 110,000	**$ 660,000**	Type U has been assumed for budgeting purposes
6.9	115kV (Type R – Single circuit wood davit arm suspension structure	1.00	Structure	$ 5,000	$ 20,000	$ 25,000	**$ 25,000**	
6.10	Allowance for all hardware and other accessories for 115kV structures	1.00	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
	Install 25 concrete caisson foundations for 12 structures and install 1 direct embedment hole for 1 structure:							
6.11	Concrete caisson foundations – 5 feet diameter, depth of 28 feet for Type U (18 Nos)	440.00	CY		$ 1,500	$ 1,500	**$ 660,000**	Supply & Install
6.12	Concrete caisson foundations – 8 feet diameter, depth of 38 feet for Type W (4 Nos)	339.71	CY		$ 1,500	$ 1,500	**$ 509,565**	Supply & Install
6.13	Concrete caisson foundation – 6 feet diameter, depth of 25 feet for Type V (1 No)	31.43	CY		$ 1,500	$ 1,500	**$ 47,145**	Supply & Install
6.14	Concrete caisson foundation – 6 feet diameter, depth of 31 feet for Type Q (1 No)	38.97	CY		$ 1,500	$ 1,500	**$ 58,455**	Supply & Install
6.15	Direct embedment hole - 3 feet diameter, embedment depth of 14 feet for Type R	1.00	Structure		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
6.16	Install approximately two 0.1 circuit-mile section of underground cable in a new manhole and duct system.	1.00	Sum		$ 600,000	$ 600,000	**$ 600,000**	Supply & Install
6.17	Replace approximately two 0.2 circuit-mile section of underground cable on the existing circuits.	1.00	Sum		$ 100,000	$ 100,000	**$ 100,000**	Supply & Install
7	**Maple Road Substation to proposed new substation located near Park Club Lane**							
7.1	Remove 400 MCM 19-strand copper conductor (typical) on the 91 line	2.00	Mile		$ 8,500	$ 8,500	**$ 17,000**	
7.2	Remove 400 MCM 19-strand copper conductor (typical) on the 92 line	2.00	Mile		$ 8,500	$ 8,500	**$ 17,000**	
7.3	Remove 3/8" x 7 strand steel HS shieldwire	4.00	Mile		$ 6,000	$ 6,000	**$ 24,000**	
	Remove 64 structures:							
7.4	Remove double circuit lattice deadend towers	9.00	Structure		$ 6,000	$ 6,000	**$ 54,000**	
7.5	Remove double circuit lattice suspension towers	42.00	Structure		$ 6,000	$ 6,000	**$ 252,000**	
7.6	Remove single circuit wood monopole suspension structures	7.00	Structure		$ 6,000	$ 6,000	**$ 42,000**	
7.7	Remove single circuit 3-pole wood deadend structures	5.00	Structure		$ 7,500	$ 7,500	**$ 37,500**	
7.8	Remove single circuit 2-pole wood deadend structure	1.00	Structure		$ 6,500	$ 6,500	**$ 6,500**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
	Obstruction Works							
7.9	2.7 miles of new UG feeders with duct banks	2.70	Mile		$ 6,500,000	$ 6,500,000	**$ 17,550,000**	Supply & Install
7.10	4.1 miles of new OH distribution	4.10	Mile		$ 500,000	$ 500,000	**$ 2,050,000**	
7.11	3.1 miles of new aerial cable subtransmission	3.10	Mile		$ 150,000	$ 150,000	**$ 465,000**	
7.12	3.6 miles of distribution removals	3.60	Mile		$ 100,000	$ 100,000	**$ 360,000**	
7.13	0.5 miles of directional boring	0.50	Mile		$ 1,000,000	$ 1,000,000	**$ 500,000**	
WG A - TOTAL SUPPLY & INSTALL:							**$ 70,767,955**	
WG B NEW 230kV LINE ASSOCIATED WORK AT GARDENVILLE SUBSTATION								
8	**Gardenville Substation Connection**							
	Below Ground							
8.1	Supply & Install Conduit, Ground Grid	1.00	Sum	$ 15,000	$ 45,000	$ 60,000	**$ 60,000**	
	Foundations							
8.2	Terminal Structure Foundation	1.00	Sum		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
8.3	Bus Support Foundation	1.00	Sum		$ 10,000	$ 10,000	**$ 10,000**	Supply & Install
8.4	Pad Foundation (Upgrade) for Breaker & Switch (use existing pad)	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	Supply & Install
	Structures							
8.5	A Frame DE Structure	1.00	Unit	$ 54,000	$ 30,000	$ 84,000	**$ 84,000**	Assume approx. 30,000lb
8.6	Switch Structure	1.00	Unit	$ 6,500	$ 4,000	$ 10,500	**$ 10,500**	
8.7	Misc. Structures	1.00	Unit	$ 12,000	$ 8,000	$ 20,000	**$ 20,000**	
	Supply and Install Substation Equipment							
8.8	GCB IPO 230kV - 3000A, 50kA	1.00	Unit	$ 250,000	$ 75,000	$ 325,000	**$ 325,000**	
8.9	DS 230kV Gang Operated - 3000A	2.00	Unit	$ 20,000	$ 15,000	$ 35,000	**$ 70,000**	
8.10	Instrument Transformers	1.00	Sum		$ 122,000	$ 122,000	**$ 122,000**	
	Protection, Telecom, Connections, Misc.							
8.11	Cable and Wire	1.00	Sum	$ 5,000	$ 4,000	$ 9,000	**$ 9,000**	
8.12	Protection, Telecom and Metering Equipment	1.00	Sum	$ 100,000	$ 70,000	$ 170,000	**$ 170,000**	
8.13	Misc. Works / Connections	1.00	Sum		$ 5,000	$ 5,000	**$ 5,000**	Supply & Install
8.14	Fencings, Restorations and Security etc.	1.00	Sum		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
WG B - TOTAL SUPPLY & INSTALL:							**$ 1,105,500**	
WG C NEW 230kV LINE - NIAGARA SUBSTATION CONNECTION								
9	**Niagara Substation Connection**							
	Below Ground							
9.1	Supply & Install Conduit, Ground Grid	1.00	Sum	$ 15,000	$ 45,000	$ 60,000	**$ 60,000**	
	Foundations							
9.2	Terminal Structure Foundation	1.00	Sum		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
9.3	Equipment Foundations (breaker pad, switch, CCVT)	1.00	Sum		$ 30,000	$ 30,000	**$ 30,000**	Supply & Install
	Support / Structures	1.00						
9.5	DE Structure	1.00	Unit	$ 54,000	$ 30,000	$ 84,000	**$ 84,000**	Assume approx. 30,000lb
9.6	Misc. Structures	1.00	Sum		$ 18,000	$ 18,000	**$ 18,000**	
	Supply and Install Substation Equipment							
9.9	GCB IPO 230kV - 3000A, 50kA	1.00	Unit	$ 250,000	$ 75,000	$ 325,000	**$ 325,000**	
9.10	DS 230kV Gang Operated - 3000A	3.00	Unit	$ 20,000	$ 15,000	$ 35,000	**$ 105,000**	
9.11	Adder for Motor Operated	1.00	Unit	$ 6,000	$ 2,000	$ 8,000	**$ 8,000**	
9.12	Instrument Transformers	1.00	Sum		$ 65,000	$ 65,000	**$ 65,000**	
	Protection, Telecom, Connections, Misc.							
9.13	Cable and Wire	1.00	Sum		$ 5,000	$ 5,000	**$ 5,000**	Supply & Install
9.14	Protection, Metering & Telecom Equipment	1.00	Sum	$ 100,000	$ 70,000	$ 170,000	**$ 170,000**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
9.15	Misc. Works / Connections	1.00	Sum		$ 5,000	$ 5,000	**$ 5,000**	
9.16	Fencings, Restorations and Security etc.	1.00	Sum		$ 150,000	$ 150,000	**$ 150,000**	
WG C - TOTAL SUPPLY & INSTALL:							**$ 1,075,000**	
SEGMENT 2								
WG-D1 REBUILD & RE-CONDUCTOR								
Description of Work: The SOW includes re-conductoring portions of the Niagara – Gardenville 180, Packard – Urban 181, Packard – Gardenville 182 115kV lines, as part of the full solution of the Western New York Project. A portion of the Gardenville – Depew 54 line will also be reconductored in support of the project. Reconductoring of the taps is not required except for the American Standard Tap on the 182 line.								
10	**Wire Removal Work**							
	Line 181/105 – Remove approximately 26.6 circuit miles, 115kV/69kV (Packard Substation to Ellicott Junction):							
10.1	Remove 13.3 circuit miles (typically 350 MCM 19 strand Copper) - Line 105	13.30	Mile		$ 15,000	$ 15,000	**$ 199,500**	
10.2	Remove13.3 circuit miles (typically 350 MCM 19 strand Copper) - Line 181	13.30	Mile		$ 15,000	$ 15,000	**$ 199,500**	
10.3	Remove 26.6 miles of existing 3/8” x 7 steel EHS shieldwire	26.60	Mile		$ 12,000	$ 12,000	**$ 319,200**	
10.4	Conductor attachment assembly at Packard Substation	1.00	Lot		$ 50,000	$ 50,000	**$ 50,000**	
	Line 180/181 – Remove approximately 18.2 circuit miles, 115kV (Ellicott Junction to Urban Switch):							
10.5	Remove 9.1 circuit miles (typically 400 MCM 19 strand Copper) - Line 180	9.10	Mile		$ 17,000	$ 17,000	**$ 154,700**	
10.6	Remove 9.1 circuit miles (typically 350 MCM 19 strand Copper) - Line 181	9.10	Mile		$ 15,000	$ 15,000	**$ 136,500**	
10.7	Remove 18.2 miles of existing 3/8” x 7 steel EHS shieldwire	18.20	Mile		$ 12,000	$ 12,000	**$ 218,400**	
10.8	Conductor attachment assembly at Urban Switch	1.00	Lot		$ 50,000	$ 50,000	**$ 50,000**	
	Line 182/92 – Remove approximately 18.2 circuit miles, 115kV/69kV (Ellicott Junction to Urban Switch):							
10.9	Remove 9.1 circuit miles (typically 400 MCM 19 strand Copper) - Line 182	9.10	Mile		$ 17,000	$ 17,000	**$ 154,700**	
10.10	Remove 9.1 circuit miles (typically 400 MCM 19 strand Copper) - Line 92	9.10	Mile		$ 17,000	$ 17,000	**$ 154,700**	
10.11	Remove 18.2 miles of existing 3/8” x 7 steel EHS shieldwire	18.20	Mile		$ 12,000	$ 12,000	**$ 218,400**	
	Line 182 – Remove approximately 0.9 circuit miles, 115kV (Near Urban Switch):							
10.10	Remove circuit miles (typically 400 MCM 19 strand Copper) - Line 182	0.90	Mile		$ 17,000	$ 17,000	**$ 15,300**	
10.11	Remove 0.9 miles of existing 3/8” x 7 steel EHS shieldwire	0.90	Mile		$ 12,000	$ 12,000	**$ 10,800**	
	Line 182/54 – Remove approximately 7.4 circuit miles, 115kV/115kV (Urban Switch to Gardenville Substation):							
10.14	Remove 3.7 circuit miles (typically 400 MCM 19 strand Copper) - Line 182	3.70	Mile		$ 17,000	$ 17,000	**$ 62,900**	
10.15	Remove 3.7 circuit miles (636 KCM 18/1 ACSR) - Line 54	3.70	Mile		$ 18,000	$ 18,000	**$ 66,600**	
10.16	Remove 7.4 miles of existing 3/8” x 7 steel EHS shieldwire	7.40	Mile		$ 12,000	$ 12,000	**$ 88,800**	
10.17	Conductor attachment assembly at Gardenville Substation	1.00	Lot		$ 50,000	$ 50,000	**$ 50,000**	
	Line 182/54 – Remove approximately 7.45 circuit miles, 115kV/115kV (American Standard Tap):							
10.18	Remove 0.02 circuit miles (typically 400 MCM 19 strand Copper) - Line 182 Tap to American Standard Tap	0.02	Mile		$ 17,000	$ 17,000	**$ 340**	
10.19	Remove 0.02 circuit miles (typically 400 MCM 19 strand Copper) - Line 54 Tap to American Standard Tap	0.02	Mile		$ 17,000	$ 17,000	**$ 340**	
10.20	Conductor attachment assembly at American Standard Tap	1.00	Lot		$ 50,000	$ 50,000	**$ 50,000**	
	Line 180/704 – Remove approximately 9.2 circuit miles, 115kV/34.5kV (Urban Switch to Gardenville Substation)							
10.21	Remove 4.6 circuit miles (typically 400 MCM 19 strand Copper) - Line 180	4.60	Mile		$ 17,000	$ 17,000	**$ 78,200**	
10.22	Remove 4.6 circuit miles (typically 336.4 18/1 ACSR) - Line 704	4.60	Mile		$ 16,000	$ 16,000	**$ 73,600**	
10.23	Remove 9.2 miles of existing 3/8” x 7 steel EHS shieldwire	9.20	Mile		$ 12,000	$ 12,000	**$ 110,400**	
10.24	Conductor attachment assembly at Gardenville Substation	1.00	Lot		$ 100,000	$ 100,000	**$ 100,000**	
11	**Structure Removal Work**							
	Line 181/105 – Remove 181 structures (Packard Substation to Ellicott Junction)							
	Remove 37 deadend structures:							
11.1	Remove 34 double circuit lattice deadend towers	34.00	Structure		$ 12,000	$ 12,000	**$ 408,000**	
11.2	Remove 3 single pole wood deadend structures	3.00	Structure		$ 6,000	$ 6,000	**$ 18,000**	
	144 suspension structures:							

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
11.3	Remove 11 double circuit steel suspension towers	11.00	Structure		$ 14,000	$ 14,000	**$ 154,000**	
11.4	Remove 10 double circuit suspension flex towers	10.00	Structure		$ 13,000	$ 13,000	**$ 130,000**	
11.5	Remove 6 H-Frame wood suspension structures	6.00	Structure		$ 10,000	$ 10,000	**$ 60,000**	
11.6	Remove 117 2 pole-wood suspension structures	117.00	Structure		$ 8,000	$ 8,000	**$ 936,000**	
	Line 180/181 – Remove 95 structures (Ellicott Junction to Urban Switch)							
	Remove 58 structures – Ellicott Junction to Pack Club Lane Substation:							
	Remove 18 deadend structures:							
11.8	Remove 14 double circuit lattice deadend towers	14.00	Structure		$ 12,000	$ 12,000	**$ 168,000**	
11.9	Remove 4 double circuit single pole steel deadend structures	4.00	Structure		$ 8,000	$ 8,000	**$ 32,000**	
	Remove 40 suspension structures:							
11.10	Remove 38 double circuit flex towers suspension structures	38.00	Structure		$ 6,600	$ 6,600	**$ 250,800**	
11.11	Remove 1 H-frame suspension structure	1.00	Structure		$ 6,000	$ 6,000	**$ 6,000**	
11.12	Remove 1 double circuit single pole steel suspension structure	1.00	Structure		$ 12,000	$ 12,000	**$ 12,000**	
	Remove 37 structures – Park Club Lane Substation to Urban Switch:							
11.13	Remove 10 double circuit lattice deadend towers	10.00	Structure		$ 12,000	$ 12,000	**$ 120,000**	
	Remove 27 suspension structures:							
11.14	Remove 2 double circuit steel towers suspension structures	2.00	Structure		$ 66,000	$ 66,000	**$ 132,000**	
11.15	Remove 25 double circuit flex towers suspension structures	25.00	Structure		$ 66,000	$ 66,000	**$ 1,650,000**	
	Line 182/92 – Remove 96 structures (Ellicott Junction to Urban Switch)							
	Remove 58 structures – Ellicott Junction to Pack Club Lane Substation							
	Remove 20 deadend structures							
11.15	Remove 13 double circuit lattice deadend towers	13.00	Structure		$ 12,000	$ 12,000	**$ 156,000**	
11.16	Remove 1 single pole wood deadend structure	1.00	Structure		$ 18,000	$ 18,000	**$ 18,000**	
11.17	Remove 5 double circuit steel pole deadend structures	5.00	Structure		$ 14,000	$ 14,000	**$ 70,000**	
11.18	Remove 1 H-frame wood deadend structure	1.00	Structure		$ 6,600	$ 6,600	**$ 6,600**	
	Remove 38 suspension structures:							
11.19	Remove 29 double circuit suspension flex towers	29.00	Structure		$ 14,000	$ 14,000	**$ 406,000**	
11.20	Remove 1 double circuit steel suspension towers	1.00	Structure		$ 6,600	$ 6,600	**$ 6,600**	
11.21	Remove 8 2-pole wood suspension structures	8.00	Structure		$ 8,000	$ 8,000	**$ 64,000**	
	Remove 38 structures – Park Club Lane Substation to Urban Switch:							
11.22	Remove 10 double circuit lattice deadend towers	10.00	Structure		$ 12,000	$ 12,000	**$ 120,000**	
	Remove 27 suspension structures:							
11.23	Remove 2 double circuit steel towers suspension structures	2.00	Structure		$ 6,600	$ 6,600	**$ 13,200**	
11.24	Remove 25 double circuit flex towers suspension structures	25.00	Structure		$ 6,600	$ 6,600	**$ 165,000**	
11.25	Remove 1 switch structure (Urban 369)	1.00	Structure		$ 6,600	$ 6,600	**$ 6,600**	
	Line 182 – Remove 12 structures (Near Urban Switch):							
	Remove 4 deadend structures:							
11.26	Remove 2 double circuit lattice deadend towers	2.00	Structure		$ 16,000	$ 16,000	**$ 32,000**	
11.27	Remove 2 3-pole wood deadend structures	2.00	Structure		$ 8,000	$ 8,000	**$ 16,000**	
	Remove 8 suspension structures:							
11.28	Remove 3 double circuit steel suspension towers	3.00	Structure		$ 8,000	$ 8,000	**$ 24,000**	
11.29	Remove 3 double circuit suspension flex towers	3.00	Structure		$ 6,600	$ 6,600	**$ 19,800**	
11.30	Remove 2 H-frame suspension structures	2.00	Structure		$ 6,000	$ 6,000	**$ 12,000**	
	Line 182/54 – Remove 45 structures (Urban Switch to Gardenville Substation):							
11.31	Remove 12 double circuit lattice deadend towers	12.00	Structure		$ 12,000	$ 12,000	**$ 144,000**	
	Remove 33 suspension structures:							
11.32	Remove 1 double circuit steel suspension tower	1.00	Structure		$ 6,600	$ 6,600	**$ 6,600**	
11.33	*Remove 25 double circuit suspension flex towers:*	25.00	Structure		$ 7,000	$ 7,000	**$ 175,000**	
11.34	Remove 7 2-pole wood suspension structures	7.00	Structure		$ 8,000	$ 8,000	**$ 56,000**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
	Line 180/704 – Remove 54 structures (Urban Switch to Gardenville Substation):							
11.35	Remove 21 double circuit lattice deadend towers	21.00	Structure		$ 12,000	$ 12,000	**$ 252,000**	
11.36	Remove 33 suspension structures							
11.37	Remove 3 double circuit steel towers suspension structures	3.00	Structure		$ 6,600	$ 6,600	**$ 19,800**	
11.38	Remove 30 double circuit flex towers suspension structures	30.00	Structure		$ 6,600	$ 6,600	**$ 198,000**	
12	**Wire Installation**							
	Line 181 – Install approximately 18.8 circuit miles, 115kV (Packard Substation to Park Club Lane Substation)							
12.1	Install 18.8 circuit miles of 1590 kcmil ACSR "FALCON" conductor	18.80	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 2,531,232**	
12.2	Install 18.8 miles of 3/8" x 7 strand EHS steel shieldwire	18.80	Mile	$ 7,920	$ 15,840	$ 23,760	**$ 446,688**	
12.3	Conductor attachment assembly at Packard Substation	1.00	Lot		$ 30,000	$ 30,000	**$ 30,000**	
	Line 182/180 – Install approximately 11.2 circuit miles, 115kV (Ellicott Junction to Park Club Lane Substation)							
	Install 11.2 circuit miles of 1590 kcmil ACSR "FALCON" conductor:							
12.4	Install 5.6 circuit miles of 1590 kcmil ACSR "FALCON" conductor	5.60	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 753,984**	
12.5	Install 5.6 circuit miles of 1590 kcmil ACSR "FALCON" conductor-Line 180	5.60	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 753,984**	
12.6	Install 11.2 miles of 3/8" x 7 strand EHS steel shieldwire	11.20	Mile	$ 7,920	$ 15,840	$ 23,760	**$ 266,112**	
12.7	Conductor attachment assembly at Park Club Lane Substation	1.00	Lot		$ 30,000	$ 30,000	**$ 30,000**	
	Line 181/182 – Install approximately 6.4 circuit miles, 115kV (Park Club Lane Substation to Urban Switch)							
	Install 6.4 circuit miles of 1590 kcmil ACSR "FALCON" conductor:							
12.8	Install 3.2 circuit miles of 1590 kcmil ACSR "FALCON" conductor- Line 181	3.20	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 430,848**	
12.9	Install 3.2 circuit miles of 1590 kcmil ACSR "FALCON" conductor- Line 182	3.20	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 430,848**	
12.10	Install 6.4 miles of 3/8" x 7 strand EHS steel shieldwire	6.40	Mile	$ 7,920	$ 15,840	$ 23,760	**$ 152,064**	
12.11	Conductor attachment assembly at Urban Switch	1.00	Lot		$ 30,000	$ 30,000	**$ 30,000**	
	Line 182/54 – Install approximately 8.2 circuit miles, 115kV (Urban Switch to Gardenville Substation):							
	Install 8.2 circuit miles of 1590 kcmil ACSR "FALCON" conductor:							
12.12	Install 4.5 circuit miles of 1590 kcmil ACSR "FALCON" conductor- Line 182	4.50	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 605,880**	
12.13	Install 3.7 circuit miles of 1590 kcmil ACSR "FALCON" conductor-Line 54	3.70	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 498,168**	
12.14	Install 8.2 miles of 3/8" x 7 strand EHS steel shieldwire	8.20	Mile	$ 7,920	$ 15,840	$ 23,760	**$ 194,832**	
12.15	Conductor attachment assembly at Gardenville Substation	1.00	Lot		$ 30,000	$ 30,000	**$ 30,000**	
	Line 182/54 – Install approximately 0.04 circuit miles, 115kV/115kV (American Standard Tap):							
	Install 0.04 circuit miles of 1590 kcmil ACSR "FALCON" conductor							
12.16	Install 0.02 circuit miles of 1590 kcmil ACSR "FALCON"- Line 182 Tap to American Standard Tap	0.02	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 2,693**	
12.17	Install 0.02 circuit miles of 1590 kcmil ACSR "FALCON" - Line 54 Tap to American Standard Tap	0.02	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 2,693**	
12.18	Conductor attachment assembly at American Standard Tap	1.00	Lot		$ 10,000	$ 10,000	**$ 10,000**	
12.19	OPGW- 7 miles and accessories	7.00	Mile	$ 21,632	$ 29,220	$ 50,852	**$ 355,964**	Includes accessories, splicing & testing
13	**Insulator & Hardware Work**							
	Group D1:							
13.1	Tangent - Porcelain String (10 Discs Assembly)	576.00	Set	$ 900	$ 720	$ 1,620	**$ 933,120**	
13.2	Angle & Deadend Porcelain String (10 Disc Assembly)	1,020.00	Set	$ 1,300	$ 1,040	$ 2,340	**$ 2,386,800**	
13.3	Jumper Post Porcelain String (Assembly)	510.00	Set	$ 500	$ 400	$ 900	**$ 459,000**	
14	**Install Structure Work:**							
	Line 181 – Install approximately 240 structures (60 deadends, 180 suspensions) :							
	(Packard Substation to Park Club Lane Substation)							
	Install 180 structures – Packard Substation to Ellicott Junction							
14.1	Install 37 structures (Type S – Single circuit davit arm steel deadend)	37.00	Structure	$ 50,000	$ 45,000	$ 95,000	**$ 3,515,000**	
14.2	Install 143 structures (Type R – Single circuit davit arm wood suspension)	143.00	Structure	$ 3,500	$ 26,000	$ 29,500	**$ 4,218,500**	
	Install 60 structures – Ellicott Junction to Pack Club Lane Substation							
14.3	Install 23 structures (Type S – Single circuit davit arm steel deadend)	23.00	Structure	$ 47,000	$ 26,000	$ 73,000	**$ 1,679,000**	
14.4	Install 37 structures (Type R – Single circuit davit arm wood suspension)	37.00	Structure	$ 3,500	$ 26,000	$ 29,500	**$ 1,091,500**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
	Line 182/180 – Install approximately 60 structures (26 deadends, 34 suspensions), 115kV (Ellicott Junction to Pack Club Lane Substation)							
14.5	Install 1 structure (Type S – Single circuit davit arm steel deadend)	15.00	Structure	$ 47,000	$ 26,000	$ 73,000	**$ 1,095,000**	
14.6	Install 25 structures (Type Q – Double circuit davit arm steel deadend)	25.00	Structure	$ 29,700	$ 26,730	$ 56,430	**$ 1,410,750**	
14.7	Install 34 structures (Type P – Double circuit davit arm steel suspension)	34.00	Structure	$ 21,000	$ 26,000	$ 47,000	**$ 1,598,000**	
	Line 181/182 – Install approximately 39 structures (14 deadends, 24 suspensions, 1 Hframe deadend switch) (Park Club Lane Substation to Urban Switch):							
14.8	Install 14 structures (Type Q – Double circuit davit arm steel deadend)	14.00	Structure	$ 29,700	$ 26,730	$ 56,430	**$ 790,020**	
14.9	Install 24 structures (Type P – Double circuit davit arm steel suspension)	47.00	Structure	$ 21,000	$ 18,900	$ 39,900	**$ 1,875,300**	
14.10	Install 1 H-frame deadend switch structure and switch (Urban 369) (Type T – H-frame deadend switch)	1.00	Structure	$ 45,000	$ 40,500	$ 85,500	**$ 85,500**	
	Line 182/54 – Install approximately 53 structures (15 deadends, 38 suspension tangents) (Urban Switch to Gardenville Substation)							
14.11	Install 15 structures (Type Q – Double circuit davit arm steel deadend)	15.00	Structure	$ 29,700	$ 26,730	$ 56,430	**$ 846,450**	
14.12	Install 38 structures (Type P – Double circuit davit arm steel suspension)	38.00	Structure	$ 21,000	$ 18,900	$ 39,900	**$ 1,516,200**	
15	**Install Foundation Work:**							
	Line 181 – Install 60 drilled shaft foundations and 180 direct embed holes (Packard Substation to Park Club Lane Substation)							
	Install 60 drilled shaft foundations:							
15.1	Install 47 drilled shaft - 6 feet diameter, depth of 23 feet	47.00	Structure		$ 27,000	$ 27,000	**$ 1,269,000**	Supply and Install
15.2	Type S– Single circuit davit arm steel tangent deadend - foundation accessories, misc. works	47.00	Structure		$ 13,000	$ 13,000	**$ 611,000**	
15.3	Install 13 drilled shaft - 8 feet diameter, depth of 37 feet - foundation accessories, misc. works	13.00	Structure		$ 30,000	$ 30,000	**$ 390,000**	
15.4	Type S– Single circuit davit arm 90° line angle deadend)	13.00	Structure		$ 13,000	$ 13,000	**$ 169,000**	
15.5	Install 180 direct embed holes - embedment depth of 14 feet	180.00	Structure		$ 16,000	$ 16,000	**$ 2,880,000**	
15.6	Type R – Single circuit davit arm wood suspension - - foundation accessories, misc. works	180.00	Structure		$ 13,000	$ 13,000	**$ 2,340,000**	
	Line 182/180 – Install 26 drilled shaft foundations and 34 direct embed holes (Ellicott Junction to Pack Club Lane Substation):							
	Install 26 drilled shaft foundations:							
15.7	Install 1 drilled shaft - 6 feet diameter, depth of 23 feet	1.00	Structure		$ 27,000	$ 27,000	**$ 27,000**	
15.8	Type S – Single circuit davit arm steel tangent deadend - foundation accessories, misc. works	1.00	Structure	$ 18,000	$ 13,000	$ 31,000	**$ 31,000**	
15.9	Install 24 drilled shaft - 6 feet diameter, depth of 31 feet	24.00	Structure		$ 28,000	$ 28,000	**$ 672,000**	
15.10	Type Q – Double circuit davit arm steel tangent deadend - foundation accessories, misc. works	24.00	Structure	$ 29,700	$ 13,000	$ 42,700	**$ 1,024,800**	
15.11	Install 1 drilled shaft - 8 feet diameter, depth of 37 feet	1.00	Structure		$ 35,000	$ 35,000	**$ 35,000**	
15.12	Type Q – Double circuit davit arm 90° line angle deadend - foundation accessories, misc. works	1.00	Structure	$ 29,700	$ 13,000	$ 42,700	**$ 42,700**	
15.13	Install 34 direct embed holes - embedment depth of 20 feet	34.00	Structure		$ 18,000	$ 18,000	**$ 612,000**	Supply and Install
15.14	Type P – Double circuit davit arm steel suspension - foundation accessories, misc. works	34.00	Structure		$ 13,000	$ 13,000	**$ 442,000**	
	Line 181/182 – Install16 drilled shaft foundations and 24 direct embed holes (Park Club Lane Substation to Urban Switch):							
	Install 16 drilled shaft foundations:							
15.15	Install 13 drilled shaft - 6 feet diameter, depth of 23 feet	13.00	structure		$ 27,000	$ 27,000	**$ 351,000**	
15.16	Type Q – Double circuit davit arm steel tangent deadend - foundation accessories, misc. works	13.00	structure	$ 29,700	$ 13,000	$ 42,700	**$ 555,100**	
15.17	Install 1 drilled shaft - 8 feet diameter, depth of 37 feet	1.00	structure		$ 30,000	$ 30,000	**$ 30,000**	Supply and Install
15.18	Type Q – Double circuit davit arm 90° angle deadend - foundation accessories, misc. works	1.00	structure	$ 29,700	$ 13,000	$ 42,700	**$ 42,700**	
15.19	Install 2 drilled shaft – 5 feet diameter, depth of 16 feet	2.00	structure		$ 16,000	$ 16,000	**$ 32,000**	Supply and Install
15.20	Type T – H-frame deadend switch - foundation accessories, misc. works	1.00	structure		$ 15,000	$ 15,000	**$ 15,000**	Supply and Install
15.21	Install 24 direct embed holes - embedment depth of 20 feet	24.00	structure	$ 9,000	$ 18,000	$ 27,000	**$ 648,000**	
15.22	Type P – Double circuit davit arm steel suspension - foundation accessories, misc. works	26.00	structure	$ 9,000	$ 13,000	$ 22,000	**$ 572,000**	
	Line 182/54 – Install 15 drilled shaft foundations and 38 direct embed holes (Urban Switch to Gardenville Substation)							
15.23	Install 15 drilled shaft foundations							

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
15.24	Install 14 drilled shaft - 6 feet diameter, depth of 31 feet	14.00	structure		$ 36,000	$ 36,000	**$ 504,000**	Supply and Install
15.25	Type Q – Double circuit davit arm steel tangent deadend - foundation accessories, misc. works	14.00	structure	$ 29,700	$ 13,000	$ 42,700	**$ 597,800**	
15.26	Install 1 drilled shaft - 8 feet diameter, depth of 38 feet	1.00	structure		$ 38,000	$ 38,000	**$ 38,000**	Supply and Install
15.27	Type Q – Double circuit davit arm 90° angle deadend - foundation accessories, misc. works	1.00	structure	$ 29,700	$ 13,000	$ 42,700	**$ 42,700**	
15.28	Install 38 direct embed holes - embedment depth of 20 feet	38.00	structure		$ 18,000	$ 18,000	**$ 684,000**	
15.29	Type P – Double circuit davit arm steel suspension - foundation accessories, misc. works	38.00	structure	$ 9,000	$ 13,000	$ 22,000	**$ 836,000**	
	Line Switches							
15.3	Supply and Install line switch for WG-D1	1.00	Unit		$ 100,000	$ 100,000	**$ 100,000**	Supply and Install
WG D1 - TOTAL SUPPLY & INSTALL:							**$ 55,276,810**	
WG-E NEW BUS BREAKER AT PACKARD STATION								
16	**New Bus Breaker at Packard Station**							
16.1	GCB 115kV - 3000A, 63kA	1.00	Unit		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
16.2	115LB1WV1 1 Way Loadbreak Switch Vertical (Located at Structure T and includes the pole)	1.00	Structure		$ 250,000	$ 250,000	**$ 250,000**	
16.3	Relocate 1 No. existing 115kV 3000A disconnect switch 343 to the right of tie breaker R342	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	
16.4	Install one new 115kV 123kV , 63kA 3000A SF6 bus tie breaker in series with existing 115kV Areva bus tie R342 b	1.00	Sum	$ 150,000	$ 50,000	$ 200,000	**$ 200,000**	
16.5	Install new cable and conduit between new tie breaker and control house and associated shield cables	1.00	Sum		$ 35,000	$ 35,000	**$ 35,000**	Supply & Install
16.6	Install new set of AL power conductors and AL four hole pad connectors	1.00	Sum		$ 12,000	$ 12,000	**$ 12,000**	
16.7	Install new AL bus and a 5" upper bus extension to existing breaker R2103 and associated disconnect switches	1.00	Sum		$ 18,000	$ 18,000	**$ 18,000**	
16.8	Structures for Switch and Bus Support	1.00	Sum		$ 30,000	$ 30,000	**$ 30,000**	
16.9	Relocate 115kV disconnect switch 2104 and R2103	1.00	Sum		$ 15,000	$ 15,000	**$ 15,000**	
16.10	Grounding all new electrical equipment	1.00	Sum		$ 10,000	$ 10,000	**$ 10,000**	
16.11	Reconnect, control and integration, test and commissioning	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	
16.12	Supply and Install new 115kV switch R2101	1.00	Sum		$ 100,000	$ 100,000	**$ 100,000**	
16.13	Allowance for all secondary electrical works including DC power, AC power and system protection	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	
WG-E - TOTAL SUPPLY & INSTALL:							**$ 880,000**	
WG-F REPLACE THERMALLY LIMITING EQUIPMENT AT PACKARD SUBSTATION FOR LINE 181								
17	**Replace Thermally Limiting Equipment at Packard Substation for Line 181**							
17.1	Conductor & insulator replacement	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	Supply & Install
WG-F - TOTAL SUPPLY & INSTALL:							**$ 200,000**	
WG-G NEW 115kV SWITCHING STATION								
18	**Supply and Install new 115kV Switching Station near Park Club Lane**							
	Structures							
18.1	Angles Bus Support- 3 Phase	7.00	Unit	$ 5,000	$ 10,000	$ 15,000	**$ 105,000**	
18.2	Sta. SVC Stand- 3 Phases	1.00	Unit	$ 15,000	$ 20,000	$ 35,000	**$ 35,000**	
18.3	Switch Stands (assume future SW Stands use bus supports)	18.00	Unit	$ 25,000	$ 30,000	$ 55,000	**$ 990,000**	
18.4	Misc. Structures	1.00	Sum		$ 385,000	$ 385,000	**$ 385,000**	
18.5	Line Terminal (shared columns)	3.00	Unit	$ 18,000	$ 22,000	$ 40,000	**$ 120,000**	
18.6	Lightning Masts	8.00	Unit	$ 45,000	$ 25,000	$ 70,000	**$ 560,000**	
	Equipment		Unit					
18.7	115kV Switches	16.00	Unit		$ 100,000	$ 100,000	**$ 1,600,000**	
18.8	115kV Line Switches	5.00	Unit		$ 100,000	$ 100,000	**$ 500,000**	
18.9	115kV Instrument Transformers	1.00	Sum		$ 545,000	$ 545,000	**$ 545,000**	
18.10	115kV Circuit Breakers	8.00	Unit	$ 150,000	$ 50,000	$ 200,000	**$ 1,600,000**	
18.11	115kV Sta SVC- 1Phase	3.00	Unit	$ 50,000	$ 18,000	$ 68,000	**$ 204,000**	
18.12	Arrestor	15.00	Unit	$ 50,000	$ 25,000	$ 75,000	**$ 1,125,000**	
18.13	Arrestor Sta SVC	3.00	Unit	$ 75,000	$ 25,000	$ 100,000	**$ 300,000**	
	Foundations							
18.14	Grading, Civils, Access Works, Ground Grid, Conduit	1.00	Sum		$ 325,000	$ 325,000	**$ 325,000**	Supply & Install
18.15	Foundations for Low Profile Structures	68.00	Unit		$ 5,000	$ 5,000	**$ 340,000**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
18.16	Caisson DE Structures	10.00	Structure		$ 75,000	$ 75,000	**$ 750,000**	
18.17	115kV Circuit Breaker Pad	8.00	Sum		$ 10,000	$ 10,000	**$ 80,000**	
18.18	Pier Lighting Mast	8.00	Sum		$ 5,000	$ 5,000	**$ 40,000**	
	Control House							
18.19	Control House 35' x 65' (includes supply & install and foundations)	1.00	Sum	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	Supply & Install (includes foundations)
	Protection, Telecom, Connections, Misc.							
18.20	Cable and Wire	1.00	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
18.21	Protection, Telecom and Metering Equipment (Panels)	23.00	Sum		$ 30,000	$ 30,000	**$ 690,000**	Supply & Install
WG-G - TOTAL SUPPLY & INSTALL:							**$ 11,169,000**	
SEGMENT 3								
WG-H PACKARD-HUNTLEY & WALCK-HUNTLEY DOUBLE CIRCUIT LINE WORKS								
Description of Work: Re-conductor 18.2 circuit miles of the Packard-Huntley and Walck - Huntley Double Circuit Line between structures 140 and Huntley Substation. Scope includes foundation and structure works and replacement of insulators, fittings and hardware.								
19	**Wire Removal Work**							
	Line 130/133 – Remove approximately 18.2 circuit miles, 115kV/69kV (Packard Structures 140 and -Huntley Substation):							
19.1	Remove 18.2 circuit miles (typically 350 MCM 19 strand Copper)	18.20	Mile		$ 15,000	$ 15,000	**$ 273,000**	
19.2	Transfer existing 3/8" x 7 steel EHS shieldwire on 6 structures	26.60	Mile		$ 24,000	$ 24,000	**$ 638,400**	
	Structure Removal Work							
	Line 130/133 – Remove 7 double circuit steel deadend lattice towers, 115kV/69kV (Packard Structures 140 and -Huntley Substation):							
	Remove 11 deadend structures:							Supply & Install
19.3	Remove 7 double circuit lattice deadend towers	7.00	Structure		$ 12,000	$ 12,000	**$ 84,000**	
19.4	Remove 4 single pole wood deadend structures	4.00	Structure		$ 6,000	$ 6,000	**$ 24,000**	
19.5	Remove 1 double circuit steel suspension flex tower	1.00	Structure		$ 14,000	$ 14,000	**$ 14,000**	
	Structure Re-inforce Work							
19.6	Install 8 concrete foundation caissons	8.00	Structure		$ 150,000	$ 150,000	**$ 1,200,000**	
19.7	Install 4 wood 3-pole deadend pole structures in kind	4.00	Structure	$ 25,000	$ 25,000	$ 50,000	**$ 200,000**	
19.8	Replace seven double circuit steel deadend lattice towers with double circuit steel deadend single pole structures on concrete foundations.	7.00	Structure		$ 85,000	$ 85,000	**$ 595,000**	Supply & Install
19.9	Replace one double circuit steel suspension flex tower with double circuit steel deadend single pole structure on concrete foundation.	1.00	Structure		$ 85,000	$ 85,000	**$ 85,000**	
19.10	Replace steel members on (16) deadend lattice towers	16.00	Structure		$ 10,000	$ 10,000	**$ 160,000**	
19.11	Replace hardware on (30) double circuit deadend structures	30.00	Structure		$ 4,000	$ 4,000	**$ 120,000**	
19.12	Install longitudinal guys on two flex towers	2.00	Structure		$ 25,000	$ 25,000	**$ 50,000**	
19.13	Install (4) temporary wood single pole deadend structures at every deadend structure to be replaced	44.00	Unit		$ 15,000	$ 15,000	**$ 660,000**	
	Wire Installation							
19.14	*Line 130/133 – Reconductoring, 115kV/69kV (Packard Structures 140 and -Huntley Substation):*							
19.15	Transfer 4 double circuit miles of 1590 kcmil ACSR "FALCON" conductor	4.00	Mile	$ 28,000	$ 40,000	$ 68,000	**$ 272,000**	
19.16	Install 18.2 miles of 3/8" x 7 strand EHS steel shieldwire	18.20	Mile	$ 7,920	$ 15,840	$ 23,760	**$ 432,432**	
19.17	Miscellaneous assemblies	1.00	Lot		$ 30,000	$ 30,000	**$ 30,000**	
19.18	OPGW- 18.2 miles and accessories	18.20	Mile	$ 21,632	$ 29,220	$ 50,852	**$ 925,506**	Supply & Install, Splicing, Accessories etc.
	Insulator & Hardware Work							
19.19	Tangent - Porcelain String (10 Discs Assembly)	390.00	Set	$ 900	$ 720	$ 1,620	**$ 631,800**	
19.20	Angle & Deadend Porcelain String (10 Disc Assembly)	192.00	Set	$ 1,300	$ 1,040	$ 2,340	**$ 449,280**	
19.21	Jumper Post Porcelain String (Assembly)	81.00	Set	$ 500	$ 400	$ 900	**$ 72,900**	
19.22	Shieldwire Suspension Clamps	32.00	Set	$ 500	$ 400	$ 900	**$ 28,800**	
19.23	Shieldwire DE Clamps	80.00	Set	$ 800	$ 640	$ 1,440	**$ 115,200**	
19.24	Miscellaneous materials, dampers, grounding etc.	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
WG-H - TOTAL SUPPLY & INSTALL:							**$ 7,261,318**	
WG-I - UPGRADE AMPACITY OF LINES 130 AND 133 AT HUNTLEY SUBSTATION								
20.1	Upgrade ampacity of Lines 130 & 133 at Huntley Substation	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	Supply & Install
20.2	Remove the span between Structures 80 and 414 on the denergized Beck – Terminal Station C 105 sub-transmission line in the vicinity of Structure 167 per input from NY-TLS. A temporary wood single pole structure may be needed in the vicinity of Structure 80 to mitigate any concerns with unbalanced load at the structure. The section of the Beck – Terminal Station C 105 sub-transmission line sharing the ROW with the 130/133 D/C line will be removed as part of the 115 kV Packard –Urban 181 line proposed scope of work for the Western New York Project.	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	
20.3	Mitigation works to lower the edge of ROW magnetic fields on the Packard – Huntley 130 line between Structures 140 and 160. The scope of work consists of transposing the top and bottom conductor phases on the 130 line outside Huntley Substation and Walck Road Switch Station in the span between Structure 242 and the bus structures at Huntley Substation and between Walck Road Switch and Structure 132 at Walck Road Switch Station.	1.00	Sum		$ 15,000	$ 15,000	**$ 15,000**	
WG-I - TOTAL SUPPLY & INSTALL:							**$ 235,000**	
SEGMENT 4								
WG-J - REFURBISHMENT WORKS ON LINES 191								
	WG-J							
21	**Wire work:**							
21.1	Reconductor 3.6 circuit miles with 2156 kcmil ACSS “Bluebird” conductor.	3.60	Mile	$ 55,440	$ 79,200	$ 134,640	**$ 484,704**	
21.2	Replace 3.2 miles of existing shieldwire with 7/16" EHS shieldwire.	3.20	Mile	$ 7,920	$ 15,840	$ 23,760	**$ 76,032**	
21.3	Transfer conductor, shieldwire and hardware on existing 101, 102, 61 lines to new suspension structures.	13.00	Structure		$ 20,000	$ 20,000	**$ 260,000**	Supply & Install
21.4	Transfer conductor, shieldwire and hardware on existing 101, 102, 61 lines to new deadend structures.	16.00	Structure		$ 25,000	$ 25,000	**$ 400,000**	
21.5	Replace deadend hardware attachment assemblies at the bus structures on the Niagara Substation and Packard Substation.	1.00	Sum		$ 20,000	$ 20,000	**$ 20,000**	
22	**Structure work:**					$ -	**$ -**	
22.1	Replace six double circuit deadend lattice towers with 6 D/C deadend steel davit arm structures.	6.00	Structure		$ 75,000	$ 75,000	**$ 450,000**	Supply & Install
22.2	Replace tower members and bolts on 12 lattice towers	12.00	Structure		$ 50,000	$ 50,000	**$ 600,000**	
22.3	Install 6 caisson foundations (8'x20') for D/C deadend steel davit are structures	6.00	Structure		$ 150,000	$ 150,000	**$ 900,000**	
22.4	Remove concrete footers at 6 structure locations (4 footers per structure)	24.00	Units		$ 20,000	$ 20,000	**$ 480,000**	
WG-J- TOTAL SUPPLY & INSTALL:							**$ 3,670,736**	
SEGMENT 5								
WG-M - LINE WORK 103,104								
23	**Wire and Hardware Work**							
23.1	Reconductor with 795MCM ACRS conductor to sections of lines 103 & 104 of 636MCM ACC	4,000.00	Ft	$ 4	$ 5	$ 9	**$ 34,000**	
23.2	Install 0.1 miles of 3/8” x 7 strand EHS steel shieldwire	0.10	Mile	$ 7,920	$ 15,840	$ 23,760	**$ 2,376**	
	Structure work:							
23.3	Remove existing structures 55A1, 55A2, 55A3, 55B1, 55B2, 55B3, 55B4 and 55B5	5.00	Structure		$ 10,000	$ 10,000	**$ 50,000**	
23.4	Remove existing conductor and 1/2" EHS	5.00	Structure		$ 5,000	$ 5,000	**$ 25,000**	
23.5	Install new steel vertical deadend pulloff structures	2.00	Structure		$ 50,000	$ 50,000	**$ 100,000**	Supply & Install
23.6	Install new steel three pole deadend pullof structure	1.00	Structure		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
	Foundation Work							
23.7	Install 2 foundations using a vibratory caisson, helical pile or other methods	2.00	Structure		$ 75,000	$ 75,000	**$ 150,000**	Supply & Install
23.8	Install 1 new vibratory caisson foundation	1.00	Structure		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
WG-M TOTAL SUPPLY & INSTALL:							**$ 486,376**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
WG-N - LINE WORK 101, 102, 103, 104								
24	**Upgrade ampacity of Lines 101, 102, 103, 104**							
24.1	Replace Thermally Limiting Equipment at Lockport Station for Lines 101, 102	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
WG-N TOTAL SUPPLY & INSTALL:							**$ 500,000**	
SEGMENT 6								
WG-O - NYSEG/NYPA/N GRID - ELIMINATE DOUBLE CIRCUIT CONTINGENCY FOR LINE 61/64								
25	**Eliminate Double Circuit Contingency for Line 61/64**							
25.1	Install "A" Delta Davit Arm Steel Suspension 230kV	1.00	Structure		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
25.2	Install "B" Davit Arm Steel DE 230kV	3.00	Structure					
25.3	Conductoring 0.70 circuit miles of 1590 ACSR for the 64 Line.	8,500.00	Ft	$ 5	$ 8	$ 13	**$ 110,500**	
25.4	Replace OGW overhead ground wire 5/8" Dia (230kV)	2.00	Mile	$ 7,920	$ 15,840	$ 23,760	**$ 47,520**	
25.5	Install 8' Dia x 26' deep reinforced concrete foundation caisson (cylindrical) Structure Type S/Q Angle DE (3 Nos)	50.00	CY		$ 1,500	$ 1,500	**$ 75,000**	Supply & Install
25.6	Direct embedment foundation 72" dia x 20' deep	1.00	EA		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
25.7	96" Dia Hole Rock Coring/ Removal	15.00	LF		$ 6,400	$ 6,400	**$ 96,000**	Supply & Install
	Group O-61/64, P1-181:							
25.8	Tangent - Porcelain String (10 Discs Assembly)	159.00	Set	$ 900	$ 720	$ 1,620	**$ 257,580**	
25.9	Angle & Deadend Porcelain String (10 Disc Assembly)	66.00	Set	$ 1,300	$ 1,040	$ 2,340	**$ 154,440**	
25.10	Jumper Post Porcelain String (Assembly)	33.00	Set	$ 500	$ 400	$ 900	**$ 29,700**	
WG-O TOTAL SUPPLY & INSTALL:							**$ 1,570,740**	
WG-P1 - IDENTIFIED 181 LINE WORK (URBAN SWITCH TO ERIE, NYSEG)								
26	**Foundation Works:**							
26.1	Direct Embed for H Frame's	52.00	Structure		$ 15,000	$ 15,000	**$ 780,000**	Supply & Install
26.2	Caissons for Dead End Structures	8.00	Structure		$ 55,000	$ 55,000	**$ 440,000**	Supply & Install
27	**Structure Work:**							
27.1	Install H Frames	52.00	Structure	$ 3,500	$ 26,000	$ 29,500	**$ 1,534,000**	
27.2	Install Dead Ends	8.00	Structure	$ 42,000	$ 37,800	$ 79,800	**$ 638,400**	
28	**Wire work:**							
28.1	1113 kcmil installation	114,000.00	Ft	$ 4	$ 5	$ 9	**$ 969,000**	
28.2	Install double shield wire	75,600.00	Ft	$ 2	$ 3	$ 5	**$ 340,200**	
29	**Insulators & Hardware Work**							
29.1	Suspension Sets	156.00	Ea.	$ 900	$ 720	$ 1,620	**$ 252,720**	
29.2	Angle / Deadend Sets	48.00	Ea.	$ 1,300	$ 1,040	$ 2,340	**$ 112,320**	
29.3	Shieldwire Fittings / Misc. Works	1.00	Sum		$ 300,000	$ 300,000	**$ 300,000**	Supply & Install
WG-P1 TOTAL SUPPLY & INSTALL:							**$ 5,366,640**	
WG-Q - REPLACE THERMALLY LIMITING EQUIPMENT AT ERIE STN FOR LINE 181								
30	**Replace Thermally Limiting Equipment at Erie Station for Line 181 (NYSEG 922 Line)**							
30.1	Replacing one 115kV circuit breaker	1.00	Unit	$ 150,000	$ 50,000	$ 200,000	**$ 200,000**	
30.2	Instrument Transformers	1.00	Unit		$ 200,000	$ 200,000	**$ 200,000**	
30.3	New disconnect switches	1.00	Lot		$ 100,000	$ 100,000	**$ 100,000**	
30.4	New A&B relay packages	1.00	Lot		$ 50,000	$ 50,000	**$ 50,000**	
30.5	Conductor and insulator replacement	1.00	Lot		$ 200,000	$ 200,000	**$ 200,000**	
30.6	New cabling (control, instrument, power and panel wiring)	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
30.7	Miscellaneous assemblies	1.00	Sum		$ 300,000	$ 300,000	**$ 300,000**	
WG-Q TOTAL SUPPLY & INSTALL:							**$ 1,250,000**	
WG-R - REPLACE THERMALLY LIMITING EQUIPMENT LINE 54 (NYSEG 921)								
31	**Replace Thermally Limiting Equipment at Erie Station for line 54 (NYSEG 921)**							
31.1	Replacing one 115kV circuit breaker	1.00	Unit	$ 150,000	$ 50,000	$ 200,000	**$ 200,000**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
31.2	Instrument Transformers	1.00	Unit		$ 200,000	$ 200,000	**$ 200,000**	
31.3	New disconnect switches	1.00	Lot		$ 100,000	$ 100,000	**$ 100,000**	
31.4	New A&B relay packages	1.00	Lot		$ 50,000	$ 50,000	**$ 50,000**	
31.5	Conductor and insulator replacement	1.00	Lot		$ 200,000	$ 200,000	**$ 200,000**	
31.6	New cabling (control, instrument, power and panel wiring)	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
31.7	Miscellaneous assemblies	1.00	Sum		$ 300,000	$ 300,000	**$ 300,000**	
WG-R TOTAL SUPPLY & INSTALL:							**$ 1,250,000**	
WG-U - REPLACE THERMALLY LIMITING EQUIPMENT ROBINSON STN LINE 64								
32	**Replace Thermally Limiting Equipment at Robinson Station for Line 64**							
32.1	Replacing two 230kV gang operated circuit breaker	2.00	Sum	$ 250,000	$ 75,000	$ 325,000	**$ 650,000**	
32.2	Instrument Transformers	1.00	Unit		$ 200,000	$ 200,000	**$ 200,000**	
32.3	New disconnect switches	1.00	Lot		$ 100,000	$ 100,000	**$ 100,000**	
32.4	New A&B relay packages	1.00	Lot		$ 50,000	$ 50,000	**$ 50,000**	
32.5	Conductor and insulator replacement	1.00	Lot		$ 200,000	$ 200,000	**$ 200,000**	
32.6	New cabling (control, instrument, power and panel wiring)	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
32.7	Miscellaneous assemblies	1.00	Sum		$ 300,000	$ 300,000	**$ 300,000**	
WG-U TOTAL SUPPLY & INSTALL:							**$ 1,700,000**	
WG-V - REPLACE THERMALLY LIMITING EQUIPMENT NIAGARA STN LINE 102								
33	**Replace Thermally Limiting Equipment at Niagara Station for Line 102**							
33.1	Substation Equipment Replacement	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
WG-V TOTAL SUPPLY & INSTALL:							**$ 500,000**	
SEGMENT 7	**Local Transmission Plan**							
MOB/DEMOB, ACCESS, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:								
34	**Contractor Mobilization / Demobilization**						**$ -**	
34.1	Mob / Demob	1.00	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
36	**Project Management, Material Handling & Amenities**					$ -	**$ -**	
36.1	Project Management & Staffing (includes PM, Field Engineers / Supervision, Scheduler and Cost Manager, SHEQ Staff, Materials Management Staff)	36.00	Months		$ 350,000	$ 350,000	**$ 12,600,000**	
36.2	Site Accommodations, Storage, Amenities, Laydown Yards	1.00	Sum		$ 2,500,000	$ 2,500,000	**$ 2,500,000**	
37	**Engineering**					$ -	**$ -**	
37.1	Design Engineering	1.00	Sum		$ 10,000,000	$ 10,000,000	**$ 10,000,000**	
37.2	LiDAR	1.00	Sum		$ 800,000	$ 800,000	**$ 800,000**	
37.3	Geotech	1.00	Sum		$ 1,800,000	$ 1,800,000	**$ 1,800,000**	
37.4	Surveying/Staking	1.00	Sum		$ 800,000	$ 800,000	**$ 800,000**	
38	**Testing & Commissioning**					$ -	**$ -**	
38.1	Testing & Commissioning of T-Line and Equipment	1.00	Sum		$ 2,500,000	$ 2,500,000	**$ 2,500,000**	
39	**Permitting and Additional Costs**					$ -	**$ -**	
39.1	Environmental Licensing & Permitting Costs	1.00	Sum		$ 5,965,150	$ 5,965,150	**$ 5,965,150**	
39.2	Environmental Mitigation Costs	1.00	Sum		$ 7,796,225	$ 7,796,225	**$ 7,796,225**	
39.3	Warranties / LOC's	1.00	Sum		$ 1,277,797	$ 1,277,797	**$ 1,277,797**	
39.4	Real Estate Costs (New)	1.00	Sum		$ 172,069	$ 172,069	**$ 172,069**	
39.5	Real Estate Costs (Incumbent Utility ROW)	1.00	Sum		$ 1,157,000	$ 1,157,000	**$ 1,157,000**	
39.6	Legal Fees	1.00	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
39.7	Sales Tax on Materials	1.00	Sum		$ 4,574,892	$ 4,574,892	**$ 4,574,892**	Includes 8.75% sales tax
39.8	Fees for easements or permits, including roadway, railroad, building or other local permits	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
MOB/DEMOB, ACCESS, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS - TOTAL:							**$ 56,143,133**	
SYSTEM UPGRADE FACILITIES								

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
SUF 1	SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)						$ 3,750,000	Contingency for possible additional SUF upgrades
SYSTEM UPGRADE FACILITY TOTAL:							$ 3,750,000	

ENVIRONMENTAL LICENSING AND PERMITTING

Revision: 4

PROJECT TITLE WNY PROJECT EVALUATION- ENVIRONMENTAL LICENSING & PERMITTING COST ELEMENTS						ENVIRONMENTAL LICENSING & PERMITTING COST ESTIMATE RANGE FOR PROPOSED WNY TRANSMISSION PROJECT - T012									
FEDERAL						Segment 1		Segment 2		Segment 3		Segment 4		Segment 5	
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
USACE	Waters of the US under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act (including regulated wetland areas)	Nationwide Permits (NWP) or Individual Permit (IP)	Any work within the boundaries of regulated wetlands (with the exception of isolated wetlands) or waterways to the spring high tide or ordinary high water mark	If project qualifies for a NWP (<0.5 acre disturbance and within NWP project type parameters), a pre-construction notification (PCN) is typically required. NWPs have a 45 day review period starting from when project logged in system (up to 6wk backlog delay in logging projects) If an IP is triggered, USACE will require Alternative Analysis and Public Notice/Hearing. IPs could also trigger restrictive environmental work windows. IPs have a 120 day review period starting from when permit is "deemed complete"	Wetland Delineation; Wetland Function & Value Assessment; Stream Delineation; Restoration Plan	$27,000	$89,000	$42,500	$118,000	$16,200	$68,750			$11,800	$60,600
USFWS	Endangered Species Act Section 7 (ESA) Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act	Consultation (Formal or Informal); Special Use Permit	Any work that may have an affect on listed species or their habitat; or projects within National Wildlife Refuges	USACE coordinates consultation with USFWS for ESA listed species during their permit review. Also includes the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act compliance. Season restrictions on construction could be imposed.	Rare, Threatened & Endangered Species Search; Preparation of Reports and Conservation Plans	$47,800	$134,000	$57,300	$153,000	$14,300	$67,000	$11,550	$61,500		
FAA	Airports / Airspace	Federal Aviation Administration (FAA) Notification	New or Replacement Structures near Airports	Depending on construction locations, this permit may only be needed for OP work.	Obstruction Analysis, Mitigation Plan (assumes Engineering Cost)	$3,000	$9,000	$3,000	$9,000	$3,000	$9,000	$3,000	$9,000		
STATE															
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans										
NYS Public Service Commission / Department of Public Service (NYSDPS)	Article VII	Article VII: Certificate of Environmental Compatibility and Public Need and Environmental Management & Construction Plan (EM&CP)	Article 7: Major electric transmission facilities with design capacity of 100kV or more extending for at least 10 miles or 125kV and over extending a distance of 1 mile or more (some exclusions for underground transmission applies)	Article 7 will incorporate all of the required State and Local approvals (costed separately), as well as Engineering and Environmental Studies and Public Outreach. Intervenor Fund payment expected to be $100,000. An Environmental Management & Construction Plan (EM&CP) must be prepared and approved by the PSC. (see 16 NYCRR Parts 85 through 88)	Includes Reports and Plans required for State and Federal Agency Permits, as well as EM&CP, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan, Mitigation Plans	$600,000	$3,100,000	$600,000	$3,100,000						
NYSDEC	Article 15 Stream Disturbance; Article 24 Wetlands, Open Waters, Wetlands Buffers (100' for Freshwater Wetland)	Individual Permit (IP) (unless developer has General Permit (GP))	Any work within the boundaries of regulated waterways or wetlands, and wetland adjacent areas	Any disturbance within wetlands and/or below mean high tide will require an IP. Areas of temporary disturbance will likely require restoration, including a monitoring and maintenance period. Permanent disturbance will require offsite mitigation up to 3:1 area ratio; also includes a monitoring and maintenance period. GP may only be applicable if project ground disturbance is located outside of wetlands areas (above MHW).	Wetland Delineation; Wetland Restoration/Mitigation Plan	$12,000	$53,000	$12,000	$53,000	$12,000	$53,000			$12,000	$53,000
NYSDEC	Stormwater (If >1 Acre Soil Disturbance)	SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 & SWPPP	Project areas of soil disturbance	If project involves 1 acre or more soil disturbance, then the GP is required. If located within a Regulated MS4 Municipality, additional coordination may be needed. Weekly inspections by a Qualified Inspector during construction will be required.	SWPPP (assumes Engineering Cost includes Sediment & Erosion Control Plan, Hydraulic & Hydrology Studies, Stormwater Management Design)	$11,200	$38,000	$11,200	$38,000	$11,200	$38,000	$11,200	$38,000		

ENVIRONMENTAL LICENSING AND PERMITTING

Any State or local government agency that issues permits or approvals	State Environmental Quality Review Act (SEQRA)	Environmental Assessment (EA) Determination of Significance	Projects not covered as a Type II Action (Note a project can not be segmented - all phases/tasks must be considered in the review)	Most projects or activities proposed by a state agency, and all discretionary approvals (permits) from a NYS agency or local government, require an environmental impact assessment. SEQR requires the sponsoring or approving governmental body to identify and mitigate the significant environmental impacts of the activity it is proposing or permitting.	Includes Reports and Plans required for State and Federal Agency Permits, as well as, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan					$10,000	$500,000	$10,000	$500,000	$10,000	$10,000
NYSDOS	State Coastal Zone/ Management Areas	Coastal Consistency Concurrence	Projects within the NYSDOS designated Coastal Zone; and consistency with Local Waterfront Revitalization Plans (LWRPs); e.g., Town of Grand Island LWRP	Online mapping available to check if within coastal zone, a significant coastal fish & wildlife habitat (SCFWH), a local waterfront revitalization program area (LWRP), or a comprehensive management program areas (CMP)		$3,400	$15,000			$3,400	$15,000				
NYSHPO	National Historic Preservation Act (NHPA) Section 106: State and Federal Historic Places; State Mapped Archeologically Sensitive Areas	Cultural Resource Information System (CRIS) Determination	Local, State, or Federal eligible or designated historic places and/or areas of archeological sensitivity (in off-road areas and areas that have not been previously disturbed)	NYSDEC EAF Online Mapper identifies State or National Register of Historic Places and archeological sensitive areas within or adjacent to the project site. Formally enter project information and supporting documents into SHPO's online CRIS program. Staff will review and email a determination of impacts letter	Phase 1A & 1B Archaeological Studies	$21,200	$73,000	$25,000	$84,400	$7,750	$32,650	$6,700	$29,500		
NYS NHP	Threatened and Endangered Species	Consultation	Activities that may affect T&E species or their habitat.		See USFWS	$1,200	$6,400	$1,200	$6,400	$1,200	$6,400	$1,200	$6,400		
NYSDOT/NYS Thruway Authority/FHWA	State Roadways	Highway Work Permit/Utility Permit, Vegetation Management Permit; Easement	Any work within or crossing State highway ROW	May require restoration landscaping coordination. Typically requires compliance with NEPA including SHPO and USFWS effects determination	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$17,000	$69,000	$17,000	$69,000						
NYS Canal Corporation	Erie Canal - jurisdiction varies along edge	Canal Occupancy & Work Permit (TA-W99072)	Any work involving the Erie Canal	Must coordinate with Division Permit Engineer about particular section of canal being affected. Commercial permit fee = $25 plus $2,000,000 additional General Aggregate Liability Insurance	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$3,800	$3,800	$3,800	$3,800	$3,800	$3,800				
NYS Dept. of Agriculture and Markets	All agricultural lands (including Agricultural Districts)	Part of Article 7 & Article 10 Review process	Any work impacting agricultural land	Must minimize impacts and restore damage to agricultural land, and coordinate with County Soil & Water Conservation District; Vineyards are a major concern in WNYS. Pre-application conference with PSC, DEC and Ag& Markets recommended. Must develop EM&CP in conformance with Art. 7/10 Certificate Conditions. Agricultural Monitor must oversee construction & restoration; requisite 2-yrs post restoration monitoring.	Crop/Pasturing Mitigation Plan (not included in costing)	$11,000	$24,000	$11,000	$24,000	$11,000	$24,000				
REGIONAL															
Railroads	Railroad crossings	Consultation-permits may be required; Easement	Access / new structures on RR property		Easement area survey (not included in costs)	$11,000	$76,000	$11,000	$76,000						
LOCAL/MUNICIPAL															

ENVIRONMENTAL LICENSING AND PERMITTING

Revision: 4

Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans										
County Dept. of Public Works	County Roadways	Lane Closure Permit, Highway Work or Access Permit	Work within county roadways and right-of-ways			$6,000	$40,000	$6,000	$40,000	$6,000	$40,000	$6,000	$40,000		
Town, City or Village	Municipal Stormwater (MS4) Review	Approval of SWPPP or EM&CP	Project areas of soil disturbance		See NYSDEC SPDES	$6,000	$35,000	$6,000	$35,000	$6,000	$35,000	$6,000	$35,000		
Town, City or Village	Variable	Building Permits	New Structures	Individual Towns/Villages must be consulted on a project specific basis to determine notification and/or permitting procedures. Permit application names vary (e.g. road obstruction permit)		$18,000	$92,000	$18,000	$92,000	$18,000	$92,000	$18,000	$92,000		
Town, City or Village	Municipal Roadways	Highway Work Permit; Road Opening Permit	Work within municipal roadways and right-of-ways			$6,000	$35,000	$6,000	$35,000	$6,000	$35,000	$6,000	$35,000		
Town, City or Village	Wetlands	Wetland Permit / Conservation Approvals	Mapped wetlands and wetland adjacent areas (buffer width variable)		See USACE / NYSDEC Art. 24	$6,000	$52,000	$6,000	$52,000	$6,000	$52,000	$6,000	$52,000		
					Total Cost Range by Segment	$811,600	$3,944,200	$837,000	$3,988,600	$135,850	$1,071,600	$85,650	$898,400	$33,800	$123,600

		Minimum	Maximum	Expected Value
ENVIRONMENTAL LICENSING & PERMITTING COST (EXCLUDING MITIGATION)	**PROJECT TOI2 TOTAL**	**$1,903,900**	**$10,026,400**	**$5,965,150**

Excluded cost: Mitigation or restoration for impact to regulated wetlands; agricultural land and tree clearing

ENVIRONMENTAL MITIGATION ESTIMATE

	Offsite Wetland Mitigation*		ROW Restoration (Seeding)**		Farmland***	
	Min.	Max.	Min.	Max.	Min.	Max.
Area	21 acres	21 acres	82 acres	163 acres	50 acres	100 acres
Cost/Acre	$100,000	$200,000	$4,000	$4,000	$503	$503
Ratio	1:1	3:1	1:1	1:1	1:1	1:1
Total	$2,100,000	$12,600,000	$328,000	$489,000	$25,150	$50,300

T012 MITIGATION TOTAL	**Minimum**	**Maximum**	**Expected Value**
	$2,453,150	**$13,139,300**	**$ 7,796,225**

*Offsite wetland mitigation area assumes 9141 LF Forested Wetland Project Impact Reported in Permitting Summary Table by 100' ROW clearing width; includes design and installation costs only; does not include land acquisition or long term monitoring

**Assumes hydroseeding restoration only for sensitive areas within the ROW requiring timber matting (minus Active Agriculture) 141990 LF by 25' Wide (Min.) or 50' Wide (Max.)

***Farmland mitigation based on corn bushel yield at 129 BU/Acre and $3.9/BU (production numbers from 2016 USDA NYS Agriculture Overview), area assumes 87,558 LF Matting Impacts to Active Agriculture Land by 25' Wide (Min.) or 50' Wide (Max.); does not include land acquisition or monitoring

REAL ESTATE ESTIMATE
(NEW ROW)

COUNTY: NIAGARA
DEVELOPER: NATIONAL GRID
SEGMENT: NIAGARA TO LOCKPORT SEGMENT

		Area (Acres)	Total Cost
	Total Cost	17.98	$ 172,069

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T012 - National Grid High Power Transfer

Revision: 4

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

COUNTY: NIAGARA & ERIE
DEVELOPER: NATIONAL GRID (T012)
SEGMENT: NIAGARA - GARDENVILLE SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
T012	National Grid (High Transfer)	Niagara to Gardenville - 36.2 miles	Niagara	203.82	$ 1,157,224
			Erie	92.85	

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

a) Cost Estimate is based on 2017 rates.
b) Construction Schedule is in accordance with the Developers proposed schedule - we have assumed continuous working with no breaks in the
c) Stringing rates allow for protection over crossings (such as rider poles).
d) We have assumed a typical work week (6 x 10 hour days).
e) We have assumed that pole weights include anchor bolts.
f) The Developer has assumed gravel work pads. During our ROW visit it was determined that matted work pads are required.
g) Costs will vary for handling and disposal of contaminated spoils, depending on type of contaminants and availability / location of the appropriate tipping facility. Since there is not enough information to provide a quantified estimate for this item, allowance is included in the contingency monies.
h) Costs have been developed based on historical data from Projects of a similar nature (AACE Class 5 and 4 Estimating Practices). We have not engaged any subcontractors or material vendors for formal quotes.
i) 15% Contractor Mark Up (OH&P) has been applied.
j) Assumes all environmental data and project details provided are accurate unless noted otherwise
k) USFWS T&E Assumes that ¼ of the total project route per segment will require field survey for T&E (Segment 1 – 9 miles, Segment 2 – 10.9 miles, Segment 3 – 2.28 miles, Segment 4 – 1.75 miles)
l) NEPA-Assumes no NEPA because Art VII (Segments 1 and 2)
m) Article 7 Intervenor Fund payment expected to be $100,000
n) SHPO- Assumes consultation and Phase 1A/1B archeological studies with field survey for 50% of project route (Segment 1 – 18 miles, Segment 2 – 21.8 miles, Segment 3 – 4.55 miles, Segment 4 – 3.5 miles)
o) NYSDOT/FHWA-Assumes any required NEPA coordination/requirements are covered under Article VII or SEQRA review
p) SEQRA for Segments 3, 4 and 5 assumes applicant is not lead agent. Minimum costs assume FEAF Part I with no additional studies. Maximum assumes an expanded EA. SEQRA for Segment 5 assumes minimum only costs.
q) Assumes no coordination with National Parks Service or OPRHP/State Parks
r) NYSDOS – Assumes coordination needed for work at Niagara Station and Huntley Station (Segments 1 and 3)
s) USACE wetland delineation totals assumed length of NWI wetland estimates on Permitting Summary Table. Assumes work group line segment length not duplicated (Segment 1 - 4 miles, Segment 2 - 7.9 miles, Segment 3 - 1.3 mile, Segment 5 – 0.2 miles). Assumes NYSDEC delineations overlap and are
t) Mitigation costs for landscaping only (no paving, sidewalks, soundwalls, etc.)
u) No tree survey or replanting required outside regulated wetlands areas
v) Agricultural mitigation (Segment 1 only) assumes timber matting impacts and pad impacts on active agriculture land linear feet (87,558) requires crop damage payments based on USDA 2016 NYS Agriculture Overview corn yield and bushel price/acre. Minimum assumes 25-foot-wide impact, Maximum

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

w) Wetland mitigation area 100' wide ROW by 9141' Forested Wetland Project Impact (Segment 1) Reported in Permitting Summary Table. Wetland mitigation includes design and installation costs only; does not include land acquisition or long term monitoring. Offsite mitigation for new ROW disturbance at 1:1 and 3:1 and mitigation within ROW seeding only. Assumes no off-site wetland mitigation is required for other work segments.
x) System Upgrade Facilities Contingency is allowance for potential additional system upgrades including overdutied breakers, protection changes, unidentified thermal issues, etc that may be identified as detailed studies are completed.

INDEPENDENT ESTIMATES

ATTACHMENT B7

T013 – NYPA/ NYSEG

SUBSTATION ENGINEERING COMPANY
8/11/2017

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T013 - NYPA and NYSEG

Revision: 4

SUMMARY OF COST ESTIMATE

	Description	Total Amount
1	DYSINGER SWITCHING STATION	$ 21,947,000
2	GARDENVILLE TO STOLLE ROAD 230KV TRANSMISSION LINE RECONDUCTORING	$ 14,140,200
3	LINE SEPARATION	$ 2,292,025
4	SOUTH PERRY SUBSTATION	$ 5,421,000
5	STOLLE ROAD SUBSTATION	$ 36,859,022
6	DYSINGER - STOLLE ROAD NEW 345kV TRANSMISSION LINE	$ 46,864,263
7	MOB/DEMOB, ACCESS, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS	$ 40,364,217
	CONTRACTOR MARK UP (OH&P) 15%	$ 25,183,159
	SUBTOTAL:	$ 193,070,885
	CONTINGENCY ON ENTIRE PROJECT (20%)	$ 38,614,177
	TOTAL PROJECT COST:	**$ 231,685,063**

SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

Revision: 4

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
1. DYSINGER SWITCHING STATION								
Description of Work: The proposed new Dysinger Switching Station, an approximately five acre station, is planned to be located in the Town of Royalton in Niagara County, New York. The station requires the acquisition of one parcel of property.								
1	**Supply and Install a New Switching Station**							
1.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement	1.0	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
1.2	Substation Fence	2,020.0	LF		$ 200	$ 200	**$ 404,000**	Supply & Install
1.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
1.4	Switches 3ph	16.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 112,000**	
1.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
1.6	Line Switches 3 ph with motor-operator	5.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 150,000**	
1.7	Instrument Transformers	1.0	Sum		$ 962,000	$ 962,000	**$ 962,000**	
1.8	Breakers	8.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 3,040,000**	
1.9	Arrestors (3 per line)	15.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 112,500**	
1.10	Two (2) 345 kV buses	2.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
1.11	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
1.12	Low Profile Foundations	293.0	Ea		$ 5,000	$ 5,000	**$ 1,465,000**	Supply & Install
1.13	Caisson DE Foundations	32.0	Ea		$ 50,000	$ 50,000	**$ 1,600,000**	Supply & Install
1.14	Circuit Breaker Foundations	8.0	Ea		$ 75,000	$ 75,000	**$ 600,000**	Supply & Install
1.15	SST Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
1.16	345 KV Line trap, 2400 A, for phase B on the line to Stolle Rd.	1.0	Ea	$ 15,000	$ 12,000	$ 27,000	**$ 27,000**	Supply & Install
1.17	Control House and Pad (30' x 90')	1.0	Ea	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	
1.18	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
1.19	Control Cables	1.0	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
1.20	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
1.21	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	
1.22	Protection, Telecom and Metering Equipment (Panels)	30.0	Ea		$ 30,000	$ 30,000	**$ 900,000**	Supply & Install
1.23	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
1.24	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
1.25	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
1.26	Cable Trench Systems for Control Cables	1.0	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
1.27	Grounding	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
1.28	Bus Support 1 Ph	118.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 354,000**	
1.29	Switch Stands	23.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 253,000**	
1.30	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
1.31	Misc. Structures	1.0	Sum		$ 44,000	$ 44,000	**$ 44,000**	
1.32	Substation A-Frame Structures Shared Column	12.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 300,000**	
1.35	Arrestor Stands	15.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 52,500**	
1.36	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
1.37	Connection of Existing Lines to Dysinger Switchyard	1.0	Sum		$ 5,000,000	$ 5,000,000	**$ 5,000,000**	Supply & Install
1. DYSINGER SWITCHING STATION - TOTAL SUPPLY & INSTALL:							**$ 21,947,000**	
2. GARDENVILLE TO STOLLE ROAD 230KV TRANSMISSION LINE RECONDUCTORING								
Description of Work: The Gardenville - Stolle Road section includes re-conductoring approximately 12 miles of the existing 230kV Line Gardenville -Stolle Road Circuit #66, between the Towns of West Seneca and Elma, Erie County. The line crosses 14 roads and two railroads. The existing line is supported by double circuit steel structure towers for most of the 12 miles and transitions to wood H-Frame structures for the last four miles connecting to Stolle Road Substation. The project utilizes the existing structures for the re-conductoring. The project also includes upgrade of existing protection relays in the remote ends of Gardenville and Stole Road Substations.								
2	**230kV Reconductoring**						**$ -**	
2.1	Reconductoring 1590 ACSR Falcon	250,000.00	Ft	$ 3	$ 5	$ 8	**$ 1,875,000**	
2.2	Reconductoring shield wire	83,000.00	Ft	$ 1	$ 5	$ 6	**$ 473,100**	
2.3	Reconductoring 48 fibers OPGW (1)	83,000.00	Ft	$ 4	$ 5	$ 9	**$ 763,600**	
2.4	OPGW Splice Boxes	5.00	Ea	$ 1,500	$ 1,000	$ 2,500	**$ 12,500**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
2.5	OPGW Splice & Test	1.00	Sum		$ 6,000	$ 6,000	**$ 6,000**	
2.6	Insulators for suspension structures (ANSI 52-5 and 52-8)	96.00	Set	$ 1,500	$ 1,500	$ 3,000	**$ 288,000**	
2.7	Miscellaneous including hardware, guying, etc.	12.00	Mile		$ 30,000	$ 30,000	**$ 360,000**	Supply & Install
2.8	Matting for wetland & sensitive areas	105,600.00	Ft		$ 70	$ 70	**$ 7,392,000**	
2.9	Access Roads	140.00	Structure		$ 10,000	$ 10,000	**$ 1,400,000**	
2.10	Remove existing conductor	8.00	Mile	$ 15,000	$ 15,000	$ 30,000	**$ 240,000**	
2.11	Replacement of 20% of steel structure arms and cross sections	12.00	Structure	$ 10,000	$ 10,000	$ 20,000	**$ 240,000**	
2.12	Replacement of 20% of wood H-Frames pieces	6.00	Structure	$ 7,500	$ 7,500	$ 15,000	**$ 90,000**	
2.13	Miscellaneous	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
2. GARDENVILLE TO STOLLE ROAD 230KV TRANSMISSION LINE RECONDUCTORING- TOTAL SUPPLY & INSTALL:							**$ 14,140,200**	
3. LINE SEPARATION								
Description of Work: The project includes separation of three structures approximately 3,000 feet of National Grid's Niagara to Packard line 61 and NYSEG's Niagara to Robinson Road line 64.								
3.1	Foundations - Tangents-Delta Configuration-1(single circuit)	1.00	EA		$ 60,000	$ 60,000	**$ 60,000**	Supply & Install
3.2	Foundations - Slight-Angles-Vertical Configuration	1.00	EA		$ 90,000	$ 90,000	**$ 90,000**	Supply & Install
3.3	Foundations - Heavy Angle-Vertical Configuration (15-25 degrees))-1 (double circuit)	1.00	EA		$ 120,000	$ 120,000	**$ 120,000**	Supply & Install
3.4	Foundations - Dead-Ends Vertical Configuration (25-90 degrees)- 2 (single circuit)	1.00	EA		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
3.5	Steel Poles 345kV Heavy Dead-End Structures	1.00	EA	$ 125,000	$ 75,000	$ 200,000	**$ 200,000**	
3.6	Steel Poles 345kV Slight Angles Vertical Structures	1.00	EA	$ 117,000	$ 80,300	$ 197,300	**$ 197,300**	
3.7	Steel Poles 345kV Angles >60 Structures	1.00	EA	$ 93,500	$ 56,000	$ 149,500	**$ 149,500**	
3.8	Steel Poles 345kV Tangent-Delta Configuration Structures	1.00	EA	$ 38,000	$ 23,000	$ 61,000	**$ 61,000**	
3.9	Conductoring 1192 45/7" "BUNTING" ACSR	20,000.00	Ft	$ 3	$ 5	$ 8	**$ 160,000**	
3.10	Shield wiring 7/16 EHS Static	5,000.00	Ft	$ 1	$ 5	$ 6	**$ 28,500**	
3.11	V-strings Suspension and tension strings hardware, OPGW, vibration dampers and spacers	20.00	EA	$ 5,000	$ 5,000	$ 10,000	**$ 200,000**	
3.12	Insulators for suspension structures (ANSI 52-5 and 52-8)	30.00	EA	$ 850	$ 850	$ 1,700	**$ 51,000**	
3.13	Miscellaneous	1.00	Sum		$ 100,000	$ 100,000	**$ 100,000**	
3.14	Matting for wetland & sensitive areas	5,280.00	Ft		$ 70	$ 70	**$ 369,600**	
3.15	Access Roads to each structure	6.00	EA		$ 10,000	$ 10,000	**$ 60,000**	
3.16	Work Pads	75,000.00	SQFT		$ 4	$ 4	**$ 264,000**	
3.17	Restoration of Work Pad Areas	7,500.00	SQFT		$ 0.2	$ 0.2	**$ 1,125**	
3.18	Clearing existing ROW for work spaces	2.00	Acre		$ 15,000	$ 15,000	**$ 30,000**	
3. LINE SEPARATION- TOTAL SUPPLY & INSTALL:							**$ 2,292,025**	
4. SOUTH PERRY SUBSTATION								
Description of Work: The project includes upgrades to the existing South Perry Substation.								
4	**Supply and Install New Phase Angle Regulator**							
4.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement	1.00	Sum		$ 375,000	$ 375,000	**$ 375,000**	
4.2	Substation Fence	375.00	LF		$ 200	$ 200	**$ 75,000**	Supply & Install
4.3	115kV 82MVA Phase Angle Regulator	1.00	Ea	$ 3,500,000	$ 500,000	$ 4,000,000	**$ 4,000,000**	
4.4	Switches 3ph	2.00	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 14,000**	
4.5	Line Switches 3 ph with motor-operator	1.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 30,000**	
4.6	Instrument Transformers	1.00	Sum		$ 121,000	$ 121,000	**$ 121,000**	
4.7	Arrestors	9.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 67,500**	
4.8	Low Profile Foundations	11.00	Ea		$ 5,000	$ 5,000	**$ 55,000**	Supply & Install
4.9	Caisson DE Foundations	4.00	Ea		$ 50,000	$ 50,000	**$ 200,000**	Supply & Install
4.10	Control Cables	1.00	Sum	$ 10,000	$ 10,000	$ 20,000	**$ 20,000**	
4.11	Protection, Telecom and Metering Equipment (Panels)	4.00	Ea		$ 30,000	$ 30,000	**$ 120,000**	Supply & Install
4.12	Control Conduits to Equipment	1.00	Sum		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
4.13	Grounding	1.00	Sum		$ 90,000	$ 90,000	**$ 90,000**	Supply & Install

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
4.14	Bus Support 1 Ph	3.00	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 9,000**	
4.15	Switch Stands	2.00	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 22,000**	
4.16	Misc. Structures	1.00	Sum		$ 12,000	$ 12,000	**$ 12,000**	
4.17	Substation A-Frame Structures	1.00	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 25,000**	
4.18	Arrestor Stands	3.00	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 10,500**	
4.19	Miscellaneous Materials and Above / Below Ground Works	1.00	Sum		$ 100,000	$ 100,000	**$ 100,000**	
4. SOUTH PERRY SUBSTATION- TOTAL SUPPLY & INSTALL:							**$ 5,421,000**	
5. STOLLE ROAD SUBSTATION								
Description of Work: The project includes upgrades to the existing Stolle Road Substation.								
5	**Supply and Install Substation upgrading equipment**							
5.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement	1.00	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
5.2	345-230kV, 240/320/400/448 MVA (55//65 deg C) Auto-transformer connected Y-Y-Delta	2.00	Ea	$ 3,900,000	$ 500,000	$ 4,400,000	**$ 8,800,000**	
5.3	345 kV, 3000A, 40ka Breakers, IPO	9.00	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 3,420,000**	
5.4	345 kV, 3000A, 3PH-GOP, 63 kA, motor-operated switches	18.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 540,000**	
5.5	345 kV, 3000A, 3PH-GOP, 63 kA, motor-operated switches equipped w/interlocked grounding switch	1.00	Ea	$ 20,000	$ 16,000	$ 36,000	**$ 36,000**	
5.6	Instrument Transformers	1.00	Sum		$ 1,137,200	$ 1,137,200	**$ 1,137,200**	
5.9	Station Class Surge Arresters - ratings: 276 kV/220 kV MVOC	21.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 157,500**	
5.10	345 KV Line trap, 2400 A, for phase B on the line to Dysinger	1.00	Ea	$ 15,000	$ 12,000	$ 27,000	**$ 27,000**	
5.11	XLPE Cable 2000 KCM Supply and Installation	3,000.00	Ft	$ 60	$ 48	$ 108	**$ 324,000**	
5.12	Terminations	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	Supply & Install
5.13	Ductbank	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
5.14	345 kV Post Insulators	37.00	Ea	$ 750	$ 600	$ 1,350	**$ 49,950**	
5.15	5" AL T6-6061 IPS Bus bar	4,068.00	Ft	$ 5	$ 4	$ 8	**$ 32,544**	
5.16	1590 KCM AAC Overhead Cable	12,972.00	Ft	$ 3	$ 2	$ 5	**$ 58,374**	
5.17	Control House Steel 26' x 62' and Pad	1.00	Ea	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	
5.18	RELAY BUS DIFF 115 KV GE B30 SYS B	3.00	Ea	$ 12,000	$ 9,600	$ 21,600	**$ 64,800**	
5.19	RELAY BUS DIFF 115 KV SEL 487B SYS A	3.00	Ea	$ 7,000	$ 5,600	$ 12,600	**$ 37,800**	
5.20	RELAY SEL 421 LN DIST APP SYS A	1.00	Ea	$ 7,000	$ 5,600	$ 12,600	**$ 12,600**	
5.21	RELAY CAP BK/MFER/LN B 115 KV SYSA SEL451	9.00	Ea	$ 5,000	$ 4,000	$ 9,000	**$ 81,000**	
5.22	RELAY BUS DIFF 345 KV SEL 487E SYS A	4.00	Ea	$ 9,000	$ 7,200	$ 16,200	**$ 64,800**	
5.23	RELAY GE T60 345/115/34/12/KV TFR DIFF/RE	4.00	Ea	$ 9,000	$ 7,200	$ 16,200	**$ 64,800**	
5.24	RELAY PRT MOD GE L90 W7K	1.00	Ea	$ 14,000	$ 11,200	$ 25,200	**$ 25,200**	
5.25	Protection, Telecom and Metering Equipment (Panels)	17.00	Ea	$ 5,000	$ 4,000	$ 9,000	**$ 153,000**	
5.26	Guard 800, RFL 9780, 9785	3.00	Ea	$ 10,000	$ 8,000	$ 18,000	**$ 54,000**	
5.27	125VDC Substation Battery Systems (345 kV)	2.00	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
5.28	(345 kV, 230 KV, 115 kV)	1.00	Ea	$ 3,750	$ 3,000	$ 6,750	**$ 6,750**	
5.29	JMUX's (Including remote ends)	3.00	Ea	$ 9,000	$ 7,200	$ 16,200	**$ 48,600**	
5.30	HVI-Positron (Including remote ends)	3.00	Ea	$ 15,000	$ 12,000	$ 27,000	**$ 81,000**	
5.31	230 kV, 3000A, 40ka Breakers, 3PH-GOP	5.00	Ea	$ 250,000	$ 75,000	$ 325,000	**$ 1,625,000**	
5.32	230 kV, 3000A, 3PH-GOP, 63 kA, motor-operated switches	12.00	Ea	$ 20,000	$ 15,000	$ 35,000	**$ 420,000**	
5.33	230 kV, 3000A, 3PH-GOP, 63 kA, motor-operated switches equipped w/interlocked grounding switch	1.00	Ea	$ 20,000	$ 15,000	$ 35,000	**$ 35,000**	
5.34	230 kV S/P CCVT, 207000:115-69V (1800-3000:1-1) Instrument Transformers	18.00	Ea	$ 14,000	$ 8,000	$ 22,000	**$ 396,000**	
5.35	Station Class Surge Arresters - ratings: 172 kV/140 kV MVOC	21.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 157,500**	
5.36	XLPE Cable 2000 KCM Supply and Installation	11,448.00	Ft	$ 15	$ 12	$ 26	**$ 297,648**	
5.37	230 kV Post Insulators	39.00	Ea	$ 650	$ 520	$ 1,170	**$ 45,630**	
5.38	5" AL T6-6061 IPS Bus bar	1,951.00	Ft	$ 5	$ 4	$ 8	**$ 15,608**	
5.39	1590 KCM AAC Overhead Cable	2,000.00	Ft	$ 2	$ 2	$ 4	**$ 7,200**	
5.40	RELAY BUS DIFF 115 KV GE B30 SYS B	1.00	Ea	$ 12,000	$ 9,600	$ 21,600	**$ 21,600**	
5.41	RELAY BUS DIFF 115 KV SEL 487B SYS A	1.00	Ea	$ 7,000	$ 5,600	$ 12,600	**$ 12,600**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
5.42	RELAY SEL 421 LN DIST APP SYS A	4.00	Ea	$ 7,000	$ 5,600	$ 12,600	**$ 50,400**	
5.43	RELAY CAP BK/MFER/LN B 115 KV SYSA SEL451	7.00	Ea	$ 5,000	$ 4,000	$ 9,000	**$ 63,000**	
5.44	RELAY PRT MOD GE L90 W7K	4.00	Ea	$ 14,000	$ 11,200	$ 25,200	**$ 100,800**	
5.45	Protection & Control Panels	7.00	Ea	$ 5,000	$ 4,000	$ 9,000	**$ 63,000**	
5.46	Guard 800, RFL 9780, 9785	10.00	Ea	$ 10,000	$ 8,000	$ 18,000	**$ 180,000**	
5.47	125VDC Substation Battery Systems (230 kV)	2.00	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
5.48	115 kV, 3000A, 40ka Breakers, 3PH-GOP	2.00	Ea	$ 150,000	$ 50,000	$ 200,000	**$ 400,000**	
5.49	115 kV, 3000A, 3PH-GOP, 63 kA, motor-operated switches	5.00	Ea	$ 15,000	$ 12,000	$ 27,000	**$ 135,000**	
5.51	Station Class Surge Arresters - ratings: 96 kV/76 kV MVOC	6.00	Ea	$ 5,000	$ 700	$ 5,700	**$ 34,200**	
5.52	XLPE Cable 2000 KCM Supply and Installation	5,500.00	Ft	$ 15	$ 12	$ 26	**$ 143,550**	
5.53	4" AL T6-6061 IPS Bus bar	306.00	Ft	$ 4	$ 3	$ 6	**$ 1,928**	
5.54	1590 KCM AAC Overhead Cable	400.00	Ft	$ 2	$ 2	$ 4	**$ 1,440**	
5.55	RELAY CAP BK/MFER/LN B 115 KV SYSA SEL451	2.00	Ea	$ 5,000	$ 4,000	$ 9,000	**$ 18,000**	
5.56	Protection & Control Panels	1.00	Ea	$ 5,000	$ 4,000	$ 9,000	**$ 9,000**	
5.57	Miscellaneous Materials and Above / Below Ground Works	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
5.58	Control Cables	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
5.59	Conduit	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
5.60	Cable trenches	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
5.61	Bus works	1.00	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
5.62	Cable and Wire	1.00	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
5.63	New fence	3,040.00	LF		$ 200	$ 200	**$ 608,000**	Supply & Install
5.64	SCADA and Communications	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
5.65	Commissioning and Testing	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	Supply & Install
5.66	Low Voltage AC Distribution & DC Panels & Switches	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
5.67	Low Profile	402.00	Structure		$ 5,000	$ 5,000	**$ 2,010,000**	Supply & Install
5.68	Caisson Dead End	31.00	Structure		$ 50,000	$ 50,000	**$ 1,550,000**	Supply & Install
5.69	Circuit Breaker	16.00	Structure		$ 75,000	$ 75,000	**$ 1,200,000**	Supply & Install
5.70	Lightning Mast	17.00	Structure		$ 15,000	$ 15,000	**$ 255,000**	Supply & Install
5.71	Transformer with concrete moat and double steel grating.	2.00	Structure		$ 150,000	$ 150,000	**$ 300,000**	Supply & Install
5.72	Bus Support 1ph	77.00	Unit	$ 2,000	$ 1,000	$ 3,000	**$ 231,000**	
5.73	Bus Support 3ph	12.00	Unit	$ 4,500	$ 2,000	$ 6,500	**$ 78,000**	
5.74	Switch Stands	37.00	Unit	$ 8,000	$ 3,000	$ 11,000	**$ 407,000**	
5.75	Misc. Structures	1.00	Sum		$ 90,000	$ 90,000	**$ 90,000**	
5.76	Lightning Masts 70-ft	17.00	Unit	$ 10,000	$ 2,000	$ 12,000	**$ 204,000**	
5.77	A-frame Dead End	8.00	Unit	$ 20,000	$ 5,000	$ 25,000	**$ 200,000**	
5.78	H-frame Dead End	2.00	Unit	$ 30,000	$ 15,000	$ 45,000	**$ 90,000**	
5.79	UG Riser Structure 1ph (assume [2] fnds per ph.)	40.00	Unit	$ 15,000	$ 15,000	$ 30,000	**$ 1,200,000**	
5.80	Grounding	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
5. STOLLE ROAD SUBSTATION - TOTAL SUPPLY & INSTALL:							**$ 36,859,022**	
6. DYSINGER - STOLLE ROAD NEW 345kV TRANSMISSION LINE								
Description of Work: The construction of a new approximately 20 miles 345kV single circuit overhead transmission line originating at the new Dysinger Switching Station, and terminating at the existing NYSEG Stolle Road Substation.								
6	**New 345kV Transmission Line**							
6.1	Foundations for Tangents-Delta Configuration	143.00	Structure		$ 60,000	$ 60,000	**$ 8,580,000**	Supply & Install
6.2	Foundations for Slight-Angles-Vertical Configuration	3.00	Structure		$ 90,000	$ 90,000	**$ 270,000**	Supply & Install
6.3	Foundations for Heavy Angle-Vertical Configuration	1.00	Structure		$ 120,000	$ 120,000	**$ 120,000**	Supply & Install
6.4	Foundations Dead-Ends Vertical Configuration	12.00	Structure		$ 150,000	$ 150,000	**$ 1,800,000**	Supply & Install
6.5	Steel Poles 345kV Heavy Dead-End Structures	12.00	Structure	$ 125,000	$ 75,000	$ 200,000	**$ 2,400,000**	
6.6	Steel Poles 345kV Slight Angles Vertical Structures	3.00	Structure	$ 67,000	$ 40,000	$ 107,000	**$ 321,000**	
6.7	Steel Poles 345kV Angles >60 Structures	1.00	Structure	$ 93,500	$ 56,000	$ 149,500	**$ 149,500**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate	TOTAL	Remarks
6.8	Steel Poles 345kV Tangent-Delta Configuration Structures	143.00	Structure	$ 38,000	$ 23,000	$ 61,000	**$ 8,723,000**	
6.9	Conductoring double bundled 795 Drake ACSR	650,000.00	Ft	$ 2	$ 5	$ 7	**$ 4,355,000**	
6.10	Shield wiring of 7#9 Alumoweld (1)	111,000.00	Ft	$ 1	$ 5	$ 6	**$ 632,700**	
6.11	Wiring of 48 fibers OPGW (1)	111,000.00	Ft	$ 4	$ 5	$ 9	**$ 999,000**	
6.12	OPGW Splice Boxes	9.00	Ea	$ 1,500	$ 1,000	$ 2,500	**$ 22,500**	
6.13	OPGW Splice & Test	1.00	Sum		$ 10,800	$ 10,800	**$ 10,800**	Supply & Install
6.14	Insulators for suspension structures (ANSI 52-5 and 52-8)	1,933.00	Set	$ 850	$ 150	$ 1,000	**$ 1,933,000**	
6.15	V-strings Suspension and tension strings hardware, OPGW, vibration dampers and spacers	1.00	Lot	$ 1,000,000	$ 900,000	$ 1,900,000	**$ 1,900,000**	
6.16	Install grounding	159.00	Ea		$ 5,000	$ 5,000	**$ 795,000**	Supply & Install
6.17	Matting for wetland & sensitive areas	36,960.00	Ft		$ 70	$ 70	**$ 2,587,200**	Supply & Install
6.18	Work Pads	1,837,500.00	SQFT		$ 4	$ 4	**$ 6,468,000**	Supply & Install
6.19	Restoration of Work Pad Areas	183,750.00	SQFT		$ 0.2	$ 0.2	**$ 27,563**	Supply & Install
6.20	Access Roads	159.00	Structure		$ 10,000	$ 10,000	**$ 1,590,000**	Supply & Install
6.21	Clearing of virgin forest land	46.00	Acre		$ 15,000	$ 15,000	**$ 690,000**	Supply & Install
6.22	Clearing existing ROW for work spaces	46.00	Acre		$ 15,000	$ 15,000	**$ 690,000**	Supply & Install
6.23	Maintenance and Protection of Traffic on Public Roads	1.00	Sum		$ 800,000	$ 800,000	**$ 800,000**	Supply & Install
6.24	Culverts and Misc Access	1.00	Sum		$ 300,000	$ 300,000	**$ 300,000**	Supply & Install
6.25	Snow Removal	1.00	Sum		$ 700,000	$ 700,000	**$ 700,000**	Supply & Install
6. DYSINGER - STOLLE ROAD NEW 345kV TRANSMISSION LINE - TOTAL SUPPLY & INSTALL:							**$ 46,864,263**	
7. MOB/DEMOB, ACCESS, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS								
7	**Contractor Mobilization / Demobilization**							
7.1	Mob / Demob	1.00	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	
	Project Management, Material Handling & Amenities	1.00				$ -	**$ -**	
7.2	Project Management & Staffing (includes PM, Field Engineers / Supervision, Scheduler and Cost Manager, SHEQ Staff, Materials Management Staff)	22.00	Months		$ 350,000	$ 350,000	**$ 7,700,000**	
7.3	Site Accommodations, Storage, Amenities, Laydown Yards	1.00	Sum		$ 1,800,000	$ 1,800,000	**$ 1,800,000**	
	Engineering	-				$ -	**$ -**	
7.4	Design Engineering	1.00	Sum		$ 6,000,000	$ 6,000,000	**$ 6,000,000**	
7.5	LiDAR	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	
7.6	Geotech	1.00	Sum		$ 800,000	$ 800,000	**$ 800,000**	
7.7	Surveying/Staking	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	
	Testing & Commissioning	-				$ -	**$ -**	
7.8	Testing & Commissioning of T-Line and Equipment	1.00	Sum		$ 2,500,000	$ 2,500,000	**$ 2,500,000**	
	Permitting and Additional Costs	-				$ -	**$ -**	
7.9	Environmental Licensing & Permitting Costs	1.00	Sum		$ 2,366,540	$ 2,366,540	**$ 2,366,540**	
7.10	Environmental Mitigation	1.00	Sum		$ 6,312,700	$ 6,312,700	**$ 6,312,700**	
7.11	Warranties / LOC's	1.00	Sum		$ 693,715	$ 693,715	**$ 693,715**	
7.12	Real Estate Costs (New)	1.00	Sum		$ 497,876	$ 497,876	**$ 497,876**	
7.13	Real Estate Costs (Incumbent Utility ROW)	1.00	Sum		$ 1,613,000	$ 1,613,000	**$ 1,613,000**	
7.14	Legal Fees	1.00	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
7.15	Allowance for Funds Used During Construction (AFUDC)	1.00	Sum			$ -	**$ -**	
7.16	Carrying Charges	1.00	Sum			$ -	**$ -**	
7.17	Fees for permits, including roadway, railroad, building or other local permits	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
7.18	Sales Tax on Materials	1.00	Sum	$ 5,380,386		$ 5,380,386	**$ 5,380,386**	
7. MOB/DEMOB, ACCESS, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS - TOTAL SUPPLY & INSTALL:							**$ 40,364,217**	

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T013- NYPA and NYSEG

ENVIRONMENTAL LICENSING AND PERMITTING

Revision: 4

PROJECT TITLE WNY PROJECT EVALUATION- ENVIRONMENTAL LICENSING & PERMITTING COST ELEMENTS						ENVIRONMENTAL LICENSING & PERMITTING COST ESTIMATE RANGE FOR PROPOSED WNY TRANSMISSION PROJECT - T013	
FEDERAL						Proposal	
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans	Min.	Max.
USACE	Waters of the US under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act (including regulated wetland areas)	Nationwide Permits (NWP) or Individual Permit (IP)	Any work within the boundaries of regulated wetlands (with the exception of isolated wetlands) or waterways to the spring high tide or ordinary high water mark	If project qualifies for a NWP (<0.5 acre disturbance and within NWP project type parameters), a pre-construction notification (PCN) is typically required. NWPs have a 45 day review period starting from when project logged in system (up to 6wk backlog delay in logging projects) If an IP is triggered, USACE will require Alternative Analysis and Public Notice/Hearing. IPs could also trigger restrictive environmental work windows. IPs have a 120 day review period starting from when permit is "deemed complete"	Wetland Delineation; Wetland Function & Value Assessment; Stream Delineation; Restoration Plan	$17,880	$124,400
USFWS	Endangered Species Act Section 7 (ESA) Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act	Consultation (Formal or Informal); Special Use Permit	Any work that may have an affect on listed species or their habitat; or projects within National Wildlife Refuges	USACE coordinates consultation with USFWS for ESA listed species during their permit review. Also includes the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act compliance. Season restrictions on construction could be imposed.	Rare, Threatened & Endangered Species Search; Preparation of Reports and Conservation Plans	$42,800	$124,000
FAA	Airports / Airspace	Federal Aviation Administration (FAA) Notification	New or Replacement Structures near Airports	Depending on construction locations, this permit may only be needed for OP work.	Obstruction Analysis, Mitigation Plan (assumes Engineering Cost)	$3,000	$9,000
STATE							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
NYS Public Service Commission / Department of Public Service (NYSDPS)	Article VII	Article VII: Certificate of Environmental Compatibility and Public Need and Environmental Management & Construction Plan (EM&CP)	Article 7: Major electric transmission facilities with design capacity of 100kV or more extending for at least 10 miles or 125kV and over extending a distance of 1 mile or more (some exclusions for underground transmission applies)	Article VII will incorporate all of the required State and Local approvals (costed separately), as well as Engineering and Environmental Studies and Public Outreach. An Environmental Management & Construction Plan (EM&CP) must be prepared and approved by the PSC. (see 16 NYCRR Parts 85 through 88) Assumes Intervenor Fund amount of $100,000	Includes Reports and Plans required for State and Federal Agency Permits, as well as EM&CP, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan, Mitigation Plans	$600,000	$3,100,000
NYSDEC	Article 15 Stream Disturbance; Article 24 Wetlands, Open Waters, Wetlands Buffers (100' for Freshwater Wetland)	Individual Permit (IP) (unless developer has General Permit (GP))	Any work within the boundaries of regulated waterways or wetlands, and wetland adjacent areas	Any disturbance within wetlands and/or below mean high tide will require an IP. Areas of temporary disturbance will likely require restoration, including a monitoring and maintenance period. Permanent disturbance will require offsite mitigation up to 3:1 area ratio; also includes a monitoring and maintenance period. GP may only be applicable if project ground disturbance is located outside of wetlands areas (above MHW).	Wetland Delineation; Wetland Restoration/Mitigation Plan	$12,000	$53,000

ENVIRONMENTAL LICENSING AND PERMITTING

NYSDEC	Stormwater (If >1 Acre Soil Disturbance)	SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 & SWPPP	Project areas of soil disturbance	If project involves 1 acre or more soil disturbance, then the GP is required. If located within a Regulated MS4 Municipality, additional coordination may be needed. Weekly inspections by a Qualified Inspector during construction will be required.	SWPPP (assumes Engineering Cost includes Sediment & Erosion Control Plan, Hydraulic & Hydrology Studies, Stormwater Management Design)	$11,200	$38,000
NYSHPO	National Historic Preservation Act (NHPA) Section 106: State and Federal Historic Places; State Mapped Archeologically Sensitive Areas	Cultural Resource Information System (CRIS) Determination	Local, State, or Federal eligible or designated historic places and/or areas of archeological sensitivity (in off-road areas and areas that have not been previously disturbed)	NYSDEC EAF Online Mapper identifies State or National Register of Historic Places and archeological sensitive areas within or adjacent to the project site. Formally enter project information and supporting documents into SHPO's online CRIS program. Staff will review and email a determination of impacts letter	Phase 1A & 1B Archaeological Studies	$19,200	$67,000
NYS NHP	Threatened and Endangered Species	Consultation	Activities that may affect T&E species or their habitat.		See USFWS	$1,200	$6,400
NYSDOT/NYS Thruway Authority/FHWA	State Roadways	Highway Work Permit/Utility Permit, Vegetation Management Permit; Easement	Any work within or crossing State highway ROW	May require restoration landscaping coordination. Typically requires compliance with NEPA including SHPO and USFWS effects determination	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$17,000	$69,000
NYS Dept. of Agriculture and Markets	All agricultural lands (including Agricultural Districts)	Part of Article 7 & Article 10 Review process	Any work impacting agricultural land	Must minimize impacts and restore damage to agricultural land, and coordinate with County Soil & Water Conservation District; Vineyards are a major concern in WNYS. Pre-application conference with PSC, DEC and Ag& Markets recommended. Must develop EM&CP in conformance with Art. 7/10 Certificate Conditions. Agricultural Monitor must oversee construction & restoration; requisite 2-yrs post restoration monitoring.	Crop/Pasturing Mitigation Plan (not included in costing)	$11,000	$24,000
REGIONAL							
Railroads	Railroad crossings	Consultation-permits may be required; Easement	Access / new structures on RR property		Easement area survey (not included in costs)	$11,000	$76,000
LOCAL/MUNICIPAL							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
County Dept. of Public Works	County Roadways	Lane Closure Permit, Highway Work or Access Permit	Work within county roadways and right-of-ways			$6,000	$40,000
Town, City or Village	Municipal Stormwater (MS4) Review	Approval of SWPPP or EM&CP	Project areas of soil disturbance		See NYSDEC SPDES	$6,000	$35,000

ENVIRONMENTAL LICENSING AND PERMITTING

Town, City or Village	Variable	Building Permits	New Structures	Individual Towns/Villages must be consulted on a project specific basis to determine notification and/or permitting procedures. Permit application names vary (e.g. road obstruction permit)		$18,000	$92,000
Town, City or Village	Municipal Roadways	Highway Work Permit; Road Opening Permit	Work within municipal roadways and right-of-ways			$6,000	$35,000
Town, City or Village	Wetlands	Wetland Permit / Conservation Approvals	Mapped wetlands and wetland adjacent areas (buffer width variable)		See USACE / NYSDEC Art. 24	$6,000	$52,000
						Minimum	**Maximum**
		ENVIRONMENTAL LICENSING & PERMITTING COST (EXCLUDING MITIGATION)			**PROJECT T013 TOTAL**	**$788,280**	**$3,944,800**
Excluded cost: Mitigation or restoration for impact to regulated wetlands; agricultural land and tree clearing					**Expected Value**	**$2,366,540**	

ENVIRONMENTAL MITIGATION ESTIMATE

	Offsite Wetland Mitigation*		Farmland**	
	Min.	Max.	Min.	Max.
Area	30 acres	30 acres	16.8 acres	33.7 acres
Cost/Acre	$60,000	$120,000	$503	$503
Ratio	1:1	3:1	1:1	1:1
Total	$1,800,000	$10,800,000	$8,450	$16,951

T013 MITIGATION TOTAL	**Minimum**	**Maximum**	**Expected Value**
	$1,808,450	**$10,816,951**	**$ 6,312,701**

*Offsite wetland mitigation area assumes clearing of NWI Forested/Shrub Wetland Approx. 3.24 miles (17107 lF) by 75' ROW width; Max. cost per acre assumes additional mitigation required for permanent impacts of proposed structures in non-forested wetlands; costing includes design and installation costs only; does not include land acquisition or long term monitoring

**Farmland mitigation based on corn bushel yield at 129 BU/Acre and $3.9/BU (production numbers from 2016 USDA NYS Agriculture Overview), area assumes 5.56 miles (29356.8 LF) Adjacent to Agricultural Land by 25' Wide (Min.) or 50' Wide (Max.); does not include land acquisition

REAL ESTATE ESTIMATE (NEW ROW)

Revision: 4

COUNTY: ERIE

DEVELOPER: NYPA/NYSEG (T013)

SEGMENT: DYSINGER - STOLLE SEGMENT

		Area (Acres)	Total Cost
	Sub Total	0.68	$ 4,376.00

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T013 - NYPA and NYSEG

Revision: 4

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

COUNTY: NIAGARA & ERIE
DEVELOPER: NORTH AMERICAN (T006)
SEGMENT: DYSINGER - STOLLE SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
1	NYPA and NYSEG	Dysinger to Stolle - 20.6 miles	Niagara	5.97	$ 1,613,000
			Erie	318.64	

Revision: 4

REAL ESTATE ESTIMATE (SUBSTATIONS)

COUNTY:	NIAGARA
DEVELOPER:	NYPA/NYSEG (T013)
SEGMENT:	DYSINGER SUBSTATION

		Total Cost
	Total Cost of Proposed Substation Site	$493,500.00

ASSUMPTIONS AND CLARIFICATIONS

Revision: 4

a) Cost Estimate is based on 2017 rates.
schedule.
c) Stringing rates allow for protection over crossings (such as rider poles).
d) We have assumed a typical work week (6 x 10 hour days).
e) We have assumed that pole weights include anchor bolts.
f) The Developer has assumed gravel work pads. During our ROW visit it was determined that matted work pads are required.
g) Costs will vary for handling and disposal of contaminated spoils, depending on type of contaminants and availability / location of the appropriate tipping facility. Since there is not enough information to provide a quantified estimate for this item, allowance is included in the contingency monies.
h) Costs have been developed based on historical data from Projects of a similar nature (AACE Class 5 and 4 Estimating Practices). We have not engaged any subcontractors or material vendors for formal quotes but budgetary costs for transformers, phase shifting transformers and reactors were obtained from vendors.
i)Acquisition of land includes the new site for Dysinger Substation. Remiander of project utilizes existing ROW.
j)Assumes all environmental data and project details provided are accurate unless noted otherwise.
k)USFWS T&E Species- Assumes that ¼ of the total line in ROW per segments will require field survey for T&E (5 miles + 3miles)
l)NEPA-Assumes no NEPA because Art VII
m)SHPO-Assumes consultation and Phase 1A/1B archeological studies with field survey for 50% of project route (16 miles)
n)NYSDOT/FHWA-Assumes any required NEPA coordination/requirements are covered under Article VII
o)Assumes no coordination with National Parks Service or OPRHP/State Parks
p)Consultant delineated approximately 7 miles of wetland along the Dysinger to Stolle Road ROW. Minimum costs assume delineating 1.72 miles along the Stolle to Gardenville ROW at $4000/mile only. Maximum costs assume delineation will need to be repeated along both ROW's for a total of 8.72 miles at $7500/mile. Delineation costs included in USACE permitting not duplicated on NYSDEC. Assumes NYSDEC delineations overlap and are accounted for in USACE costing.
q)Offsite wetland mitigation area costs based on impacts anticipated by clearing of NWI Forested/Shrub Wetland of approximately 3.24 miles (calculated by GEI based on NWI mapper legend categories). Assumes clearing an additional 75 feet within Right of Way. Minimum costs at $60,000/acre, maximum costs at $120,000/acre for additional permanent impacts of proposed structures in non-forested wetlands. Costing includes design and installation costs only and does not include land acquisition or long term monitoring. Mitigation costs assume no offsite mitigation for Gardenville to Stolle.

ASSUMPTIONS AND CLARIFICATIONS

r)Agricultural mitigation assumes timber matting impacts and pad impacts on adjacent agriculture land total (5.56 miles) along the Dysinger to Stolle and Gardenville to Stolle routes requires crop damage payments. Payments based on USDA 2016 NYS Agriculture Overview corn yield and bushel price/acre. Minimum assumes 25-foot-wide impact, Maximum assumes 50-foot-wide impact.
s)Assumes Right of Way restoration is accounted for in construction costs
t)Mitigation costs for landscaping only (no paving, sidewalks, sound walls, etc.)
u)No tree survey or replanting required outside regulated wetlands areas
v)Assumes Article VII Intervenor Fund payment expected to be $100,000
w)Assume preliminary engineering and preparation of interconnection studies are complete.

INDEPENDENT ESTIMATES

ATTACHMENT B8

T014 – NEXTERA ENERGY

SUBSTATION ENGINEERING COMPANY
8/11/2017

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T014 - NextEra Energy

SECO SUBSTATION ENGINEERING COMPANY

SUMMARY OF COST ESTIMATE

		PROPOSAL (T014)	
		PREFERRED ROUTE	ALTERNATIVE ROUTE
	Description	Total Amount	Total Amount
1	CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION	$ 12,717,405	$ 13,571,466
2	TRANSMISSION LINE FOUNDATIONS	$ 3,200,398	$ 10,001,353
3	STRUCTURES - TRANSMISSION LINE	$ 4,688,312	$ 12,215,200
4	CONDUCTOR, SHIELDWIRE, OPGW	$ 6,137,208	$ 6,089,688
5	TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE	$ 1,382,170	$ 1,829,571
6	NEW DYSINGER SUBSTATION	$ 37,852,000	$ 37,852,000
7	EAST STOLLE RD SUBSTATION	$ 13,963,000	$ 13,963,000
8	MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS	$ 31,728,688	$ 43,673,566
	CONTRACTOR MARK-UP (OH&P) 15%	$ 16,750,377	$ 20,879,376
	SUBTOTAL:	$ 128,419,558	$ 160,075,219
	CONTINGENCY (20%)	$ 25,683,912	$ 32,015,044
	TOTAL (A):	**$ 154,103,470**	**$ 192,090,263**
9	SYSTEM UPGRADE FACILITIES	$ 19,705,790	$ 19,705,790
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 6,897,027	$ 6,897,027
	TOTAL (B):	**$ 26,602,817**	**$ 26,602,817**
	TOTAL PROJECT COST (A+B):	**$ 180,706,286**	**$ 218,693,080**

COST ESTIMATE

(PREFERRED ROUTE)

Revision: 5

Description of Work: The Project consists of 2 new 345kV Switchyards (Dysinger and new East Stolle Road. TO14 includes the 345kV, 700MVA Phase Shifting Transformer at Dysinger Switchyard), the Scope of Work also includes approximately 20 miles of new 345kV Transmission Line, located in Erie County and Niagara County (Empire State Line). This estimate includes for the Developers Preferred Route which utilizes an existing utility ROW. Wood H-Frames will be used to minimize visual impact.

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
1. CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION								
1.1	Clearing the ROW (mowing & clearing)	139.0	Acre		$ 15,000	$ 15,000	**$ 2,085,000**	
1.2	Access Road	48,535.0	LF		$ 45	$ 45	**$ 2,184,075**	Assumes Type 1 Type Gravel Road
1.3	Silt Fence	48,535.0	LF		$ 4	$ 4	**$ 194,140**	
1.4	Matting	56,952.0	LF		$ 70	$ 70	**$ 3,986,640**	
1.5	Snow Removal	1.0	Sum		$ 320,000	$ 320,000	**$ 320,000**	
1.6	ROW Restoration	20.0	Mile		$ 10,000	$ 10,000	**$ 200,000**	
1.7	Work Pads	795,000.00	SF		$ 4	$ 4	**$ 2,798,400**	
1.8	Restoration for Work Pad areas	79,500.00	SF		$ 0.2	$ 0.2	**$ 11,925**	
1.9	Temporary Access Bridge	20.0	EA		$ 20,035	$ 20,035	**$ 400,700**	
1.10	Air Bridge	5.0	EA		$ 14,445	$ 14,445	**$ 72,225**	
1.11	Stabilized Construction Entrance	10.0	EA		$ 4,580	$ 4,580	**$ 45,800**	
1.12	Maintenance and Protection of Traffic on Public Roads	1.0	LS		$ 300,000	$ 300,000	**$ 300,000**	
1.13	Culverts / Misc. Access	1.0	LS		$ 100,000	$ 100,000	**$ 100,000**	
1.14	Concrete Washout Station	10.0	EA		$ 1,850	$ 1,850	**$ 18,500**	
TOTAL - CLEARING & ACCESS FOR TRANSMISSION LINE:							**$ 12,717,405**	
2. TRANSMISSION LINE FOUNDATIONS								
2.1	Direct Embed Foundation 3' x 11'	267.0	Ea		$ 9,680	$ 9,680	**$ 2,584,560**	Supply & Install
2.2	Direct Embed Foundation 3' x 12'	35.0	Ea		$ 10,648	$ 10,648	**$ 372,680**	Supply & Install
2.3	Direct Embed Foundation 3' x 13'	8.0	Ea		$ 11,713	$ 11,713	**$ 93,702**	Supply & Install
2.4	Direct Embed Foundation 3' x 14'	5.0	Ea		$ 12,884	$ 12,884	**$ 64,420**	Supply & Install
2.5	Direct Embed Foundation 3' x 15'	6.0	Ea		$ 14,172	$ 14,172	**$ 85,035**	Supply & Install
TOTAL - TRANSMISSION LINE FOUNDATIONS:							**$ 3,200,398**	
3. STRUCTURES - TRANSMISSION LINE								
3.1	Dead-End 3 Pole Wood Structure, H2 80ft	5	Ea	$ 6,000	$ 8,185	$ 14,185	**$ 70,927**	
3.2	Dead-End 3 Pole Wood Structure, H2 90ft	2	Ea	$ 7,200	$ 6,925	$ 14,125	**$ 28,250**	
3.3	Dead-End 3 Pole Wood Structure, H2 100ft	2	Ea	$ 8,640	$ 8,459	$ 17,099	**$ 34,198**	
3.4	Dead-End 3 Pole Wood Structure, H2 110ft	1	Ea	$ 10,368	$ 12,689	$ 23,057	**$ 23,057**	
3.5	Angle 3 Pole Wood Structure, H1-90ft	4	Ea	$ 6,480	$ 13,177	$ 19,657	**$ 78,628**	
3.6	Angle 3 Pole Wood Structure, H1-100ft	1	Ea	$ 7,776	$ 16,471	$ 24,247	**$ 24,247**	
3.7	Tangent H-Frame Wood Structure, H2 85'	1	Ea	$ 4,800	$ 15,373	$ 20,173	**$ 20,173**	
3.8	Tangent H-Frame Wood Structure, H2 90'	118	Ea	$ 5,760	$ 18,448	$ 24,208	**$ 2,856,506**	
3.9	Tangent H-Frame Wood Structure, H2 95'	11	Ea	$ 6,912	$ 22,137	$ 29,049	**$ 319,541**	
3.10	Tangent H-Frame Wood Structure, H2 100'	3	Ea	$ 8,294	$ 8,185	$ 16,480	**$ 49,439**	
3.11	Tangent H-Frame Wood Structure, H2 105'	1	Ea	$ 9,953	$ 6,925	$ 16,878	**$ 16,878**	
3.12	Tangent H-Frame Wood Structure, H2 115'	1	Ea	$ 11,944	$ 8,459	$ 20,403	**$ 20,403**	
3.13	Tangent H-Frame Wood Structure, H2 125'	3	Ea	$ 14,333	$ 12,689	$ 27,021	**$ 81,064**	
3.14	Install Grounding	153.0	Structure		$ 5,000	$ 5,000	**$ 765,000**	Supply & Install
3.15	Guy Wires and Anchors for DE / Angle Structures	15.0	Structure		$ 20,000	$ 20,000	**$ 300,000**	Supply & install
TOTAL - STRUCTURES TRANSMISSION LINE:							**$ 4,688,312**	

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T014 - NextEra Energy

COST ESTIMATE

(PREFERRED ROUTE)

Revision: 5

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
4. CONDUCTOR, SHIELDWIRE, OPGW								
4.1	(2)/Phase - 795kcmil 26/7 Stranded "Drake" ACSR	21	Circuit Mile	$ 53,856	$ 158,400	$ 212,256	**$ 4,457,376**	
4.2	(1) OPGW 48 Fiber	21	Mile	$ 22,176	$ 27,720	$ 49,896	**$ 1,047,816**	
4.3	(1) 3/8" HS Steel	21	Mile	$ 3,696	$ 26,400	$ 30,096	**$ 632,016**	
TOTAL: CONDUCTOR, SHIELDWIRE, OPGW:							**$ 6,137,208**	
5. TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE								
5.1	Tangent - Polymer V-String	414	Set	$ 900	$ 720	$ 1,620	**$ 670,680**	
5.2	Deadend / Angle Assemblies	96.0	Set	$ 1,500	$ 1,040	$ 2,540	**$ 243,840**	
5.3	OPGW Assembly - Tangent	138.0	Set	$ 200	$ 150	$ 350	**$ 48,300**	
5.4	OPGW Assembly - Angle / DE	34.0	Set	$ 250	$ 150	$ 400	**$ 13,600**	
5.5	OHSW Assembly - Tangent	138.0	Set	$ 200	$ 150	$ 350	**$ 48,300**	
5.5	OHSW Assembly - Angle / DE	34.0	Set	$ 250	$ 150	$ 400	**$ 13,600**	
5.8	OPGW Splice Boxes	9.0	Ea	$ 1,500	$ 1,000	$ 2,500	**$ 22,500**	
5.7	OPGW Splice & Test	1.0	Sum		$ 10,800	$ 10,800	**$ 10,800**	
5.8	Spacer Dampers	2,310.0	Ea	$ 50	$ 35	$ 85	**$ 196,350**	
5.9	Vibration Dampers - Conductor	1,850.0	Ea	$ 32	$ 20	$ 52	**$ 96,200**	
5.10	Shieldwire / OPGW Dampers, Misc Fittings	1.0	Sum	$ 10,000	$ 8,000	$ 18,000	**$ 18,000**	
TOTAL: TRANSMISSION LINE INSULA+52:63TORS, FITTINGS, HARDWARE:							**$ 1,382,170**	
6. NEW DYSINGER SWITCHYARD								
6.1	Site Works including sediment controls, access roads, rough grading, final	1.0	Sum		$ 1,650,000.00	$ 1,650,000	**$ 1,650,000**	Supply & Install
6.2	Substation Fence	2,840.0	LF		$ 200.00	$ 200	**$ 568,000**	Supply & Install
6.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
6.4	Switches 3ph	24.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 168,000**	
6.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
6.6	Line Switches 3 ph w/ motor-operators	7.0	Ea	$ 15,000	$ 15,000.00	$ 30,000	**$ 210,000**	
6.7	Instrument Transformers	1.0	Sum		$ 1,214,000	$ 1,214,000	**$ 1,214,000**	
6.8	Breakers	11.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 4,180,000**	
6.9	Arrestors (3 per line)	27.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 202,500**	
6.10	Line Traps	7.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 147,000**	
6.11	345 kV buses	2.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
6.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
6.13	Low Profile Foundations	308.0	Ea		$ 5,000	$ 5,000	**$ 1,540,000**	Supply & Install
6.14	Caisson DE Foundations	52.0	Ea		$ 50,000	$ 50,000	**$ 2,600,000**	Supply & Install
6.15	Circuit Breaker Foundations	11.0	Ea		$ 75,000	$ 75,000	**$ 825,000**	Supply & Install
6.16	Lightning Mast Foundations	5.0	Ea		$ 15,000	$ 15,000	**$ 75,000**	Supply & Install
6.17	SST Foundation	1.0	Ea		$ 75,000.00	$ 75,000	**$ 75,000**	Supply & Install
6.18	Control House and Pad (30' x 90')	1.0	Ea	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	
6.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
6.20	Control Cables	1.0	Sum	$ 150,000	$ 150,000	$ 300,000	**$ 300,000**	
6.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
6.22	Station Services	2.0	Ea	$ -	$ 25,000	$ 25,000	**$ 50,000**	
6.23	Protection, Telecom and Metering Equipment (Panels)	40.0	Ea		$ 30,000	$ 30,000	**$ 1,200,000**	Supply & Install
6.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
6.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
6.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 975,000	$ 975,000	**$ 975,000**	Supply & Install
6.28	Grounding	1.0	Sum		$ 275,000	$ 275,000	**$ 275,000**	Supply & Install
6.29	Bus Support 3 Ph	23.0	Ea	$ 4,500	$ 2,000	$ 6,500	**$ 149,500**	
6.30	Bus Support 1 Ph	42.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 126,000**	

COST ESTIMATE

(PREFERRED ROUTE)

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
6.31	Switch Stands	26.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 286,000**	
6.32	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
6.33	Misc. Structures	1.0	Sum		$ 74,000	$ 74,000	**$ 74,000**	
6.34	Substation A-Frame Structures Standalone	13.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 325,000**	
6.35	Lightning Masts	5.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 60,000**	
6.36	Arrestor Stands	21.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 73,500**	
6.37	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
6.38	Connection of Existing Lines to Dysinger Switchyard	1.0	Sum		$ 5,000,000	$ 5,000,000	**$ 5,000,000**	Supply & Install
6.39	345kV 700MVA Phase Shifting Transformer	1.0	Sum	$ 11,000,000	$ 500,000	$ 11,500,000	**$ 11,500,000**	
6.40	Transformer Foundation with concrete moat and double steel grating	1.0	Sum		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
TOTAL - DYSINGER SWITCHYARD:							**$ 37,852,000**	
7. EAST STOLLE RD SUBSTATION								
7.1	Site Works including sediment controls, access roads, rough grading, final	1.0	Sum		$ 1,000,000.00	$ 1,000,000	**$ 1,000,000**	Supply & Install
7.2	Substation Fence	1,900.0	LF		$ 200.00	$ 200	**$ 380,000**	Supply & Install
7.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
7.4	Switches 3ph	9.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 63,000**	
7.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
7.6	Line Switches 3 ph w/ motor-operators	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
7.7	Instrument Transformers	1.0	Sum		$ 752,000	$ 752,000	**$ 752,000**	
7.8	Breakers	4.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 1,520,000**	
7.9	Arrestors (3 per line) and shunt reactor	12.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 90,000**	
7.10	Line Traps	2.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 42,000.00**	
7.11	345 kV buses	1.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 60,000**	
7.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
7.13	Low Profile Foundations	147.0	Ea		$ 5,000	$ 5,000	**$ 735,000**	Supply & Install
7.14	Caisson DE Foundations	20.0	Ea		$ 50,000	$ 50,000	**$ 1,000,000**	Supply & Install
7.15	Circuit Breaker Foundations	4.0	Ea		$ 75,000	$ 75,000	**$ 300,000**	Supply & Install
7.16	Lightning Mast Foundations	5.0	Ea		$ 15,000	$ 15,000	**$ 75,000**	Supply & Install
7.17	SST Foundation	1.0	Ea		$ 75,000.00	$ 75,000	**$ 75,000**	Supply & Install
7.18	Control House and Pad (25' x 50' - 1250 sq. ft)	1.0	Ea	$ 350,000	$ 100,000	$ 450,000	**$ 450,000**	
7.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
7.20	Control Cables	1.0	Sum	$ 130,000	$ 130,000	$ 260,000	**$ 260,000**	
7.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
7.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	
7.23	Protection, Telecom and Metering Equipment (Panels)	18.0	Ea		$ 30,000	$ 30,000	**$ 540,000**	Supply & Install
7.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
7.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
7.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
7.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 975,000	$ 975,000	**$ 975,000**	Supply & Install
7.28	Grounding	1.0	Sum		$ 125,000	$ 125,000	**$ 125,000**	Supply & Install
7.29	Bus Support 3 Ph	9.0	Ea	$ 4,500	$ 2,000	$ 6,500	**$ 58,500**	
7.30	Bus Support 1 Ph	21.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 63,000**	
7.31	Switch Stands	13.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 143,000**	
7.32	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
7.33	Misc. Structures	1.0	Sum		$ 24,000	$ 24,000	**$ 24,000**	
7.34	Substation A-Frame Structures Standalone	5.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 125,000**	
7.35	Lightning Masts	5.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 60,000**	
7.36	Arrestor Stands	12.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 42,000**	

COST ESTIMATE

(PREFERRED ROUTE)

Revision: 5

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
7.37	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
7.38	345kV 30MVAR Shunt Reactor	1.0	Ea	$ 732,000	$ 100,000	$ 832,000	**$ 832,000**	
7.39	Transformer Foundation with concrete moat and double steel grating	1.0	Sum		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
7.40	Interconnection arrangement at Stolle Rd Substation	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
TOTAL - EAST STOLLE RD SUBSTATION:							**$ 13,963,000**	
8. MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS								
	Contractor Mobilization / Demobilization							
8.1	Mob / Demob	1.00	Sum		$ 800,000	$ 800,000	**$ 800,000**	
	Project Management, Material Handling & Amenities					$ -	**$ -**	
8.2	Project Management & Staffing (includes PM, Field Engineers / Supervision, Scheduler and Cost Manager, SHEQ Staff, Admin, Materials Management Staff)	14.00	Months		$ 220,000	$ 220,000	**$ 3,080,000**	
8.3	Site Accommodation, Facilities, Storage	1.00	Sum		$ 1,400,000	$ 1,400,000	**$ 1,400,000**	
	Engineering					$ -	**$ -**	
8.4	Design Engineering	1.00	Sum		$ 3,600,000	$ 3,600,000	**$ 3,600,000**	
8.5	LiDAR	1.00	Sum		$ 400,000	$ 400,000	**$ 400,000**	
8.6	Geotech	1.00	Sum		$ 600,000	$ 600,000	**$ 600,000**	
8.7	Surveying/Staking	1.00	Sum		$ 400,000	$ 400,000	**$ 400,000**	
	Testing & Commissioning							
8.8	Testing & Commissioning of TRANSMISSION LINE and Equipment	1.00	Sum		$ 1,600,000	$ 1,600,000	**$ 1,600,000**	
	Permitting and Additional Costs					$ -	**$ -**	
8.9	Environmental Licensing & Permitting Costs	1.00	Sum		$ 2,312,325	$ 2,312,325	**$ 2,312,325**	
8.10	Environmental Mitigation	1.00	Sum		$ 9,472,635	$ 9,472,635	**$ 9,472,635**	
8.11	Warranties / LOC's	1.00	Sum		$ 459,515	$ 459,515	**$ 459,515**	
8.12	Real Estate Costs (New ROW)	1.00	Sum		$ 391,346	$ 391,346	**$ 391,346**	
8.13	Real Estate Costs (Incumbent Utility ROW)	1.00	Sum		$ 1,793,000	$ 1,793,000	**$ 1,793,000**	
8.14	Legal Fees	1.00	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
8.15	Sales Tax on Materials	1.00	Sum	$ 3,219,867		$ 3,219,867	**$ 3,219,867**	
8.16	Fees for permits, including roadway, railroad, building or other local permits	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
8.17	Allowance for Funds Used During Construction (AFUDC)	1.00	Sum			$ -	**$ -**	
8.18	Carrying Charges	1.00	Sum			$ -	**$ -**	
TOTAL - MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:							**$ 31,728,688**	
9. SYSTEM UPGRADE FACILITIES								
SUF 1.1	Depew to Erie Street 115kV Transmission Line 921. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Relay was replaced and line ratings increased to 124/137/158 (NOR/LTE/STE) resulting ratings are below line conductor ratings. Scope is to remove all limitations on the circuit so it is limited by line conductor ratings 125/152/181 (NOR/LTE/STE).
SUF 1.2	Engineering, T&C, PM, Indirects for SUF 1.1 (15%)					$ -	**$ 75,000**	
SUF 2.1	Shawnee to Swann Reconductor	12.00	Mile		$ 400,000	$ 400,000	**$ 4,800,000**	Rate for reconductor is pro-rated from National Grid Niagara - Packard reconductor. Note that rate does not include upgrades to structures or foundations.
SUF 2.2	Engineering, T&C, PM, Indirects FOR SUF 2.2 (15%)					$ -	**$ 720,000**	

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T014 - NextEra Energy

COST ESTIMATE

(PREFERRED ROUTE)

Revision: 5

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
SUF 3.1	Roll Rd to Stolle Rd 115kV Transmission Line 928. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Replace limiting terminal equipment at Stolle Rd 115 kV Substation.
SUF 3.2	Engineering, T&C, PM, Indirects for SUF 3.1 (15%)					$ -	**$ 75,000**	
SUF 4	**100MVAR Shunt Reactor at RG&E Sta 80**							
SUF 4.1	Site Works including sediment controls, access roads, rough grading, final	1.00	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
SUF 4.2	Substation Fence	600.00	LF		$ 200	$ 200	**$ 120,000**	Supply & Install
SUF 4.3	Shunt Reactor 3ph 345kV 100MVAR	1.00	Ea	$ 1,500,000	$ 500,000	$ 2,000,000	**$ 2,000,000**	
SUF 4.4	Switches 3ph 345kV	1.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 30,000**	
SUF 4.5	CVT's 345kV	3.00	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 63,000**	
SUF 4.6	Breakers 345kV	1.00	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 380,000**	
SUF 4.7	Arrestors - 235kV	3.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 22,500**	
SUF 4.8	Low Profile Foundations	19.00	Ea		$ 5,000	$ 5,000	**$ 95,000**	Supply & Install
SUF 4.9	Circuit Breaker Foundations	1.00	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
SUF 4.10	Lightning Mast Foundations	2.00	Ea		$ 15,000	$ 15,000	**$ 30,000**	Supply & Install
SUF 4.11	Reactor Foundation with concrete moat and double steel grating	1.00	Ea		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
SUF 4.12	Control Cables	1.00	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
SUF 4.13	Protection & Telecom Equipment	3.00	Ea		$ 15,000	$ 15,000	**$ 45,000**	Supply & Install
SUF 4.14	SCADA and Communications	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.15	Low Voltage AC Distribution	1.0	Sum		$ 300,000	$ 300,000	**$ 300,000**	Supply & Install
SUF 4.16	Control Conduits	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.17	Cable Trench System for Control Conduits	1.0	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
SUF 4.18	Grounding	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.19	Bus Support 3ph	2.0	Ea	$ 3,000	$ 2,000	$ 5,000	**$ 10,000**	
SUF 4.20	Bus Support 1ph	3.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 9,000**	
SUF 4.21	Switch Stands	1.0	Ea	$ 1,500	$ 800	$ 2,300	**$ 2,300**	
SUF 4.22	Fuse Stand	1.0	Ea	$ 1,500	$ 800	$ 2,300	**$ 2,300**	
SUF 4.23	CVT Stand	3.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 10,500**	
SUF 4.24	Lightning Mast	2.0	Ea	$ 10,000	$ 5,000	$ 15,000	**$ 30,000**	
SUF 4.25	Misc Materials and Above / Below Ground Works	1.0	Ea		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
SUF 4.26	**Engineering, T&C, PM, Indirects (15%)**					$ -	**$ 1,211,190**	
SUF 5	**SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)**						**$ 3,750,000**	Contingency for possible additional SUF upgrades
TOTAL -SUF							**$ 19,705,790**	

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T014 - NextEra Energy

COST ESTIMATE

(ALTERNATE ROUTE)

Revision: 5

Description of Work: The Project consists of 2 new 345kV Switchyards (Dysinger and new East Stolle Road. TO14 includes the 345kV, 700MVA Phase Shifting Transformer at Dysinger Switchyard), the Scope of Work also includes approximately 22 miles of new 345kV Transmission Line, located in Erie County and Niagara County (Empire State Line). This estimate includes for the Developers Alternate Route which uses Steel Poles.

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
1. CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION								
1.1	Clearing the ROW (mowing & clearing)	118.0	Acre		$ 15,000	$ 15,000	**$ 1,770,000**	
1.2	Access Road	53,388.5	LF		$ 45	$ 45	**$ 2,402,483**	Assumes Type 1 Type Gravel Road
1.3	Silt Fence	53,388.5	LF		$ 4	$ 4	**$ 213,554**	
1.4	Matting	62,647.2	LF		$ 70	$ 70	**$ 4,385,304**	
1.5	Snow Removal	1.0	Sum		$ 320,000	$ 320,000	**$ 320,000**	
1.6	ROW Restoration	22.0	Mile		$ 10,000	$ 10,000	**$ 220,000**	
1.7	Work Pads	940,000.00	SF		$ 4	$ 4	**$ 3,308,800**	
1.8	Restoration for Work Pad areas	94,000.00	SF		$ 0.2	$ 0.2	**$ 14,100**	
1.9	Temporary Access Bridge	20.0	EA		$ 20,035	$ 20,035	**$ 400,700**	
1.10	Air Bridge	5.0	EA		$ 14,445	$ 14,445	**$ 72,225**	
1.11	Stabilized Construction Entrance	10.0	EA		$ 4,580	$ 4,580	**$ 45,800**	
1.12	Maintenance and Protection of Traffic on Public Roads	1.0	LS		$ 300,000	$ 300,000	**$ 300,000**	
1.13	Culverts / Misc. Access	1.0	LS		$ 100,000	$ 100,000	**$ 100,000**	
1.14	Concrete Washout Station	10.0	EA		$ 1,850	$ 1,850	**$ 18,500**	
TOTAL - CLEARING & ACCESS FOR TRANSMISSION LINE:							**$ 13,571,466**	
2. TRANSMISSION LINE FOUNDATIONS								
2.1	Direct Embed Foundation for Vertical Tangent Poles (5'x 20')	109.0	Ea		$ 18,000	$ 18,000	**$ 1,962,000**	Supply & Install
2.2	Direct Embed Foundation for Vertical Tangent Poles (5'x 20.5')	12.0	Ea		$ 18,900	$ 18,900	**$ 226,800**	Supply & Install
2.3	Direct Embed Foundation for Vertical Tangent Poles (5'x 21')	16.0	Ea		$ 20,790	$ 20,790	**$ 332,640**	Supply & Install
2.4	Direct Embed Foundation for Vertical Tangent Poles (5'x 21.5')	3.0	Ea		$ 22,869	$ 22,869	**$ 68,607**	Supply & Install
2.5	Direct Embed Foundation for Vertical Tangent Poles (5'x 23')	1.0	Ea		$ 25,156	$ 25,156	**$ 25,156**	Supply & Install
2.6	Caisson Foundation for Vertical Angle (9' x 20')	445.5	CUY		$ 1,500	$ 1,500	**$ 668,250**	
2.7	Caisson Foundation for Dead End (10' x 35')	3,978.6	CUY		$ 1,500	$ 1,500	**$ 5,967,900**	
2.8	Rock Adder	500.0	CUY		$ 1,500	$ 1,500	**$ 750,000**	
TOTAL - TRANSMISSION LINE FOUNDATIONS:							**$ 10,001,353**	
3. STRUCTURES - TRANSMISSION LINE								
3.1	Steel Vertical Tangent Monopole (130' including embedment)	109	Ea	$ 25,200	$ 15,120	$ 40,320	**$ 4,394,880**	
3.2	Steel Vertical Tangent Monopole (135' including embedment)	12	Ea	$ 27,900	$ 16,740	$ 44,640	**$ 535,680**	
3.3	Steel Vertical Tangent Monopole (141' including embedment)	16	Ea	$ 30,600	$ 18,360	$ 48,960	**$ 783,360**	
3.4	Steel Vertical Tangent Monopole (145' including embedment)	3	Ea	$ 34,200	$ 20,520	$ 54,720	**$ 164,160**	
3.5	Steel Vertical Tangent Monopole (162' including embedment)	1	Ea	$ 37,800	$ 22,680	$ 60,480	**$ 60,480**	
3.6	Steel Vertical Angle Monopole (131')	9	Ea	$ 66,600	$ 39,960	$ 106,560	**$ 959,040**	
3.7	Steel Vertical Deadend Monopole (105')	38	Ea	$ 72,000	$ 43,200	$ 115,200	**$ 4,377,600**	
3.8	Install Grounding	188	Ea		$ 5,000	$ 5,000	**$ 940,000**	Supply & Install
TOTAL - STRUCTURES TRANSMISSION LINE:							**$ 12,215,200**	
4. CONDUCTOR, SHIELDWIRE, OPGW								
4.1	(2)/Phase - 795kcmil 26/7 Stranded "Drake" ACSR	23	Circuit Mile	$ 53,856	$ 158,400	$ 212,256	**$ 4,881,888**	
4.2	(1) OPGW 48 Fiber	23	Mile	$ 22,176	$ 27,720	$ 49,896	**$ 1,147,608**	
4.3	(1) 3/8" HS Steel	2	Mile	$ 3,696	$ 26,400	$ 30,096	**$ 60,192**	
TOTAL: CONDUCTOR, SHIELDWIRE, OPGW:							**$ 6,089,688**	
5. TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE								
5.1	Tangent - Polymer V-String	450	Set	$ 900	$ 720	$ 1,620	**$ 729,000**	
5.2	Deadend / Angle Assemblies	234.0	Set	$ 1,500	$ 1,040	$ 2,540	**$ 594,360**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
5.3	OPGW Assembly - Tangent	150.0	Set	$ 200	$ 150	$ 350	**$ 52,500**	
5.5	OPGW Assembly - Angle / DE	72.0	Set	$ 250	$ 150	$ 400	**$ 28,800**	
5.6	OHSW Assembly - Angle / DE	15.0	Set	$ 250	$ 150	$ 400	**$ 6,000**	
5.8	OPGW Splice Boxes	10.0	Ea	$ 1,500	$ 1,000	$ 2,500	**$ 25,000**	
5.9	OPGW Splice & Test	1.0	Sum		$ 12,000	$ 12,000	**$ 12,000**	
5.10	Spacer Dampers	2,835.0	Ea	$ 50	$ 35	$ 85	**$ 240,975**	
5.11	Vibration Dampers - Conductor	2,268.0	Ea	$ 32	$ 20	$ 52	**$ 117,936**	
5.12	Shield wire / OPGW Dampers, Misc Fittings	1.0	Sum	$ 15,000	$ 8,000	$ 23,000	**$ 23,000**	
TOTAL: TRANSMISSION LINE INSULATORS, FITTINGS, HARDWARE:							**$ 1,829,571**	
6. NEW DYSINGER SUBSTATION								
6.1	Site Works including sediment controls, access roads, rough grading, final grading and	1.0	Sum		$ 1,650,000.00	$ 1,650,000	**$ 1,650,000**	Supply & Install
6.2	Substation Fence	2,840.0	LF		$ 200.00	$ 200	**$ 568,000**	Supply & Install
6.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
6.4	Switches 3ph	24.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 168,000**	
6.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
6.6	Line Switches 3 ph w/ motor-operators	7.0	Ea	$ 15,000	$ 15,000.00	$ 30,000	**$ 210,000**	
6.7	Instrument Transformers	1.0	Sum		$ 1,214,000	$ 1,214,000	**$ 1,214,000**	
6.8	Breakers	11.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 4,180,000**	
6.9	Arrestors (3 per line)	27.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 202,500**	
6.10	Line Traps	7.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 147,000**	
6.11	345 kV buses	2.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
6.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
6.13	Low Profile Foundations	308.0	Ea		$ 5,000	$ 5,000	**$ 1,540,000**	Supply & Install
6.14	Caisson DE Foundations	52.0	Ea		$ 50,000	$ 50,000	**$ 2,600,000**	Supply & Install
6.15	Circuit Breaker Foundations	11.0	Ea		$ 75,000	$ 75,000	**$ 825,000**	Supply & Install
6.16	Lightning Mast Foundations	5.0	Ea		$ 15,000	$ 15,000	**$ 75,000**	Supply & Install
6.17	SST Foundation	1.0	Ea		$ 75,000.00	$ 75,000	**$ 75,000**	Supply & Install
6.18	Control House and Pad (30' x 90')	1.0	Ea	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	
6.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
6.20	Control Cables	1.0	Sum	$ 150,000	$ 150,000	$ 300,000	**$ 300,000**	
6.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
6.22	Station Services	2.0	Ea	$ -	$ 25,000	$ 25,000	**$ 50,000**	
6.23	Protection, Telecom and Metering Equipment (Panels)	40.0	Ea		$ 30,000	$ 30,000	**$ 1,200,000**	Supply & Install
6.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
6.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
6.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 975,000	$ 975,000	**$ 975,000**	Supply & Install
6.28	Grounding	1.0	Sum		$ 275,000	$ 275,000	**$ 275,000**	Supply & Install
6.29	Bus Support 3 Ph	23.0	Ea	$ 4,500	$ 2,000	$ 6,500	**$ 149,500**	
6.30	Bus Support 1 Ph	42.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 126,000**	
6.31	Switch Stands	26.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 286,000**	
6.32	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
6.33	Misc. Structures	1.0	Sum		$ 74,000	$ 74,000	**$ 74,000**	
6.34	Substation A-Frame Structures Standalone	13.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 325,000**	
6.35	Lightning Masts	5.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 60,000**	
6.36	Arrestor Stands	21.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 73,500**	
6.37	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
6.38	Connection of Existing Lines to Dysinger Switchyard	1.0	Sum		$ 5,000,000	$ 5,000,000	**$ 5,000,000**	Supply & Install
6.39	345kV 700MVA Phase Shifting Transformer	1.0	Sum	$ 11,000,000	$ 500,000	$ 11,500,000	**$ 11,500,000**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
6.40	Transformer Foundation with concrete moat and double steel grating	1.0	Sum		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
TOTAL - DYSINGER SWITCHYARD:							**$ 37,852,000**	
7. EAST STOLLE RD SUBSTATION								
7.1	Site Works including sediment controls, access roads, rough grading, final grading and	1.0	Sum		$ 1,000,000.00	$ 1,000,000	**$ 1,000,000**	Supply & Install
7.2	Substation Fence	1,900.0	LF		$ 200.00	$ 200	**$ 380,000**	Supply & Install
7.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
7.4	Switches 3ph	9.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 63,000**	
7.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
7.6	Line Switches 3 ph w/ motor-operators	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
7.7	Instrument Transformers	1.0	Sum		$ 752,000	$ 752,000	**$ 752,000**	
7.8	Breakers	4.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 1,520,000**	
7.9	Arrestors (3 per line) and shunt reactor	12.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 90,000**	
7.10	Line Traps	2.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 42,000**	
7.11	345 kV buses	1.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 60,000**	
7.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
7.13	Low Profile Foundations	147.0	Ea		$ 5,000	$ 5,000	**$ 735,000**	Supply & Install
7.14	Caisson DE Foundations	20.0	Ea		$ 50,000	$ 50,000	**$ 1,000,000**	Supply & Install
7.15	Circuit Breaker Foundations	4.0	Ea		$ 75,000	$ 75,000	**$ 300,000**	Supply & Install
7.16	Lightning Mast Foundations	5.0	Ea		$ 15,000	$ 15,000	**$ 75,000**	Supply & Install
7.17	SST Foundation	1.0	Ea		$ 75,000.00	$ 75,000	**$ 75,000**	Supply & Install
7.18	Control House and Pad (25' x 50' - 1250 sq. ft)	1.0	Ea	$ 350,000	$ 100,000	$ 450,000	**$ 450,000**	
7.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
7.20	Control Cables	1.0	Sum	$ 130,000	$ 130,000	$ 260,000	**$ 260,000**	
7.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
7.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	
7.23	Protection, Telecom and Metering Equipment (Panels)	18.0	Ea		$ 30,000	$ 30,000	**$ 540,000**	Supply & Install
7.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
7.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
7.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
7.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 975,000	$ 975,000	**$ 975,000**	Supply & Install
7.28	Grounding	1.0	Sum		$ 125,000	$ 125,000	**$ 125,000**	Supply & Install
7.29	Bus Support 3 Ph	9.0	Ea	$ 4,500	$ 2,000	$ 6,500	**$ 58,500**	
7.30	Bus Support 1 Ph	21.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 63,000**	
7.31	Switch Stands	13.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 143,000**	
7.32	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
7.33	Misc. Structures	1.0	Sum		$ 24,000	$ 24,000	**$ 24,000**	
7.34	Substation A-Frame Structures Standalone	5.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 125,000.00**	
7.35	Lightning Masts	5.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 60,000**	
7.36	Arrestor Stands	12.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 42,000**	
7.37	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
7.38	345kV 30MVAR Shunt Reactor	1.0	Ea	$ 732,000	$ 100,000	$ 832,000	**$ 832,000**	
7.39	Transformer Foundation with concrete moat and double steel grating	1.0	Sum		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
7.40	Interconnection arrangement at Stolle Rd Substation	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
TOTAL - EAST STOLLE RD SUBSTATION:							**$ 13,963,000**	
8. MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:								
	Contractor Mobilization / Demobilization							
8.1	Mob / Demob	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
	Project Management, Material Handling & Amenities							

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8.2	Project Management & Staffing (includes PM, Field Engineers / Supervision, Scheduler and Cost Manager, SHEQ Staff, Admin, Materials Management Staff)	14.00	Months		$ 350,000	$ 350,000	**$ 4,900,000**	
8.3	Site Accommodation, Facilities, Storage	1.00	Sum		$ 1,400,000	$ 1,400,000	**$ 1,400,000**	
	Engineering							
8.4	Design Engineering	1.00	Sum		$ 4,770,000	$ 4,770,000	**$ 4,770,000**	
8.5	LiDAR	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	
8.6	Geotech	1.00	Sum		$ 1,100,000	$ 1,100,000	**$ 1,100,000**	
8.7	Surveying/Staking	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	
	Testing & Commissioning							
8.8	Testing & Commissioning of TRANSMISSION LINE and Equipment	1.00	Sum		$ 1,600,000	$ 1,600,000	**$ 1,600,000**	
	Permitting and Additional Costs					$ -	**$ -**	
8.9	Environmental Licensing & Permitting Costs	1.00	Sum		$ 3,477,113	$ 3,477,113	**$ 3,477,113**	
8.10	Environmental Mitigation	1.00	Sum		$ 8,002,635	$ 8,002,635	**$ 8,002,635**	
8.11	Warranties / LOC's	1.00	Sum		$ 575,441	$ 575,441	**$ 575,441**	
8.12	Real Estate Costs (New ROW)	1.00	Sum		$ 7,993,538	$ 7,993,538	**$ 7,993,538**	
8.13	Real Estate Costs (Incumbent Utility ROW)	1.00	Sum		$ 90,000	$ 90,000	**$ 90,000**	
8.14	Legal Fees	1.00	Sum		$ 3,500,000	$ 3,500,000	**$ 3,500,000**	
8.15	Sales Tax on Materials	1.00	Sum	$ 4,064,839		$ 4,064,839	**$ 4,064,839**	
8.16	Fees for permits, including roadway, railroad, building or other local permits	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
8.17	Allowance for Funds Used During Construction (AFUDC)	1.00	Sum			$ -	**$ -**	
8.18	Carrying Charges	1.00	Sum			$ -	**$ -**	
TOTAL - MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:							**$ 43,673,566**	
9. SYSTEM UPGRADE FACILITIES								
SUF 1.1	Depew to Erie Street 115kV Transmission Line 921. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Relay was replaced and line ratings increased to 124/137/158 (NOR/LTE/STE) resulting ratings are below line conductor ratings. Scope is to remove all limitations on the circuit so it is limited by lien conductor ratings 125/152/181 (NOR/LTE/STE).
SUF 1.2	Engineering, T&C, PM, Indirects for SUF 1.1 (15%)					$ -	**$ 75,000**	
SUF 2.1	Shawnee to Swann Reconductor	12.00	Mile		$ 400,000	$ 400,000	**$ 4,800,000**	Rate for reconductor is pro-rated from National Grid Niagara - Packard reconductor. Note that rate does not include upgrades to structures or foundations.
SUF 2.2	Engineering, T&C, PM, Indirects FOR SUF 2.2 (15%)					$ -	**$ 720,000**	
SUF 3.1	Roll Rd to Stolle Rd 115kV Transmission Line 928. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Replace limiting terminal equipment at both Stolle Rd 115 kV Substation and Roll Rd 115 kV Substation.
SUF 3.2	Engineering, T&C, PM, Indirects for SUF 3.1 (15%)					$ -	**$ 75,000**	
SUF 4	**100MVAR Shunt Reactor at RG&E Sta 80**							
SUF 4.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement - approx 1. acre	1.00	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
SUF 4.2	Substation Fence	600.00	LF		$ 200	$ 200	**$ 120,000**	Supply & Install
SUF 4.3	Shunt Reactor 3ph 345kV 100MVAR	1.00	Ea	$ 1,500,000	$ 500,000	$ 2,000,000	**$ 2,000,000**	
SUF 4.4	Switches 3ph 345kV	1.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 30,000**	
SUF 4.5	CVT's 345kV	3.00	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 63,000**	
SUF 4.6	Breakers 345kV	1.00	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 380,000**	
SUF 4.7	Arrestors - 235kV	3.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 22,500**	
SUF 4.8	Low Profile Foundations	19.00	Ea		$ 5,000	$ 5,000	**$ 95,000**	Supply & Install

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SUF 4.9	Circuit Breaker Foundations	1.00	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
SUF 4.10	Lightning Mast Foundations	2.00	Ea		$ 15,000	$ 15,000	**$ 30,000**	Supply & Install
SUF 4.11	Reactor Foundation with concrete moat and double steel grating	1.00	Ea		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
SUF 4.12	Control Cables	1.00	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
SUF 4.13	Protection & Telecom Equipment	3.00	Ea		$ 15,000	$ 15,000	**$ 45,000**	Supply & Install
SUF 4.14	SCADA and Communications	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.15	Low Voltage AC Distribution	1.0	Sum		$ 300,000	$ 300,000	**$ 300,000**	Supply & Install
SUF 4.16	Control Conduits	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.17	Cable Trench System for Control Conduits	1.0	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
SUF 4.18	Grounding	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.19	Bus Support 3ph	2.0	Ea	$ 3,000	$ 2,000	$ 5,000	**$ 10,000**	
SUF 4.20	Bus Support 1ph	3.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 9,000**	
SUF 4.21	Switch Stands	1.0	Ea	$ 1,500	$ 800	$ 2,300	**$ 2,300**	
SUF 4.22	Fuse Stand	1.0	Ea	$ 1,500	$ 800	$ 2,300	**$ 2,300**	
SUF 4.23	CVT Stand	3.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 10,500**	
SUF 4.24	Lightning Mast	2.0	Ea	$ 10,000	$ 5,000	$ 15,000	**$ 30,000**	
SUF 4.25	Misc Materials and Above / Below Ground Works	1.0	Ea		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
SUF 4.26	**Engineering, T&C, PM, Indirects (15%)**					$ -	**$ 1,211,190**	
SUF 5	**SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)**						**$ 3,750,000**	Contingency for possible additional SUF upgrades
TOTAL -SUF							**$ 19,705,790**	

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ENVIRONMENTAL LICENSING AND PERMITTING

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PROJECT TITLE WNY PROJECT EVALUATION- ENVIRONMENTAL LICENSING & PERMITTING COST ELEMENTS						ENVIRONMENTAL LICENSING & PERMITTING COST ESTIMATE RANGE FOR PROPOSED WNY TRANSMISSION PROJECT - T014			
FEDERAL						**Preferred Route**		**Alternative Route**	
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans	Min.	Max.	Min.	Max.
USACE	Waters of the US under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act (including regulated wetland areas)	Nationwide Permits (NWP) or Individual Permit (IP)	Any work within the boundaries of regulated wetlands (with the exception of isolated wetlands) or waterways to the spring high tide or ordinary high water mark	If project qualifies for a NWP (<0.5 acre disturbance and within NWP project type parameters), a pre-construction notification (PCN) is typically required. NWPs have a 45 day review period starting from when project logged in system (up to 6wk backlog delay in logging projects) If an IP is triggered, USACE will require Alternative Analysis and Public Notice/Hearing. IPs could also trigger restrictive environmental work windows. IPs have a 120 day review period starting from when permit is "deemed complete"	Wetland Delineation; Wetland Function & Value Assessment; Stream Delineation; Restoration Plan	$26,600	$88,250	$26,600	$88,250
National Park Service	National Parks	Consultation; Special Use Permit	Only applies if National Park located in project area.	Depending on impact of project request for a special use permit may require a NEPA environmental assessment.					
USFWS	Endangered Species Act Section 7 (ESA) Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act	Consultation (Formal or Informal); Special Use Permit	Any work that may have an affect on listed species or their habitat; or projects within National Wildlife Refuges	USACE coordinates consultation with USFWS for ESA listed species during their permit review. Also includes the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act compliance. Season restrictions on construction could be imposed.	Rare, Threatened & Endangered Species Search; Preparation of Reports and Conservation Plans	$27,800	$94,000	$30,300	$99,000
NEPA	National Environmental Policy Act	Categorical Exclusion; EA Finding of No Impact; or EIS Record of Decision	With some exemptions, projects on federally owned lands and/or projects requiring federal permit approvals	Possible NEPA review due if federal agency coordination is required. Federal agency involved to determine if Categorical Exclusion applies. Assumes Article 7 covers NEPA requirements or if an EIS is required it is prepared under SEQRA Task.					
FAA	Airports / Airspace	Federal Aviation Administration (FAA) Notification	New or Replacement Structures near Airports	Depending on construction locations, this permit may only be needed for OP work.	Obstruction Analysis, Mitigation Plan (assumes Engineering Cost)				
STATE									
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans				
NYS Public Service Commission / Department of Public Service (NYSDPS)	Article VII	Article VII: Certificate of Environmental Compatibility and Public Need and Environmental Management & Construction Plan (EM&CP)	Article 7: Major electric transmission facilities with design capacity of 100kV or more extending for at least 10 miles or 125kV and over extending a distance of 1 mile or more (some exclusions for underground transmission applies)	Article 7 will incorporate all of the required State and Local approvals (costed separately), as well as Engineering and Environmental Studies and Public Outreach. Article VII Intervenor Fund payment expected to be $100,000. An Environmental Management & Construction Plan (EM&CP) must be prepared and approved by the PSC. (see 16 NYCRR Parts 85 through 88)	Includes Reports and Plans required for State and Federal Agency Permits, as well as EM&CP, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan, Mitigation Plans	$600,000	$3,100,000	$600,000	$3,100,000

ENVIRONMENTAL LICENSING AND PERMITTING

NYS Public Service Commission / Department of Public Service (NYSDPS)	Part 102		Construction of a utility overhead transmission facility that will convey electric energy at 65kV or higher for a distance of one mile or longer and are not subject to Article VII of the Public Service Law.	May include coordination or studies completed under other line items including: Visual assessment, SHPO determination, OPRHP consultation, Ecological Impacts Assessment	Advantage-Disadvantage Analysis				
NYSDEC	Article 15 Stream Disturbance; Article 24 Wetlands, Open Waters, Wetlands Buffers (100' for Freshwater Wetland)	Individual Permit (IP) (unless developer has General Permit (GP))	Any work within the boundaries of regulated waterways or wetlands, and wetland adjacent areas	Any disturbance within wetlands and/or below mean high tide will require an IP. Areas of temporary disturbance will likely require restoration, including a monitoring and maintenance period. Permanent disturbance will require offsite mitigation up to 3:1 area ratio; also includes a monitoring and maintenance period. GP may only be applicable if project ground disturbance is located outside of wetlands areas (above MHW).	Wetland Delineation; Wetland Restoration/Mitigation Plan	$12,000	$53,000	$12,000	$53,000
NYSDEC	Stormwater (If >1 Acre Soil Disturbance)	SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 & SWPPP	Project areas of soil disturbance	If project involves 1 acre or more soil disturbance, then the GP is required. If located within a Regulated MS4 Municipality, additional coordination may be needed. Weekly inspections by a Qualified Inspector during construction will be required.	SWPPP (assumes Engineering Cost includes Sediment & Erosion Control Plan, Hydraulic & Hydrology Studies, Stormwater Management Design)	$11,200	$38,000	$11,200	$38,000
Any State or local government agency that issues permits or approvals	State Environmental Quality Review Act (SEQRA)	Environmental Assessment (EA) Determination of Significance	Projects not covered as a Type II Action (Note a project can not be segmented - all phases/tasks must be considered in the review)	Most projects or activities proposed by a state agency, and all discretionary approvals (permits) from a NYS agency or local government, require an environmental impact assessment. SEQR requires the sponsoring or approving governmental body to identify and mitigate the significant environmental impacts of the activity it is proposing or permitting.					
NYSDOS	State Coastal Management Program Mapped Coastal Area Boundary	Coastal Consistency Concurrence	Projects within the NYSDOS designated Coastal Zone; and consistency with Local Waterfront Revitalization Plans (LWRPs); e.g., Town of Grand Island LWRP	Online mapping available to check if within coastal zone, a significant coastal fish & wildlife habitat (SCFWH), a local waterfront revitalization program area (LWRP), or a comprehensive management program areas (CMP)					
NYSHPO	National Historic Preservation Act (NHPA) Section 106: State and Federal Historic Places; State Mapped Archeologically Sensitive Areas	Cultural Resource Information System (CRIS) Determination	Local, State, or Federal eligible or designated historic places and/or areas of archeological sensitivity (in off-road areas and areas that have not been previously disturbed)	NYSDEC EAF Online Mapper identifies State or National Register of Historic Places and archeological sensitive areas within or adjacent to the project site. Formally enter project information and supporting documents into SHPO's online CRIS program. Staff will review and email a determination of impacts letter	Phase 1A & 1B Archaeological Studies	$13,200	$49,000	$14,200	$52,000
NYS NHP	Threatened and Endangered Species	Consultation	Activities that may affect T&E species or their habitat.		See USFWS	$1,200	$6,400	$1,200	$6,400

Client: NYISO
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ENVIRONMENTAL LICENSING AND PERMITTING

Revision: 5

NYSDOT/NYS Thruway Authority/FHWA	State Roadways	Highway Work Permit/Utility Permit, Vegetation Management Permit; Easement	Any work within or crossing State highway ROW	May require restoration landscaping coordination. Typically requires compliance with NEPA including SHPO and USFWS effects determination	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$17,000	$69,000	$17,000	$69,000
NYS Canal Corporation	Erie Canal - jurisdiction varies along edge	Canal Occupancy & Work Permit (TA-W99072)	Any work involving the Erie Canal	Must coordinate with Division Permit Engineer about particular section of canal being affected. Commercial permit fee = $25 plus $2,000,000 additional General Aggregate Liability Insurance	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)				
NYS Dept. of Agriculture and Markets	All agricultural lands (including Agricultural Districts)	Part of Article 7 & Article 10 Review process	Any work impacting agricultural land	Must minimize impacts and restore damage to agricultural land, and coordinate with County Soil & Water Conservation District; Vineyards are a major concern in WNYS. Pre-application conference with PSC, DEC and Ag& Markets recommended. Must develop EM&CP in conformance with Art. 7/10 Certificate Conditions. Agricultural Monitor must oversee construction & restoration; requisite 2-yrs post restoration monitoring.	Crop/Pasturing Mitigation Plan (not included in costing)	$11,000	$24,000	$11,000	$24,000
REGIONAL									
Railroads	Railroad crossings	Consultation-permits may be required; Easement	Access / new structures on RR property		Easement area survey (not included in costs)	$11,000	$76,000	$11,000	$76,000
LOCAL/MUNICIPAL									
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans				
County Dept. of Public Works	County Roadways	Lane Closure Permit, Highway Work or Access Permit	Work within county roadways and right-of-ways			$6,000	$40,000	$6,000	$40,000
Town, City or Village	Municipal Stormwater (MS4) Review	Approval of SWPPP or EM&CP	Project areas of soil disturbance		See NYSDEC SPDES	$6,000	$35,000	$6,000	$35,000
Town, City or Village	Variable	Building Permits	New Structures	Individual Towns/Villages must be consulted on a project specific basis to determine notification and/or permitting procedures. Permit application names vary (e.g. road obstruction permit)		$18,000	$92,000	$18,000	$92,000
Town, City or Village	Municipal Roadways	Highway Work Permit; Road Opening Permit	Work within municipal roadways and right-of-ways			$6,000	$35,000	$6,000	$35,000
Town, City or Village	Wetlands	Wetland Permit / Conservation Approvals	Mapped wetlands and wetland adjacent areas (buffer width variable)		See USACE / NYSDEC Art. 24	$6,000	$52,000	$6,000	$52,000

		Minimum	Maximum	Minimum	Maximum
ENVIRONMENTAL LICENSING & PERMITTING COST (EXCLUDING MITIGATION)	**PROJECT T014 TOTAL**	**$773,000**	**$3,851,650**	**$776,500**	**$3,859,650**
	Expected Value	**$2,312,325**		**$3,477,112.50**	

Excluded cost: Mitigation or restoration for impact to regulated wetlands; agricultural land and tree clearing

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T014 - NextEra Energy

ENVIRONMENTAL MITIGATION ESTIMATE

Revision: 5

WNY TRANSMISSION PROJECT - ENVIRONMENTAL MITIGATION COST ESTIMATE FOR T014

	Offsite Wetland Mitigation*				Farmland**	
	Preferred Route		Alternative Rotue		Preferred & Alternative Routes	
	Min.	Max.	Min.	Max.	Min.	Max.
Area	45 acres	45 acres	38 acres	38 acres	30 acres	60 acres
Cost/Acre	$60,000	$120,000	$60,000	$120,000	$503	$503
Ratio	1:1	3:1	1:1	3:1	1:1	1:1
Total	$ 2,700,000	$16,200,000	$2,280,000	$13,680,000	$15,090	$30,180

T014 PREFERRED ROUTE MITIGATION TOTAL	Minimum	Maximum	Expected Value
	$2,715,090	**$16,230,180**	**$ 9,472,635**

T014 ALTERNATIVE ROUTE MITIGATION TOTAL	Minimum	Maximum	Expected Value
	$2,295,090	**$13,710,180**	**$ 8,002,635**

*Offsite wetland mitigation area assumes clearing of NWI Forested/Shrub Wetland approx. 3.24 miles (17107 LF) by 115' ROW width for the Preferred Route and approx. 3.47 (18322 LF) by 90' ROW width for the Alternative Route; Max. cost per acre assumes additional mitigation required for permanent impacts of proposed structures in non-forested wetlands; costing includes design and installation costs only; does not include land acquisition or long term monitoring

**Farmland mitigation based on corn bushel yield at 129 BU/Acre and $3.9/BU (production numbers from 2016 USDA NYS Agriculture Overview), area assumes 9.8 miles (51744 LF) Land Adjacent to Agriculture District/Crop Land by 25' Wide (Min.) or 50' Wide (Max.); does not include land acquisition

Revision: 5

REAL ESTATE ESTIMATE
(NEW ROW)

COUNTY: ERIE
DEVELOPER: NEXTERA (T014 & T015 PREFERRED)
SEGMENT: DYSINGER - STOLLE SEGMENT

		Area (Acres)	Total Cost
	Total	0.68	$ 4,376.00

Revision: 5

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

COUNTY: NIAGARA & ERIE
DEVELOPER: NEXTERA (T014 & T015 PREFERRED)
SEGMENT: DYSINGER - STOLLE SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
1	NEXTERA ENERGY	Dysinger SS to Stolle Rd SS - 19.93 miles	Niagara	4.59	$ 1,793,000
			Erie	355.48	

Revision: 5

REAL ESTATE ESTIMATE
(NEW ROW - 80FT. CORRIDOR)

COUNTY: NIAGARA & ERIE
DEVELOPER: NEXTERA (T014 & T015 ALTERNATIVE)
SEGMENT: DYSINGER TO STOLLE ROAD SEGMENT

	Address	Area (Acres)	Total Cost
A	**NIAGARA COUNTY**		
	Sub Total (A)	5.30	$ 124,550.00
B	**ERIE COUNTY**		
	Sub Total (B)	191.75	$ 5,572,547.00
	Total (A + B)	197.05	$ 5,697,097.00

Revision: 5

REAL ESTATE ESTIMATE
(NEW ROW - 10FT. ADDITIONAL CORRIDOR)

COUNTY:	NIAGARA & ERIE
DEVELOPER:	NEXTERA (T014 & T015 ALTERNATIVE)
SEGMENT:	DYSINGER TO STOLLE ROAD SEGMENT

	Address	Area (Acres)	Total Cost
A	**NIAGARA COUNTY**		
	Sub Total (A)	0.59	$ 13,865.00
B	**ERIE COUNTY**		
	Sub Total (B)	26.28	$ 858,481.50
	Total (A + B)	26.87	$ 872,346.50

Revision: 5

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

COUNTY: NIAGARA & ERIE
DEVELOPER: NEXTERA (T014 & T015 ALTERNATIVE)
SEGMENT: DYSINGER - STOLLE SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
1	NEXTERA ENERGY (Alternative)	Dysinger SS to Stolle Rd SS - 21.66 miles	Niagara	1.20	$ 90,000
			Erie	17.16	

REAL ESTATE ESTIMATE (HOUSES)

Revision: 5

COUNTY: ERIE

DEVELOPER: NEXTERA (T014 & T015 ALTERNATIVE)

SEGMENT: DYSINGER - STOLLE SEGMENT

		Total Valuation of Property with 3% Escalation/year (as of 2017)
	Total Valuation Cost	$ 1,037,124.17

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T014 - NextEra Energy

REAL ESTATE ESTIMATE

Revision: 5

COUNTY:	NIAGARA
DEVELOPER:	NEXTERA
SEGMENT:	DYSINGER SUBSTATION

		Total Cost
	Total Cost of Proposed Substation Site	$ 251,450.00

REAL ESTATE ESTIMATE

Revision: 5

COUNTY:	ERIE
DEVELOPER:	NEXTERA
SEGMENT:	STOLLE ROAD SUBSTATION

		Total Cost
	Total Cost of Proposed Substation Site	$ 135,520.00

Revision: 5

ASSUMPTIONS AND CLARIFICATIONS

a) Cost Estimate is based on 2017 rates.
b) Construction Schedule is in accordance with the Developers proposed schedule (6 months for construction - seems light) - we have assumed continuous working with no breaks in the schedule. Six months added for start up and close out works and assisting in pre-construction activities (i.e. permitting activates, material procurement etc.)
c) Stringing rates allow for protection over crossings (such as rider poles).
d) We have assumed a typical work week (6 x 10 hour days).
e) Wood Pole types are based on Plan and Profile drawings. Direct embed foundations are assumed to be 10% plus 2 ft and rates include backfill. Steel Pole weights and foundation types are estimated based on benchmark data.
f) We have assumed that the Access Road upgrades include gravel updates only.
g) Costs will vary for handling and disposal of contaminated spoils, depending on type of contaminants and availability / location of the appropriate tipping facility. Since there is not enough information to provide a quantified estimate for this item, allowance is included in the contingency monies.
h) Costs have been developed based on historical data from Projects of a similar nature (AACE Class 5 and 4 Estimating Practices). We have not engaged any subcontractors or material vendors for formal quotes.
i) The equipment types listed for Dysinger and East Stolle Rd Substation have been taken from a recently completed 345kV substation project, using current pricing.
j) Estimated quantities have been used for items in red text in Section 1 of the Estimate (CLEARING & ACCESS FOR T-LINE CONSTRUCTION). These items were not quantified in the Developers Estimate, however we believe that they are necessary for the works.
k) A Contractor Mark-Up (OH&P) of 15% has been included in the Total section
l) Assumes all environmental data and project details provided are accurate unless noted otherwise.
m) USFWS T&E assumes ¼ of the total Preferred Route will require field survey for T&E (5 miles).
n)USFWS T&E assumes ¼ of the total Alternative Route will require field survey for T&E (5. 5 miles).
o) NEPA-Assumes no NEPA because Art VII.
p) SHPO-Assumes consultation and Phase 1A/1B archeological studies with field survey for 50% of Preferred Route (10 miles) and Alternative Route (11 miles).
q) NYSDOT/FHWA-Assumes any required NEPA coordination/requirements are covered under Article VII.
r) Assumes no coordination with National Parks Service or OPRHP/State Parks.
s) USACE wetland delineation total for Preferred and Alternative Routes is based on combined NYSDEC/USACE wetland length of 3.9 miles from information in Proposal Attachment C.
t) NYSDEC delineations overlap and are accounted for in USACE costing.

ASSUMPTIONS AND CLARIFICATIONS

u) Offsite wetland mitigation area costs for the Preferred Route based on impacts anticipated by clearing of NWI Forested/Shrub Wetland of approximately 3.24 miles (calculated by GEI based on NWI mapper legend categories). Assumes clearing an additional 115 feet within Right of Way. Minimum costs $60,000/acre at 1:1 ratio, maximum costs at $120,000/acre at 3:1 ratio for additional permanent impacts of proposed structures in non-forested wetlands. Costing includes design and installation costs only and does not include land acquisition or long term monitoring.
v) Offsite wetland mitigation area costs for the Alternative Route based on impacts anticipated by clearing of NWI Forested/Shrub Wetland of approximately 3.47 calculated by GEI based on NWI mapper legend categories). Assumes clearing 90 wide feet within Right of Way. Minimum costs at $60,000/acre at 1:1 ratio, maximum costs at $120,000/acre at 3:1 ratio for additional permanent impacts of proposed structures in non-forested wetlands. Costing includes design and installation costs only and does not include land acquisition or long term monitoring.
w) Agricultural mitigation for Preferred and Alternative Routes assumes timber matting impacts and pad impacts on adjacent agriculture land (9.8 miles) requires crop damage payments based on USDA 2016 NYS Agriculture Overview corn yield and bushel price/acre. Minimum assumes 25-foot-wide impact, Maximum assumes 50-foot-wide impact.
x) Assumes Right of Way restoration is accounted for in construction costs.
y) Mitigation costs for landscaping only (no paving, sidewalks, sound walls, etc.).
z) No tree survey or replanting required outside regulated wetlands areas.
aa) Article VII Intervenor Fund payment expected to be $100,000.
ab) Expected value of Alt. Route is estimated to be 50% higher than the mean of the range of environmental licensing and permitting costs due to new ROW.
ac) SUF pricing is included at the end of the estimate workbook (costs excluded from main estimate).
ad) SUF pricing includes 35% to cover Contractor markup (15%) and contingency (20%)
ae) Reconductor pricing (SUF 2 - Shaw to Swan Reconductor) is based on Niagara-Packard (National Grid) reconductor estimate, pro-rated to a rate / mile. Note that this is based on conductor, shieldwire and hardware pricing only and does not include structure or foundation works.
af) System Upgrade Facilities Contingency is allowance for potential additional system upgrades including overdutied breakers, protection changes, unidentified thermal issues, etc that may be identified as detailed studies are completed.

INDEPENDENT ESTIMATES

ATTACHMENT B9

T015 – NEXTERA ENERGY

SUBSTATION ENGINEERING COMPANY
8/11/2017

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T015 - NextEra Energy

SECO SUBSTATION ENGINEERING COMPANY

SUMMARY OF COST ESTIMATE

		PROPOSAL (T015)	
		PREFERRED ROUTE	ALTERNATIVE ROUTE
	Description	Total Amount	Total Amount
1	CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION	$ 12,717,405	$ 13,571,466
2	TRANSMISSION LINE FOUNDATIONS	$ 3,200,398	$ 10,001,353
3	STRUCTURES - TRANSMISSION LINE	$ 4,688,312	$ 12,215,200
4	CONDUCTOR, SHIELDWIRE, OPGW	$ 6,137,208	$ 6,089,688
5	TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE	$ 1,382,170	$ 1,829,571
6	NEW DYSINGER SUBSTATION	$ 25,374,000	$ 25,374,000
7	EAST STOLLE RD SUBSTATION	$ 13,963,000	$ 13,963,000
8	MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS	$ 28,687,203	$ 40,632,082
	CONTRACTOR MARK-UP (OH&P) 15%	$ 14,422,454	$ 18,551,454
	SUBTOTAL:	$ 110,572,150	$ 142,227,813
	CONTINGENCY (20%)	$ 22,114,430	$ 28,445,563
	TOTAL (A):	**$ 132,686,580**	**$ 170,673,375**
9	SYSTEM UPGRADE FACILITIES	$ 19,705,790	$ 19,705,790
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$ 6,897,027	$ 6,897,027
	TOTAL (B):	**$ 26,602,817**	**$ 26,602,817**
	TOTAL PROJECT COST (A+B):	**$ 159,289,397**	**$ 197,276,192**

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T015 - NextEra Energy

COST ESTIMATE

(PREFERRED ROUTE)

Revision: 5

Description of Work: The Project consists of 2 new 345kV Switchyards (Dysinger and new East Stolle Road. TO15 excludes the 345kV, 700MVA Phase Shifting Transformer at Dysinger Switchyard), the Scope of Work also includes approximately 20 miles of new 345kV Transmission Line, located in Erie County and Niagara County (Empire State Line). This estimate includes for the Developers Preferred Route which utilizes an existing utility ROW. Wood H-Frames will be used to minimize visual impact.

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
1. CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION								
1.1	Clearing the ROW (mowing & clearing)	139.0	Acre		$ 15,000	$ 15,000	**$ 2,085,000**	
1.2	Access Road	48,535.0	LF		$ 45	$ 45	**$ 2,184,075**	Assumes Type 1 Type Gravel Road
1.3	Silt Fence	48,535.0	LF		$ 4	$ 4	**$ 194,140**	
1.4	Matting	56,952.0	LF		$ 70	$ 70	**$ 3,986,640**	
1.5	Snow Removal	1.0	Sum		$ 320,000	$ 320,000	**$ 320,000**	
1.6	ROW Restoration	20.0	Mile		$ 10,000	$ 10,000	**$ 200,000**	
1.7	Work Pads	795,000.00	SF		$ 4	$ 4	**$ 2,798,400**	
1.8	Restoration for Work Pad areas	79,500.00	SF		$ 0.2	$ 0.2	**$ 11,925**	
1.9	Temporary Access Bridge	20.0	EA		$ 20,035	$ 20,035	**$ 400,700**	
1.10	Air Bridge	5.0	EA		$ 14,445	$ 14,445	**$ 72,225**	
1.11	Stabilized Construction Entrance	10.0	EA		$ 4,580	$ 4,580	**$ 45,800**	
1.12	Maintenance and Protection of Traffic on Public Roads	1.0	LS		$ 300,000	$ 300,000	**$ 300,000**	
1.13	Culverts / Misc. Access	1.0	LS		$ 100,000	$ 100,000	**$ 100,000**	
1.14	Concrete Washout Station	10.0	EA		$ 1,850	$ 1,850	**$ 18,500**	
TOTAL - CLEARING & ACCESS FOR TRANSMISSION LINE:							**$ 12,717,405**	
2. TRANSMISSION LINE FOUNDATIONS								
2.1	Direct Embed Foundation 3' x 11'	267.0	Ea		$ 9,680	$ 9,680	**$ 2,584,560**	Supply & Install
2.2	Direct Embed Foundation 3' x 12'	35.0	Ea		$ 10,648	$ 10,648	**$ 372,680**	Supply & Install
2.3	Direct Embed Foundation 3' x 13'	8.0	Ea		$ 11,713	$ 11,713	**$ 93,702**	Supply & Install
2.4	Direct Embed Foundation 3' x 14'	5.0	Ea		$ 12,884	$ 12,884	**$ 64,420**	Supply & Install
2.5	Direct Embed Foundation 3' x 15'	6.0	Ea		$ 14,172	$ 14,172	**$ 85,035**	Supply & Install
TOTAL - TRANSMISSION LINE FOUNDATIONS:							**$ 3,200,398**	
3. STRUCTURES - TRANSMISSION LINE								
3.1	Dead-End 3 Pole Wood Structure, H2 80ft	5	Ea	$ 6,000	$ 8,185	$ 14,185	**$ 70,927**	
3.2	Dead-End 3 Pole Wood Structure, H2 90ft	2	Ea	$ 7,200	$ 6,925	$ 14,125	**$ 28,250**	
3.3	Dead-End 3 Pole Wood Structure, H2 100ft	2	Ea	$ 8,640	$ 8,459	$ 17,099	**$ 34,198**	
3.4	Dead-End 3 Pole Wood Structure, H2 110ft	1	Ea	$ 10,368	$ 12,689	$ 23,057	**$ 23,057**	
3.5	Angle 3 Pole Wood Structure, H1-90ft	4	Ea	$ 6,480	$ 13,177	$ 19,657	**$ 78,628**	
3.6	Angle 3 Pole Wood Structure, H1-100ft	1	Ea	$ 7,776	$ 16,471	$ 24,247	**$ 24,247**	
3.7	Tangent H-Frame Wood Structure, H2 85'	1	Ea	$ 4,800	$ 15,373	$ 20,173	**$ 20,173**	
3.8	Tangent H-Frame Wood Structure, H2 90'	118	Ea	$ 5,760	$ 18,448	$ 24,208	**$ 2,856,506**	
3.9	Tangent H-Frame Wood Structure, H2 95'	11	Ea	$ 6,912	$ 22,137	$ 29,049	**$ 319,541**	
3.10	Tangent H-Frame Wood Structure, H2 100'	3	Ea	$ 8,294	$ 8,185	$ 16,480	**$ 49,439**	
3.11	Tangent H-Frame Wood Structure, H2 105'	1	Ea	$ 9,953	$ 6,925	$ 16,878	**$ 16,878**	
3.12	Tangent H-Frame Wood Structure, H2 115'	1	Ea	$ 11,944	$ 8,459	$ 20,403	**$ 20,403**	
3.13	Tangent H-Frame Wood Structure, H2 125'	3	Ea	$ 14,333	$ 12,689	$ 27,021	**$ 81,064**	
3.14	Install Grounding	153.0	Structure		$ 5,000	$ 5,000	**$ 765,000**	Supply & Install
3.15	Guy Wires and Anchors for DE / Angle Structures	15.0	Structure		$ 20,000	$ 20,000	**$ 300,000**	Supply & install
TOTAL - STRUCTURES TRANSMISSION LINE:							**$ 4,688,312**	
4. CONDUCTOR, SHIELDWIRE, OPGW								
4.1	(2)/Phase - 795kcmil 26/7 Stranded "Drake" ACSR	21	Circuit Mile	$ 53,856	$ 158,400	$ 212,256	**$ 4,457,376**	
4.2	(1) OPGW 48 Fiber	21	Mile	$ 22,176	$ 27,720	$ 49,896	**$ 1,047,816**	
4.3	(1) 3/8" HS Steel	21	Mile	$ 3,696	$ 26,400	$ 30,096	**$ 632,016**	

COST ESTIMATE

(PREFERRED ROUTE)

Revision: 5

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
TOTAL: CONDUCTOR, SHIELDWIRE, OPGW:							**$ 6,137,208**	
5. TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE								
5.1	Tangent - Polymer V-String	414	Set	$ 900	$ 720	$ 1,620	**$ 670,680**	
5.2	Deadend / Angle Assemblies	96.0	Set	$ 1,500	$ 1,040	$ 2,540	**$ 243,840**	
5.3	OPGW Assembly - Tangent	138.0	Set	$ 200	$ 150	$ 350	**$ 48,300**	
5.4	OPGW Assembly - Angle / DE	34.0	Set	$ 250	$ 150	$ 400	**$ 13,600**	
5.5	OHSW Assembly - Tangent	138.0	Set	$ 200	$ 150	$ 350	**$ 48,300**	
5.5	OHSW Assembly - Angle / DE	34.0	Set	$ 250	$ 150	$ 400	**$ 13,600**	
5.8	OPGW Splice Boxes	9.0	Ea	$ 1,500	$ 1,000	$ 2,500	**$ 22,500**	
5.7	OPGW Splice & Test	1.0	Sum		$ 10,800	$ 10,800	**$ 10,800**	
5.8	Spacer Dampers	2,310.0	Ea	$ 50	$ 35	$ 85	**$ 196,350**	
5.9	Vibration Dampers - Conductor	1,850.0	Ea	$ 32	$ 20	$ 52	**$ 96,200**	
5.10	Shieldwire / OPGW Dampers, Misc Fittings	1.0	Sum	$ 10,000	$ 8,000	$ 18,000	**$ 18,000**	
TOTAL: TRANSMISSION LINE INSULA+52:63TORS, FITTINGS, HARDWARE:							**$ 1,382,170**	
6. NEW DYSINGER SWITCHYARD								
6.1	Site Works including sediment controls, access roads, rough grading, final	1.0	Sum		$1,500,000.00	$ 1,500,000	**$ 1,500,000**	Supply & Install
6.2	Substation Fence	2,500.0	LF		$200.00	$ 200	**$ 500,000**	Supply & Install
6.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
6.4	Switches 3ph	22.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 154,000**	
6.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
6.6	Line Switches 3 ph w/ motor-operators	7.0	Ea	$ 15,000	$15,000	$ 30,000	**$ 210,000**	
6.7	Instrument Transformers	1.0	Sum		$ 1,214,000	$ 1,214,000	**$ 1,214,000**	
6.8	Breakers	11.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 4,180,000**	
6.9	Arrestors (3 per line)	21.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 157,500**	
6.10	Line Traps	7.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 147,000**	
6.11	345 kV buses	2.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
6.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
6.13	Low Profile Foundations	282.0	Ea		$ 5,000	$ 5,000	**$ 1,410,000**	Supply & Install
6.14	Caisson DE Foundations	48.0	Ea		$ 50,000	$ 50,000	**$ 2,400,000**	Supply & Install
6.15	Circuit Breaker Foundations	11.0	Ea		$ 75,000	$ 75,000	**$ 825,000**	Supply & Install
6.16	Lightning Mast Foundations	5.0	Ea		$15,000	$ 15,000	**$ 75,000**	Supply & Install
6.17	SST Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
6.18	Control House and Pad (30' x 90')	1.0	Ea	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	
6.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
6.20	Control Cables	1.0	Sum	$ 130,000	$ 130,000	$ 260,000	**$ 260,000**	
6.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
6.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	
6.23	Protection, Telecom and Metering Equipment (Panels)	37.0	Ea		$ 30,000	$ 30,000	**$ 1,110,000**	Supply & Install
6.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
6.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
6.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 975,000	$ 975,000	**$ 975,000**	Supply & Install
6.28	Grounding	1.0	Sum		$ 275,000	$ 275,000	**$ 275,000**	Supply & Install
6.29	Bus Support 3 Ph	19.0	Ea	$ 4,500	$ 2,000	$ 6,500	**$ 123,500**	
6.30	Bus Support 1 Ph	36.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 108,000**	
6.31	Switch Stands	24.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 264,000**	
6.32	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
6.33	Misc. Structures	1.0	Sum		$ 74,000	$ 74,000	**$ 74,000**	
6.34	Substation A-Frame Structures Standalone	12.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 300,000**	

COST ESTIMATE

(PREFERRED ROUTE)

Revision: 5

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
6.35	Lightning Masts	5.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 60,000**	
6.36	Arrestor Stands	21.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 73,500**	
6.37	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
6.38	Connection of Existing Lines to Dysinger Switchyard	1.0	Sum		$ 5,000,000	$ 5,000,000	**$ 5,000,000**	Supply & Install
TOTAL - DYSINGER SWITCHYARD:							**$ 25,374,000**	
7. EAST STOLLE RD SUBSTATION								
7.1	Site Works including sediment controls, access roads, rough grading, final	1.0	Sum		$ 1,000,000.00	$ 1,000,000	**$ 1,000,000**	Supply & Install
7.2	Substation Fence	1,900.0	LF		$ 200.00	$ 200	**$ 380,000**	Supply & Install
7.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
7.4	Switches 3ph	9.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 63,000**	
7.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
7.6	Line Switches 3 ph w/ motor-operators	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
7.7	Instrument Transformers	1.0	Sum		$ 752,000	$ 752,000	**$ 752,000.00**	
7.8	Breakers	4.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 1,520,000.00**	
7.9	Arrestors (3 per line) and shunt reactor	12.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 90,000**	
7.10	Line Traps	2.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 42,000.00**	
7.11	345 kV buses	1.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 60,000**	
7.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
7.13	Low Profile Foundations	147.0	Ea		$ 5,000	$ 5,000	**$ 735,000**	Supply & Install
7.14	Caisson DE Foundations	20.0	Ea		$ 50,000	$ 50,000	**$ 1,000,000**	Supply & Install
7.15	Circuit Breaker Foundations	4.0	Ea		$ 75,000	$ 75,000	**$ 300,000**	Supply & Install
7.16	Lightning Mast Foundations	5.0	Ea		$ 15,000	$ 15,000	**$ 75,000**	Supply & Install
7.17	SST Foundation	1.0	Ea		$ 75,000.00	$ 75,000	**$ 75,000**	Supply & Install
7.18	Control House and Pad (25' x 50' - 1250 sq. ft)	1.0	Ea	$ 350,000	$ 100,000	$ 450,000	**$ 450,000**	
7.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
7.20	Control Cables	1.0	Sum	$ 130,000	$ 130,000	$ 260,000	**$ 260,000.00**	
7.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
7.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	
7.23	Protection, Telecom and Metering Equipment (Panels)	18.0	Ea		$ 30,000	$ 30,000	**$ 540,000**	Supply & Install
7.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
7.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
7.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
7.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 975,000	$ 975,000	**$ 975,000**	Supply & Install
7.28	Grounding	1.0	Sum		$ 125,000	$ 125,000	**$ 125,000**	Supply & Install
7.29	Bus Support 3 Ph	9.0	Ea	$ 4,500	$ 2,000	$ 6,500	**$ 58,500**	
7.30	Bus Support 1 Ph	21.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 63,000**	
7.31	Switch Stands	13.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 143,000**	
7.32	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
7.33	Misc. Structures	1.0	Sum		$ 24,000	$ 24,000	**$ 24,000.00**	
7.34	Substation A-Frame Structures Standalone	5.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 125,000**	
7.35	Lightning Masts	5.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 60,000**	
7.36	Arrestor Stands	12.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 42,000**	
7.37	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
7.38	345kV 30MVAR Shunt Reactor	1.0	Ea	$ 732,000	$ 100,000	$ 832,000	**$ 832,000**	
7.39	Transformer Foundation with concrete moat and double steel grating	1.0	Sum		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
7.40	Interconnection arrangement at Stolle Rd Substation	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
TOTAL - EAST STOLLE RD SUBSTATION:							**$ 13,963,000**	
8. MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS								
	Contractor Mobilization / Demobilization							

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

(PREFERRED ROUTE)

Revision: 5

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
8.1	Mob / Demob	1.00	Sum		$ 800,000	$ 800,000	**$ 800,000**	
	Project Management, Material Handling & Amenities					$ -	**$ -**	
8.2	Project Management & Staffing (includes PM, Field Engineers / Supervision,	14.00	Months		$ 220,000	$ 220,000	**$ 3,080,000**	
8.3	Site Accommodation, Facilities, Storage	1.00	Sum		$ 1,400,000	$ 1,400,000	**$ 1,400,000**	
	Engineering					$ -	**$ -**	
8.4	Design Engineering	1.00	Sum		$ 3,000,000	$ 3,000,000	**$ 3,000,000**	
8.5	LiDAR	1.00	Sum		$ 400,000	$ 400,000	**$ 400,000**	
8.6	Geotech	1.00	Sum		$ 600,000	$ 600,000	**$ 600,000**	
8.7	Surveying/Staking	1.00	Sum		$ 400,000	$ 400,000	**$ 400,000**	
	Testing & Commissioning							
8.8	Testing & Commissioning of TRANSMISSION LINE and Equipment	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
	Permitting and Additional Costs					$ -	**$ -**	
8.9	Environmental Licensing & Permitting Costs	1.00	Sum		$ 2,312,325	$ 2,312,325	**$ 2,312,325**	
8.10	Environmental Mitigation	1.00	Sum		$ 9,472,635	$ 9,472,635	**$ 9,472,635**	
8.11	Warranties / LOC's	1.00	Sum		$ 395,286	$ 395,286	**$ 395,286**	
8.12	Real Estate Costs (New ROW)	1.00	Sum		$ 391,346	$ 391,346	**$ 391,346**	
8.13	Real Estate Costs (Incumbent Utility ROW)	1.00	Sum		$ 1,793,000	$ 1,793,000	**$ 1,793,000**	
8.14	Legal Fees	1.00	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
8.15	Sales Tax on Materials	1.00	Sum	$ 1,442,611		$ 1,442,611	**$ 1,442,611**	
8.16	Fees for permits, including roadway, railroad, building or other local permits	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
8.17	Allowance for Funds Used During Construction (AFUDC)	1.00	Sum			$ -	**$ -**	
8.18	Carrying Charges	1.00	Sum			$ -	**$ -**	
TOTAL - MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:							**$ 28,687,203**	
9. SYSTEM UPGRADE FACILITIES								
SUF 1.1	Depew to Erie Street 115kV Transmission Line 921. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Relay was replaced and line ratings increased to 124/137/158 (NOR/LTE/STE) resulting ratings are below line conductor ratings. Scope is to remove all limitations on the circuit so it is limited by lien conductor ratings 125/152/181 (NOR/LTE/STE).
SUF 1.2	Engineering, T&C, PM, Indirects for SUF 1.1 (15%)					$ -	**$ 75,000**	
SUF 2.1	Shawnee to Swann Reconductor	12.00	Mile		$ 400,000	$ 400,000	**$ 4,800,000**	Rate for reconductor is pro-rated from National Grid Niagara - Packard reconductor. Note that rate does not include upgrades to structures or foundations.
SUF 2.2	Engineering, T&C, PM, Indirects FOR SUF 2.2 (15%)					$ -	**$ 720,000**	
SUF 3.1	Roll Rd to Stolle Rd 115kV Transmission Line 928. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Replace limiting terminal equipment at both Stolle Rd 115 kV Substation.
SUF 3.2	Engineering, T&C, PM, Indirects for SUF 3.1 (15%)					$ -	**$ 75,000**	
SUF 4	**100MVAR Shunt Reactor at RG&E Sta 80**							
SUF 4.1	Site Works including sediment controls, access roads, rough grading, final	1.00	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
SUF 4.2	Substation Fence	600.00	LF		$ 200	$ 200	**$ 120,000**	Supply & Install
SUF 4.3	Shunt Reactor 3ph 345kV 100MVAR	1.00	Ea	$ 1,500,000	$ 500,000	$ 2,000,000	**$ 2,000,000**	
SUF 4.4	Switches 3ph 345kV	1.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 30,000**	
SUF 4.5	CVT's 345kV	3.00	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 63,000**	

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

(PREFERRED ROUTE)

Revision: 5

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
SUF 4.6	Breakers 345kV	1.00	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 380,000**	
SUF 4.7	Arrestors - 235kV	3.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 22,500**	
SUF 4.8	Low Profile Foundations	19.00	Ea		$ 5,000	$ 5,000	**$ 95,000**	Supply & Install
SUF 4.9	Circuit Breaker Foundations	1.00	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
SUF 4.10	Lightning Mast Foundations	2.00	Ea		$ 15,000	$ 15,000	**$ 30,000**	Supply & Install
SUF 4.11	Reactor Foundation with concrete moat and double steel grating	1.00	Ea		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
SUF 4.12	Control Cables	1.00	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
SUF 4.13	Protection & Telecom Equipment	3.00	Ea		$ 15,000	$ 15,000	**$ 45,000**	Supply & Install
SUF 4.14	SCADA and Communications	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.15	Low Voltage AC Distribution	1.0	Sum		$ 300,000	$ 300,000	**$ 300,000**	Supply & Install
SUF 4.16	Control Conduits	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.17	Cable Trench System for Control Conduits	1.0	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
SUF 4.18	Grounding	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.19	Bus Support 3ph	2.0	Ea	$ 3,000	$ 2,000	$ 5,000	**$ 10,000**	
SUF 4.20	Bus Support 1ph	3.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 9,000**	
SUF 4.21	Switch Stands	1.0	Ea	$ 1,500	$ 800	$ 2,300	**$ 2,300**	
SUF 4.22	Fuse Stand	1.0	Ea	$ 1,500	$ 800	$ 2,300	**$ 2,300**	
SUF 4.23	CVT Stand	3.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 10,500**	
SUF 4.24	Lightning Mast	2.0	Ea	$ 10,000	$ 5,000	$ 15,000	**$ 30,000**	
SUF 4.25	Misc Materials and Above / Below Ground Works	1.0	Ea		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
SUF 4.26	**Engineering, T&C, PM, Indirects (15%)**					$ -	**$ 1,211,190**	
SUF 5	**SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)**						**$ 3,750,000**	Contingency for possible additional SUF upgrades
TOTAL -SUF							**$ 19,705,790**	

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T015 - NextEra Energy

COST ESTIMATE

(ALTERNATE ROUTE)

Revision:5

Description of Work: The Project consists of 2 new 345kV Switchyards (Dysinger and new East Stolle Road. TO15 excludes the 345kV, 700MVA Phase Shifting Transformer at Dysinger Switchyard), the Scope of Work also includes approximately 22 miles of new 345kV Transmission Line, located in Erie County and Niagara County (Empire State Line). This estimate includes for the Developers Alternate Route which uses Steel Poles.

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
1. CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION								
1.1	Clearing the ROW (mowing & clearing)	118.0	Acre		$ 15,000	$ 15,000	**$ 1,770,000**	
1.2	Access Road	53,388.5	LF		$ 45	$ 45	**$ 2,402,483**	Assumes Type 1 Type Gravel Road
1.3	Silt Fence	53,388.5	LF		$ 4	$ 4	**$ 213,554**	
1.4	Matting	62,647.2	LF		$ 70	$ 70	**$ 4,385,304**	
1.5	Snow Removal	1.0	Sum		$ 320,000	$ 320,000	**$ 320,000**	
1.6	ROW Restoration	22.0	Mile		$ 10,000	$ 10,000	**$ 220,000**	
1.7	Work Pads	940,000.00	SF		$ 4	$ 4	**$ 3,308,800**	
1.8	Restoration for Work Pad areas	94,000.00	SF		$ 0.2	$ 0.2	**$ 14,100**	
1.9	Temporary Access Bridge	20.0	EA		$ 20,035	$ 20,035	**$ 400,700**	
1.10	Air Bridge	5.0	EA		$ 14,445	$ 14,445	**$ 72,225**	
1.11	Stabilized Construction Entrance	10.0	EA		$ 4,580	$ 4,580	**$ 45,800**	
1.12	Maintenance and Protection of Traffic on Public Roads	1.0	LS		$ 300,000	$ 300,000	**$ 300,000**	
1.13	Culverts / Misc. Access	1.0	LS		$ 100,000	$ 100,000	**$ 100,000**	
1.14	Concrete Washout Station	10.0	EA		$ 1,850	$ 1,850	**$ 18,500**	
TOTAL - CLEARING & ACCESS FOR TRANSMISSION LINE:							**$ 13,571,466**	
2. TRANSMISSION LINE FOUNDATIONS								
2.1	Direct Embed Foundation for Vertical Tangent Poles (5'x 20')	109.0	Ea		$ 18,000	$ 18,000	**$ 1,962,000**	Supply & Install
2.2	Direct Embed Foundation for Vertical Tangent Poles (5'x 20.5')	12.0	Ea		$ 18,900	$ 18,900	**$ 226,800**	Supply & Install
2.3	Direct Embed Foundation for Vertical Tangent Poles (5'x 21')	16.0	Ea		$ 20,790	$ 20,790	**$ 332,640**	Supply & Install
2.4	Direct Embed Foundation for Vertical Tangent Poles (5'x 21.5')	3.0	Ea		$ 22,869	$ 22,869	**$ 68,607**	Supply & Install
2.5	Direct Embed Foundation for Vertical Tangent Poles (5'x 23')	1.0	Ea		$ 25,156	$ 25,156	**$ 25,156**	Supply & Install
2.6	Caisson Foundation for Vertical Angle (9' x 20')	445.5	CUY		$ 1,500	$ 1,500	**$ 668,250**	
2.7	Caisson Foundation for Dead End (10' x 35')	3,978.6	CUY		$ 1,500	$ 1,500	**$ 5,967,900**	
2.8	Rock Adder	500.0	CUY		$ 1,500	$ 1,500	**$ 750,000**	
TOTAL - TRANSMISSION LINE FOUNDATIONS:							**$ 10,001,353**	
3. STRUCTURES - TRANSMISSION LINE								
3.1	Steel Vertical Tangent Monopole (130' including embedment)	109	Ea	$ 25,200	$ 15,120	$ 40,320	**$ 4,394,880**	
3.2	Steel Vertical Tangent Monopole (135' including embedment)	12	Ea	$ 27,900	$ 16,740	$ 44,640	**$ 535,680**	
3.3	Steel Vertical Tangent Monopole (141' including embedment)	16	Ea	$ 30,600	$ 18,360	$ 48,960	**$ 783,360**	
3.4	Steel Vertical Tangent Monopole (145' including embedment)	3	Ea	$ 34,200	$ 20,520	$ 54,720	**$ 164,160**	
3.5	Steel Vertical Tangent Monopole (162' including embedment)	1	Ea	$ 37,800	$ 22,680	$ 60,480	**$ 60,480**	
3.6	Steel Vertical Angle Monopole (131')	9	Ea	$ 66,600	$ 39,960	$ 106,560	**$ 959,040**	
3.7	Steel Vertical Deadend Monopole (105')	38	Ea	$ 72,000	$ 43,200	$ 115,200	**$ 4,377,600**	
3.8	Install Grounding	188	Ea		$ 5,000	$ 5,000	**$ 940,000**	Supply & Install
TOTAL - STRUCTURES TRANSMISSION LINE:							**$ 12,215,200**	
4. CONDUCTOR, SHIELDWIRE, OPGW								
4.1	(2)/Phase - 795kcmil 26/7 Stranded "Drake" ACSR	23	Circuit Mile	$ 53,856	$ 158,400	$ 212,256	**$ 4,881,888**	
4.2	(1) OPGW 48 Fiber	23	Mile	$ 22,176	$ 27,720	$ 49,896	**$ 1,147,608**	
4.3	(1) 3/8" HS Steel	2	Mile	$ 3,696	$ 26,400	$ 30,096	**$ 60,192**	
TOTAL: CONDUCTOR, SHIELDWIRE, OPGW:							**$ 6,089,688**	
5. TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE								
5.1	Tangent - Polymer V-String	450	Set	$ 900	$ 720	$ 1,620	**$ 729,000**	
5.2	Deadend / Angle Assemblies	234.0	Set	$ 1,500	$ 1,040	$ 2,540	**$ 594,360**	

COST ESTIMATE

(ALTERNATE ROUTE)

Revision:5

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
5.3	OPGW Assembly - Tangent	150.0	Set	$ 200	$ 150	$ 350	**$ 52,500**	
5.5	OPGW Assembly - Angle / DE	72.0	Set	$ 250	$ 150	$ 400	**$ 28,800**	
5.6	OHSW Assembly - Angle / DE	15.0	Set	$ 250	$ 150	$ 400	**$ 6,000**	
5.8	OPGW Splice Boxes	10.0	Ea	$ 1,500	$ 1,000	$ 2,500	**$ 25,000**	
5.9	OPGW Splice & Test	1.0	Sum		$ 12,000	$ 12,000	**$ 12,000**	
5.10	Spacer Dampers	2,835.0	Ea	$ 50	$ 35	$ 85	**$ 240,975**	
5.11	Vibration Dampers - Conductor	2,268.0	Ea	$ 32	$ 20	$ 52	**$ 117,936**	
5.12	Shield wire / OPGW Dampers, Misc Fittings	1.0	Sum	$ 15,000	$ 8,000	$ 23,000	**$ 23,000**	
TOTAL: TRANSMISSION LINE INSULATORS, FITTINGS, HARDWARE:							**$ 1,829,571**	
6. NEW DYSINGER SUBSTATION								
6.1	Site Works including sediment controls, access roads, rough grading, final grading and	1.0	Sum		$1,500,000.00	$ 1,500,000	**$ 1,500,000**	Supply & Install
6.2	Substation Fence	2,500.0	LF		$200.00	$ 200	**$ 500,000**	Supply & Install
6.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
6.4	Switches 3ph	22.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 154,000**	
6.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
6.6	Line Switches 3 ph w/ motor-operators	7.0	Ea	$ 15,000	$15,000	$ 30,000	**$ 210,000**	
6.7	Instrument Transformers	1.0	Sum		$ 1,214,000	$ 1,214,000	**$ 1,214,000**	
6.8	Breakers	11.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 4,180,000**	
6.9	Arrestors (3 per line)	21.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 157,500**	
6.1	Line Traps	7.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 147,000**	
6.11	345 kV buses	2.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 120,000**	
6.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
6.13	Low Profile Foundations	282.0	Ea		$ 5,000	$ 5,000	**$ 1,410,000**	Supply & Install
6.14	Caisson DE Foundations	48.0	Ea		$ 50,000	$ 50,000	**$ 2,400,000**	Supply & Install
6.15	Circuit Breaker Foundations	11.0	Ea		$ 75,000	$ 75,000	**$ 825,000**	Supply & Install
6.16	Lightning Mast Foundations	5.0	Ea		$15,000	$ 15,000	**$ 75,000**	Supply & Install
6.17	SST Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
6.18	Control House and Pad (30' x 90')	1.0	Ea	$ 650,000	$ 200,000	$ 850,000	**$ 850,000**	
6.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
6.2	Control Cables	1.0	Sum	$ 130,000	$ 130,000	$ 260,000	**$ 260,000**	
6.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
6.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	
6.23	Protection, Telecom and Metering Equipment (Panels)	37.0	Ea		$ 30,000	$ 30,000	**$ 1,110,000**	Supply & Install
6.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
6.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
6.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
6.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 975,000	$ 975,000	**$ 975,000**	Supply & Install
6.28	Grounding	1.0	Sum		$ 275,000	$ 275,000	**$ 275,000**	Supply & Install
6.29	Bus Support 3 Ph	19.0	Ea	$ 4,500	$ 2,000	$ 6,500	**$ 123,500**	
6.3	Bus Support 1 Ph	36.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 108,000**	
6.31	Switch Stands	24.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 264,000**	
6.32	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
6.33	Misc. Structures	1.0	Sum		$ 74,000	$ 74,000	**$ 74,000**	
6.34	Substation A-Frame Structures Standalone	12.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 300,000**	
6.35	Lightning Masts	5.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 60,000**	
6.36	Arrestor Stands	21.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 73,500**	
6.37	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
6.38	Connection of Existing Lines to Dysinger Switchyard	1.0	Sum		$ 5,000,000	$ 5,000,000	**$ 5,000,000**	Supply & Install
TOTAL - DYSINGER SWITCHYARD:							**$ 25,374,000**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
7. EAST STOLLE RD SUBSTATION								
7.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement	1.0	Sum		$ 1,000,000.00	$ 1,000,000	**$ 1,000,000**	Supply & Install
7.2	Substation Fence	1,900.0	LF		$ 200.00	$ 200	**$ 380,000**	Supply & Install
7.3	SSVT	1.0	Ea	$ 200,000	$ 50,000	$ 250,000	**$ 250,000**	
7.4	Switches 3ph	9.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 63,000**	
7.5	Fuses 1ph	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
7.6	Line Switches 3 ph w/ motor-operators	3.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 90,000**	
7.7	Instrument Transformers	1.0	Sum		$ 752,000	$ 752,000	**$ 752,000.00**	
7.8	Breakers	4.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 1,520,000.00**	
7.9	Arrestors (3 per line) and shunt reactor	12.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 90,000**	
7.10	Line Traps	2.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 42,000.00**	
7.11	345 kV buses	1.0	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 60,000**	
7.12	Auxillary Power Generator - 500kW	1.0	Ea	$ 160,000	$ 40,000	$ 200,000	**$ 200,000**	
7.13	Low Profile Foundations	147.0	Ea		$ 5,000	$ 5,000	**$ 735,000**	Supply & Install
7.14	Caisson DE Foundations	20.0	Ea		$ 50,000	$ 50,000	**$ 1,000,000**	Supply & Install
7.15	Circuit Breaker Foundations	4.0	Ea		$ 75,000	$ 75,000	**$ 300,000**	Supply & Install
7.16	Lightning Mast Foundations	5.0	Ea		$ 15,000	$ 15,000	**$ 75,000**	Supply & Install
7.17	SST Foundation	1.0	Ea		$ 75,000.00	$ 75,000	**$ 75,000**	Supply & Install
7.18	Control House and Pad (25' x 50' - 1250 sq. ft)	1.0	Ea	$ 350,000	$ 100,000	$ 450,000	**$ 450,000**	
7.19	Generator Foundation	1.0	Sum		$ 25,000	$ 25,000	**$ 25,000**	Supply & Install
7.20	Control Cables	1.0	Sum	$ 130,000	$ 130,000	$ 260,000	**$ 260,000.00**	
7.21	125VDC Batteries	2.0	Ea	$ 50,000	$ 50,000	$ 100,000	**$ 200,000**	
7.22	Station Services	2.0	Ea		$ 25,000	$ 25,000	**$ 50,000**	
7.23	Protection, Telecom and Metering Equipment (Panels)	18.0	Ea		$ 30,000	$ 30,000	**$ 540,000**	Supply & Install
7.24	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
7.25	Low Voltage AC Distribution & DC Panels & Switches	1.0	Sum		$ 500,000	$ 500,000	**$ 500,000**	Supply & Install
7.26	Control Conduits from Cable Tray to Equipment	1.0	Sum		$ 357,500	$ 357,500	**$ 357,500**	Supply & Install
7.27	Cable Trench Systems for Control Cables	1.0	Sum		$ 975,000	$ 975,000	**$ 975,000**	Supply & Install
7.28	Grounding	1.0	Sum		$ 125,000	$ 125,000	**$ 125,000**	Supply & Install
7.29	Bus Support 3 Ph	9.0	Ea	$ 4,500	$ 2,000	$ 6,500	**$ 58,500**	
7.30	Bus Support 1 Ph	21.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 63,000**	
7.31	Switch Stands	13.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 143,000**	
7.32	Fuse Stand	1.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 11,000**	
7.33	Misc. Structures	1.0	Sum		$ 24,000	$ 24,000	**$ 24,000.00**	
7.34	Substation A-Frame Structures Standalone	5.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 125,000**	
7.35	Lightning Masts	5.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 60,000**	
7.36	Arrestor Stands	12.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 42,000**	
7.37	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
7.38	345kV 30MVAR Shunt Reactor	1.0	Ea	$ 732,000	$ 100,000	$ 832,000	**$ 832,000**	
7.39	Transformer Foundation with concrete moat and double steel grating	1.0	Sum		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
7.40	Interconnection arrangement at Stolle Rd Substation	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	Supply & Install
TOTAL - EAST STOLLE RD SUBSTATION:							**$ 13,963,000**	
8. MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:								
	Contractor Mobilization / Demobilization							
8.1	Mob / Demob	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
	Project Management, Material Handling & Amenities							
8.2	Project Management & Staffing (includes PM, Field Engineers / Supervision, Scheduler and	14.00	Months		$ 350,000	$ 350,000	**$ 4,900,000**	
8.3	Site Accommodation, Facilities, Storage	1.00	Sum		$ 1,400,000	$ 1,400,000	**$ 1,400,000**	

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
	Engineering							
8.4	Design Engineering	1.00	Sum		$ 4,170,000	$ 4,170,000	**$ 4,170,000**	
8.5	LiDAR	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	
8.6	Geotech	1.00	Sum		$ 1,100,000	$ 1,100,000	**$ 1,100,000**	
8.7	Surveying/Staking	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	
	Testing & Commissioning							
8.8	Testing & Commissioning of TRANSMISSION LINE and Equipment	1.00	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
	Permitting and Additional Costs					$ -	**$ -**	
8.9	Environmental Licensing & Permitting Costs	1.00	Sum		$ 3,477,113	$ 3,477,113	**$ 3,477,113**	
8.10	Environmental Mitigation	1.00	Sum		$ 8,002,635	$ 8,002,635	**$ 8,002,635**	
8.11	Warranties / LOC's	1.00	Sum		$ 511,213	$ 511,213	**$ 511,213**	
8.12	Real Estate Costs (New ROW)	1.00	Sum		$ 7,993,538	$ 7,993,538	**$ 7,993,538**	
8.13	Real Estate Costs (Incumbent Utility ROW)	1.00	Sum		$ 90,000	$ 90,000	**$ 90,000**	
8.14	Legal Fees	1.00	Sum		$ 3,500,000	$ 3,500,000	**$ 3,500,000**	
8.15	Sales Tax on Materials	1.00	Sum	$ 2,287,583		$ 2,287,583	**$ 2,287,583**	
8.16	Fees for permits, including roadway, railroad, building or other local permits	1.00	Sum		$ 200,000	$ 200,000	**$ 200,000**	
8.17	Allowance for Funds Used During Construction (AFUDC)	1.00	Sum			$ -	**$ -**	
8.18	Carrying Charges	1.00	Sum			$ -	**$ -**	
TOTAL - MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:							**$ 40,632,082**	
9. SYSTEM UPGRADE FACILITIES								
SUF 1.1	Depew to Erie Street 115kV Transmission Line 921. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Relay was replaced and line ratings increased to 124/137/158 (NOR/LTE/STE) resulting ratings are below line conductor ratings. Scope is to remove all limitations on the circuit so it is limited by lien conductor ratings 125/152/181 (NOR/LTE/STE).
SUF 1.2	Engineering, T&C, PM, Indirects for SUF 1.1 (15%)					$ -	**$ 75,000**	
SUF 2.1	Shawnee to Swann Reconductor	12.00	Mile		$ 400,000	$ 400,000	**$ 4,800,000**	Rate for reconductor is pro-rated from National Grid Niagara - Packard reconductor. Note that rate does not include upgrades to structures or foundations.
SUF 2.2	Engineering, T&C, PM, Indirects FOR SUF 2.2 (15%)					$ -	**$ 720,000**	
SUF 3.1	Roll Rd to Stolle Rd 115kV Transmission Line 928. Terminal allowance included. See comments.	1.00	Sum		$ 500,000	$ 500,000	**$ 500,000**	Replace limiting terminal equipment at both Stolle Rd 115 kV Substation and Roll Rd 115 kV Substation.
SUF 3.2	Engineering, T&C, PM, Indirects for SUF 3.1 (15%)					$ -	**$ 75,000**	
SUF 4	**100MVAR Shunt Reactor at RG&E Sta 80**							
SUF 4.1	Site Works including sediment controls, access roads, rough grading, final grading and stone placement - approx 1. acre	1.00	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
SUF 4.2	Substation Fence	600.00	LF		$ 200	$ 200	**$ 120,000**	Supply & Install
SUF 4.3	Shunt Reactor 3ph 345kV 100MVAR	1.00	Ea	$ 1,500,000	$ 500,000	$ 2,000,000	**$ 2,000,000**	
SUF 4.4	Switches 3ph 345kV	1.00	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 30,000**	
SUF 4.5	CVT's 345kV	3.00	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 63,000**	
SUF 4.6	Breakers 345kV	1.00	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 380,000**	
SUF 4.7	Arrestors - 235kV	3.00	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 22,500**	
SUF 4.8	Low Profile Foundations	19.00	Ea		$ 5,000	$ 5,000	**$ 95,000**	Supply & Install
SUF 4.9	Circuit Breaker Foundations	1.00	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
SUF 4.10	Lightning Mast Foundations	2.00	Ea		$ 15,000	$ 15,000	**$ 30,000**	Supply & Install

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Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Remarks
SUF 4.11	Reactor Foundation with concrete moat and double steel grating	1.00	Ea		$ 150,000	$ 150,000	**$ 150,000**	Supply & Install
SUF 4.12	Control Cables	1.00	Sum	$ 100,000	$ 100,000	$ 200,000	**$ 200,000**	
SUF 4.13	Protection & Telecom Equipment	3.00	Ea		$ 15,000	$ 15,000	**$ 45,000**	Supply & Install
SUF 4.14	SCADA and Communications	1.00	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.15	Low Voltage AC Distribution	1.0	Sum		$ 300,000	$ 300,000	**$ 300,000**	Supply & Install
SUF 4.16	Control Conduits	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.17	Cable Trench System for Control Conduits	1.0	Sum		$ 750,000	$ 750,000	**$ 750,000**	Supply & Install
SUF 4.18	Grounding	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
SUF 4.19	Bus Support 3ph	2.0	Ea	$ 3,000	$ 2,000	$ 5,000	**$ 10,000**	
SUF 4.20	Bus Support 1ph	3.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 9,000**	
SUF 4.21	Switch Stands	1.0	Ea	$ 1,500	$ 800	$ 2,300	**$ 2,300**	
SUF 4.22	Fuse Stand	1.0	Ea	$ 1,500	$ 800	$ 2,300	**$ 2,300**	
SUF 4.23	CVT Stand	3.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 10,500**	
SUF 4.24	Lightning Mast	2.0	Ea	$ 10,000	$ 5,000	$ 15,000	**$ 30,000**	
SUF 4.25	Misc Materials and Above / Below Ground Works	1.0	Ea		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	Supply & Install
SUF 4.26	**Engineering, T&C, PM, Indirects (15%)**					$ -	**$ 1,211,190**	
SUF 5	**SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)**						**$ 3,750,000**	Contingency for possible additional SUF upgrades
TOTAL -SUF							**$ 19,705,790**	

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ENVIRONMENTAL LICENSING AND PERMITTING

Revision: 5

PROJECT TITLE WNY PROJECT EVALUATION- ENVIRONMENTAL LICENSING & PERMITTING COST ELEMENTS						ENVIRONMENTAL LICENSING & PERMITTING COST ESTIMATE RANGE FOR PROPOSED WNY TRANSMISSION PROJECT - T015			
FEDERAL						**Preferred Route**		**Alternative Route**	
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans	Min.	Max.	Min.	Max.
USACE	Waters of the US under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act (including regulated wetland areas)	Nationwide Permits (NWP) or Individual Permit (IP)	Any work within the boundaries of regulated wetlands (with the exception of isolated wetlands) or waterways to the spring high tide or ordinary high water mark	If project qualifies for a NWP (<0.5 acre disturbance and within NWP project type parameters), a pre-construction notification (PCN) is typically required. NWPs have a 45 day review period starting from when project logged in system (up to 6wk backlog delay in logging projects) If an IP is triggered, USACE will require Alternative Analysis and Public Notice/Hearing. IPs could also trigger restrictive environmental work windows. IPs have a 120 day review period starting from when permit is "deemed complete"	Wetland Delineation; Wetland Function & Value Assessment; Stream Delineation; Restoration Plan	$26,600	$88,250	$26,600	$88,250
National Park Service	National Parks	Consultation; Special Use Permit	Only applies if National Park located in project area.	Depending on impact of project request for a special use permit may require a NEPA environmental assessment.					
USFWS	Endangered Species Act Section 7 (ESA) Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act	Consultation (Formal or Informal); Special Use Permit	Any work that may have an affect on listed species or their habitat; or projects within National Wildlife Refuges	USACE coordinates consultation with USFWS for ESA listed species during their permit review. Also includes the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act compliance. Season restrictions on construction could be imposed.	Rare, Threatened & Endangered Species Search; Preparation of Reports and Conservation Plans	$27,800	$94,000	$30,300	$99,000
NEPA	National Environmental Policy Act	Categorical Exclusion; EA Finding of No Impact; or EIS Record of Decision	With some exemptions, projects on federally owned lands and/or projects requiring federal permit approvals	Possible NEPA review due if federal agency coordination is required. Federal agency involved to determine if Categorical Exclusion applies. Assumes Article 7 covers NEPA requirements or if an EIS is required it is prepared under SEQRA Task.					
FAA	Airports / Airspace	Federal Aviation Administration (FAA) Notification	New or Replacement Structures near Airports	Depending on construction locations, this permit may only be needed for OP work.	Obstruction Analysis, Mitigation Plan (assumes Engineering Cost)				
STATE									
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans				
NYS Public Service Commission / Department of Public Service (NYSDPS)	Article VII	Article VII: Certificate of Environmental Compatibility and Public Need and Environmental Management & Construction Plan (EM&CP)	Article 7: Major electric transmission facilities with design capacity of 100kV or more extending for at least 10 miles or 125kV and over extending a distance of 1 mile or more (some exclusions for underground transmission applies)	Article 7 will incorporate all of the required State and Local approvals (costed separately), as well as Engineering and Environmental Studies and Public Outreach. Article VII Intervenor Fund payment expected to be $100,000. An Environmental Management & Construction Plan (EM&CP) must be prepared and approved by the PSC. (see 16 NYCRR Parts 85 through 88)	Includes Reports and Plans required for State and Federal Agency Permits, as well as EM&CP, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan, Mitigation Plans	$600,000	$3,100,000	$600,000	$3,100,000

ENVIRONMENTAL LICENSING AND PERMITTING

NYS Public Service Commission / Department of Public Service (NYSDPS)	Part 102		Construction of a utility overhead transmission facility that will convey electric energy at 65kV or higher for a distance of one mile or longer and are not subject to Article VII of the Public Service Law.	May include coordination or studies completed under other line items including: Visual assessment, SHPO determination, OPRHP consultation, Ecological Impacts Assessment	Advantage-Disadvantage Analysis				
NYSDEC	Article 15 Stream Disturbance; Article 24 Wetlands, Open Waters, Wetlands Buffers (100' for Freshwater Wetland)	Individual Permit (IP) (unless developer has General Permit (GP))	Any work within the boundaries of regulated waterways or wetlands, and wetland adjacent areas	Any disturbance within wetlands and/or below mean high tide will require an IP. Areas of temporary disturbance will likely require restoration, including a monitoring and maintenance period. Permanent disturbance will require offsite mitigation up to 3:1 area ratio; also includes a monitoring and maintenance period. GP may only be applicable if project ground disturbance is located outside of wetlands areas (above MHW).	Wetland Delineation; Wetland Restoration/Mitigation Plan	$12,000	$53,000	$12,000	$53,000
NYSDEC	Stormwater (If >1 Acre Soil Disturbance)	SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 & SWPPP	Project areas of soil disturbance	If project involves 1 acre or more soil disturbance, then the GP is required. If located within a Regulated MS4 Municipality, additional coordination may be needed. Weekly inspections by a Qualified Inspector during construction will be required.	SWPPP (assumes Engineering Cost includes Sediment & Erosion Control Plan, Hydraulic & Hydrology Studies, Stormwater Management Design)	$11,200	$38,000	$11,200	$38,000
Any State or local government agency that issues permits or approvals	State Environmental Quality Review Act (SEQRA)	Environmental Assessment (EA) Determination of Significance	Projects not covered as a Type II Action (Note a project can not be segmented - all phases/tasks must be considered in the review)	Most projects or activities proposed by a state agency, and all discretionary approvals (permits) from a NYS agency or local government, require an environmental impact assessment. SEQR requires the sponsoring or approving governmental body to identify and mitigate the significant environmental impacts of the activity it is proposing or permitting.					
NYSDOS	State Coastal Management Program Mapped Coastal Area Boundary	Coastal Consistency Concurrence	Projects within the NYSDOS designated Coastal Zone; and consistency with Local Waterfront Revitalization Plans (LWRPs); e.g., Town of Grand Island LWRP	Online mapping available to check if within coastal zone, a significant coastal fish & wildlife habitat (SCFWH), a local waterfront revitalization program area (LWRP), or a comprehensive management program areas (CMP)					
NYSHPO	National Historic Preservation Act (NHPA) Section 106: State and Federal Historic Places; State Mapped Archeologically Sensitive Areas	Cultural Resource Information System (CRIS) Determination	Local, State, or Federal eligible or designated historic places and/or areas of archeological sensitivity (in off-road areas and areas that have not been previously disturbed)	NYSDEC EAF Online Mapper identifies State or National Register of Historic Places and archeological sensitive areas within or adjacent to the project site. Formally enter project information and supporting documents into SHPO's online CRIS program. Staff will review and email a determination of impacts letter	Phase 1A & 1B Archaeological Studies	$13,200	$49,000	$14,200	$52,000
NYS NHP	Threatened and Endangered Species	Consultation	Activities that may affect T&E species or their habitat.		See USFWS	$1,200	$6,400	$1,200	$6,400

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T015 - NextEra Energy

ENVIRONMENTAL LICENSING AND PERMITTING

Revision: 5

NYSDOT/NYS Thruway Authority/FHWA	State Roadways	Highway Work Permit/Utility Permit, Vegetation Management Permit; Easement	Any work within or crossing State highway ROW	May require restoration landscaping coordination. Typically requires compliance with NEPA including SHPO and USFWS effects determination	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$17,000	$69,000	$17,000	$69,000
NYS Canal Corporation	Erie Canal - jurisdiction varies along edge	Canal Occupancy & Work Permit (TA-W99072)	Any work involving the Erie Canal	Must coordinate with Division Permit Engineer about particular section of canal being affected. Commercial permit fee = $25 plus $2,000,000 additional General Aggregate Liability Insurance	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)				
NYS Dept. of Agriculture and Markets	All agricultural lands (including Agricultural Districts)	Part of Article 7 & Article 10 Review process	Any work impacting agricultural land	Must minimize impacts and restore damage to agricultural land, and coordinate with County Soil & Water Conservation District; Vineyards are a major concern in WNYS. Pre-application conference with PSC, DEC and Ag& Markets recommended. Must develop EM&CP in conformance with Art. 7/10 Certificate Conditions. Agricultural Monitor must oversee construction & restoration; requisite 2-yrs post restoration monitoring.	Crop/Pasturing Mitigation Plan (not included in costing)	$11,000	$24,000	$11,000	$24,000
REGIONAL									
Railroads	Railroad crossings	Consultation-permits may be required; Easement	Access / new structures on RR property		Easement area survey (not included in costs)	$11,000	$76,000	$11,000	$76,000
LOCAL/MUNICIPAL									
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans				
County Dept. of Public Works	County Roadways	Lane Closure Permit, Highway Work or Access Permit	Work within county roadways and right-of-ways			$6,000	$40,000	$6,000	$40,000
Town, City or Village	Municipal Stormwater (MS4) Review	Approval of SWPPP or EM&CP	Project areas of soil disturbance		See NYSDEC SPDES	$6,000	$35,000	$6,000	$35,000
Town, City or Village	Variable	Building Permits	New Structures	Individual Towns/Villages must be consulted on a project specific basis to determine notification and/or permitting procedures. Permit application names vary (e.g. road obstruction permit)		$18,000	$92,000	$18,000	$92,000
Town, City or Village	Municipal Roadways	Highway Work Permit; Road Opening Permit	Work within municipal roadways and right-of-ways			$6,000	$35,000	$6,000	$35,000
Town, City or Village	Wetlands	Wetland Permit / Conservation Approvals	Mapped wetlands and wetland adjacent areas (buffer width variable)		See USACE / NYSDEC Art. 24	$6,000	$52,000	$6,000	$52,000

		Minimum	Maximum	Minimum	Maximum
ENVIRONMENTAL LICENSING & PERMITTING COST (EXCLUDING MITIGATION)	**PROJECT T014 TOTAL**	**$773,000**	**$3,851,650**	**$776,500**	**$3,859,650**
	Expected Value	**$2,312,325**		**$3,477,112.50**	

Excluded cost: Mitigation or restoration for impact to regulated wetlands; agricultural land and tree clearing

ENVIRONMENTAL MITIGATION ESTIMATE

Revision: 5

WNY TRANSMISSION PROJECT - ENVIRONMENTAL MITIGATION COST ESTIMATE FOR T014

	Offsite Wetland Mitigation*				Farmland**	
	Preferred Route		Alternative Rotue		Preferred & Alternative Routes	
	Min.	Max.	Min.	Max.	Min.	Max.
Area	45 acres	45 acres	38 acres	38 acres	30 acres	60 acres
Cost/Acre	$60,000	$120,000	$60,000	$120,000	$503	$503
Ratio	1:1	3:1	1:1	3:1	1:1	1:1
Total	$ 2,700,000	$16,200,000	$2,280,000	$13,680,000	$15,090	$30,180

T014 PREFERRED ROUTE MITIGATION TOTAL	Minimum	Maximum	Expected Value
	$2,715,090	**$16,230,180**	**$ 9,472,635**

T014 ALTERNATIVE ROUTE MITIGATION TOTAL	Minimum	Maximum	Expected Value
	$2,295,090	**$13,710,180**	**$ 8,002,635**

*Offsite wetland mitigation area assumes clearing of NWI Forested/Shrub Wetland approx. 3.24 miles (17107 LF) by 115' ROW width for the Preferred Route and approx. 3.47 (18322 LF) by 90' ROW width for the Alternative Route; Max. cost per acre assumes additional mitigation required for permanent impacts of proposed structures in non-forested wetlands; costing includes design and installation costs only; does not include land acquisition or long term monitoring

**Farmland mitigation based on corn bushel yield at 129 BU/Acre and $3.9/BU (production numbers from 2016 USDA NYS Agriculture Overview), area assumes 9.8 miles (51744 LF) Land Adjacent to Agriculture District/Crop Land by 25' Wide (Min.) or 50' Wide (Max.); does not include land acquisition

Revision: 5

REAL ESTATE ESTIMATE
(NEW ROW)

COUNTY: ERIE
DEVELOPER: NEXTERA (T014 & T015 PREFERRED)
SEGMENT: DYSINGER - STOLLE SEGMENT

		Area (Acres)	Total Cost
	Total	0.68	$ 4,376.00

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

COUNTY: NIAGARA & ERIE
DEVELOPER: NEXTERA (T014 & T015 PREFERRED)
SEGMENT: DYSINGER - STOLLE SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
1	NEXTERA ENERGY	Dysinger SS to Stolle Rd SS - 19.93 miles	Niagara	4.59	$ 1,793,000
			Erie	355.48	

Revision: 5

REAL ESTATE ESTIMATE
(NEW ROW - 80FT. CORRIDOR)

COUNTY: NIAGARA & ERIE
DEVELOPER: NEXTERA (T014 & T015 ALTERNATIVE)
SEGMENT: DYSINGER TO STOLLE ROAD SEGMENT

	Address	Area (Acres)	Total Cost
A	**NIAGARA COUNTY**		
	Sub Total (A)	5.30	$ 124,550.00
B	**ERIE COUNTY**		
	Sub Total (B)	191.75	$ 5,572,547.00
	Total (A + B)	197.05	$ 5,697,097.00

Revision: 5

REAL ESTATE ESTIMATE
(NEW ROW - 10FT. ADDITIONAL CORRIDOR)

COUNTY:	NIAGARA & ERIE
DEVELOPER:	NEXTERA (T014 & T015 ALTERNATIVE)
SEGMENT:	DYSINGER TO STOLLE ROAD SEGMENT

	Address	Area (Acres)	Total Cost
A	**NIAGARA COUNTY**		
	Sub Total (A)	0.59	$ 13,865.00
B	**ERIE COUNTY**		
	Sub Total (B)	26.28	$ 858,481.50
	Total (A + B)	26.87	$ 872,346.50

Revision: 5

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

COUNTY: NIAGARA & ERIE
DEVELOPER: NEXTERA (T014 & T015 ALTERNATIVE)
SEGMENT: DYSINGER - STOLLE SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
1	NEXTERA ENERGY (Alternative)	Dysinger SS to Stolle Rd SS - 21.66 miles	Niagara	1.20	$ 90,000
			Erie	17.16	

REAL ESTATE ESTIMATE (HOUSES)

Revision: 5

COUNTY: ERIE

DEVELOPER: NEXTERA (T014 & T015 ALTERNATIVE)

SEGMENT: DYSINGER - STOLLE SEGMENT

	Address	Total Valuation of Property with 3% Escalation/year (as of 2017)
	Total Valuation Cost	$ 1,037,124.17

REAL ESTATE ESTIMATE

Revision: 5

COUNTY:	NIAGARA
DEVELOPER:	NEXTERA
SEGMENT:	DYSINGER SUBSTATION

	Address	Total Cost
	Total Cost of Proposed Substation Site	$ 251,450.00

REAL ESTATE ESTIMATE

Revision: 5

COUNTY:	ERIE
DEVELOPER:	NEXTERA
SEGMENT:	STOLLE ROAD SUBSTATION

	Address	Total Cost
	Total Cost of Proposed Substation Site	$ 135,520.00

Revision: 5

ASSUMPTIONS AND CLARIFICATIONS

a) Cost Estimate is based on 2017 rates.
b) Construction Schedule is in accordance with the Developers proposed schedule (6 months for construction - seems light) - we have assumed continuous working with no breaks in the schedule. Six months added for start up and close out works and assisting in pre-construction activities (i.e. permitting activates, material procurement etc.)
c) Stringing rates allow for protection over crossings (such as rider poles).
d) We have assumed a typical work week (6 x 10 hour days).
e) Wood Pole types are based on Plan and Profile drawings. Direct embed foundations are assumed to be 10% plus 2 ft and rates include backfill. Steel Pole weights and foundation types are estimated based on benchmark data.
f) We have assumed that the Access Road upgrades include gravel updates only.
g) Costs will vary for handling and disposal of contaminated spoils, depending on type of contaminants and availability / location of the appropriate tipping facility. Since there is not enough information to provide a quantified estimate for this item, allowance is included in the contingency monies.
h) Costs have been developed based on historical data from Projects of a similar nature (AACE Class 5 and 4 Estimating Practices). We have not engaged any subcontractors or material vendors for formal quotes.
i) The equipment types listed for Dysinger and East Stolle Rd Substation have been taken from a recently completed 345kV substation project, using current pricing.
j) Estimated quantities have been used for items in red text in Section 1 of the Estimate (CLEARING & ACCESS FOR T-LINE CONSTRUCTION). These items were not quantified in the Developers Estimate, however we believe that they are necessary for the works.
k) A Contractor Mark-Up (OH&P) of 15% has been included in the Total section
l) Assumes all environmental data and project details provided are accurate unless noted otherwise.
m) USFWS T&E assumes ¼ of the total Preferred Route will require field survey for T&E (5 miles).
n)USFWS T&E assumes ¼ of the total Alternative Route will require field survey for T&E (5. 5 miles).
o) NEPA-Assumes no NEPA because Art VII.
p) SHPO-Assumes consultation and Phase 1A/1B archeological studies with field survey for 50% of Preferred Route (10 miles) and Alternative Route (11 miles).
q) NYSDOT/FHWA-Assumes any required NEPA coordination/requirements are covered under Article VII.
r) Assumes no coordination with National Parks Service or OPRHP/State Parks.
s) USACE wetland delineation total for Preferred and Alternative Routes is based on combined NYSDEC/USACE wetland length of 3.9 miles from information in Proposal Attachment C.
t) NYSDEC delineations overlap and are accounted for in USACE costing.

Revision: 5

ASSUMPTIONS AND CLARIFICATIONS

u) Offsite wetland mitigation area costs for the Preferred Route based on impacts anticipated by clearing of NWI Forested/Shrub Wetland of approximately 3.24 miles (calculated by GEI based on NWI mapper legend categories). Assumes clearing an additional 115 feet within Right of Way. Minimum costs $60,000/acre at 1:1 ratio, maximum costs at $120,000/acre at 3:1 ratio for additional permanent impacts of proposed structures in non-forested wetlands. Costing includes design and installation costs only and does not include land acquisition or long term monitoring.
v) Offsite wetland mitigation area costs for the Alternative Route based on impacts anticipated by clearing of NWI Forested/Shrub Wetland of approximately 3.47 calculated by GEI based on NWI mapper legend categories). Assumes clearing 90 wide feet within Right of Way. Minimum costs at $60,000/acre at 1:1 ratio, maximum costs at $120,000/acre at 3:1 ratio for additional permanent impacts of proposed structures in non-forested wetlands. Costing includes design and installation costs only and does not include land acquisition or long term monitoring.
w) Agricultural mitigation for Preferred and Alternative Routes assumes timber matting impacts and pad impacts on adjacent agriculture land (9.8 miles) requires crop damage payments based on USDA 2016 NYS Agriculture Overview corn yield and bushel price/acre. Minimum assumes 25-foot-wide impact, Maximum assumes 50-foot-wide impact.
x) Assumes Right of Way restoration is accounted for in construction costs.
y) Mitigation costs for landscaping only (no paving, sidewalks, sound walls, etc.).
z) No tree survey or replanting required outside regulated wetlands areas.
aa) Article VII Intervenor Fund payment expected to be $100,000.
ab) Expected value of Alt. Route is estimated to be 50% higher than the mean of the range of environmental licensing and permitting costs due to new ROW.
ac) SUF pricing is included at the end of the estimate workbook (costs excluded from main estimate).
ad) SUF pricing includes 35% to cover Contractor markup (15%) and contingency (20%)
ae) Reconductor pricing (SUF 2 - Shaw to Swan Reconductor) is based on Niagara-Packard (National Grid) reconductor estimate, pro-rated to a rate / mile. Note that this is based on conductor, shieldwire and hardware pricing only and does not include structure or foundation works.
af) System Upgrade Facilities Contingency is allowance for potential additional system upgrades including overdutied breakers, protection changes, unidentified thermal issues, etc that may be identified as detailed studies are completed.

INDEPENDENT ESTIMATES

ATTACHMENT B10

T017 – EXELON TRANSMISSION

SUBSTATION ENGINEERING COMPANY
8/11/2017

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T017 - Exelon Transmission

Revision: 3

SUMMARY OF COST ESTIMATE

	Description		Total Amount
1	CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION	$	40,368,420
2	TRANSMISSION LINE FOUNDATIONS	$	16,694,900
3	STRUCTURES - TRANSMISSION LINE	$	30,784,427
4	CONDUCTOR, SHIELDWIRE, OPGW	$	15,797,866
5	TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE	$	4,498,017
6	STOLLE ROAD SUBSTATION WORKS:	$	3,616,500
7	GARDENVILLE 230kV SUBSTATION WORKS	$	3,414,500
8	NIAGARA SUBSTATION WORK	$	4,209,000
9	MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:	$	66,804,397
	CONTRACTOR MARK-UP (OH&P) 15%	$	27,928,204
	SUBTOTAL:	$	214,116,230
	CONTINGENCY ON ENTIRE PROJECT (25%)	$	53,529,058
	TOTAL (A):	**$**	**267,645,288**

10	SYSTEM UPGRADE FACILITIES	$	23,287,200
	CONTRACTOR MARKUP & CONTINGENCY (35%)	$	8,150,520
	TOTAL (B):	**$**	**31,437,720**

TOTAL PROJECT COST (A+B):	**$**	**299,083,008**

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

Description of Work: New Niagara to Stolle Road approx. 47 mile 345kV Line, new Gardenville - Stolle Rd 230kV Line approx. 12 miles, Niagara, Gardenville and Stolle Road Substation Upgrades.								
Item	**Description**	**Quantity**	**Unit**	**Supply Rate**	**Labor & Equipment Rate**	**Total Unit Rate:**	**TOTAL:**	**Comments:**
1. CLEARING & ACCESS FOR TRANSMISSION LINE CONSTRUCTION								
1.1	Clearing the ROW (mowing & clearing)	427.0	Acre		$ 15,000	$ 15,000	**$ 6,405,000**	
1.2	Access Road	14,256.0	LF		$ 45	$ 45	**$ 641,520**	Assumes Type 1 Type Gravel Road
1.3	Access Road Improvement	31,680.0	LF		$ 7	$ 7	**$ 221,760**	Assumes Type 1 Type Gravel Road
1.4	Silt Fence	163,680.0	LF		$ 4	$ 4	**$ 654,720**	
1.5	Matting	163,680.0	LF		$ 70	$ 70	**$ 11,457,600**	
1.6	Snow Removal	1.0	Sum		$ 900,000	$ 900,000	**$ 900,000**	
1.7	ROW Restoration	60.0	Mile		$ 10,000	$ 10,000	**$ 600,000**	
1.8	Work Pads	4,520,000.0	SF		$ 4	$ 4	**$ 15,910,400**	
1.9	Restoration for Work Pad areas	452,000.0	SF		$ 0.2	$ 0.2	**$ 67,800**	
1.10	Temporary Access Bridge	60.0	EA		$ 20,035	$ 20,035	**$ 1,202,100**	
1.11	Air Bridge	20.0	EA		$ 14,445	$ 14,445	**$ 288,900**	
1.12	Stabilized Construction Entrance	34.0	EA		$ 4,580	$ 4,580	**$ 155,720**	
1.13	Maintenance and Protection of Traffic on Public Roads	1.0	LS		$ 1,200,000	$ 1,200,000	**$ 1,200,000**	
1.14	Culverts / Misc. Access	1.0	LS		$ 600,000	$ 600,000	**$ 600,000**	
1.15	Concrete Washout Station	34.0	EA		$ 1,850	$ 1,850	**$ 62,900**	
TOTAL - CLEARING & ACCESS FOR TRANSMISSION LINE:							**$ 40,368,420**	
2. TRANSMISSION LINE FOUNDATIONS								
2.1	Drilled Pier 5ft dia.	2,111.2	CUY		$ 1,500	$ 1,500	**$ 3,166,800**	Supply & Install
2.2	Drilled Pier 6ft dia.	4,047.0	CUY		$ 1,500	$ 1,500	**$ 6,070,500**	Supply & Install
2.3	Drilled Pier 7ft dia.	1,320.0	CUY		$ 1,500	$ 1,500	**$ 1,980,000**	Supply & Install
2.4	Drilled Pier 8ft dia.	285.0	CUY		$ 1,500	$ 1,500	**$ 427,500**	Supply & Install
2.5	Drilled Pier 9ft dia.	155.4	CUY		$ 1,500	$ 1,500	**$ 233,100**	Supply & Install
2.6	Drilled Pier 10ft dia.	198.0	CUY		$ 1,500	$ 1,500	**$ 297,000**	Supply & Install
2.7	Rock Excavation Adder	2,260.0	CUY		$ 2,000	$ 2,000	**$ 4,520,000**	
TOTAL - TRANSMISSION LINE FOUNDATIONS:							**$ 16,694,900**	
3. STRUCTURES - TRANSMISSION LINE								
3.1	345kV Dead End / Strain Pole (30-90 deg angle) Ave 114ft	15.0	EA	$ 72,428	$ 43,457	$ 115,885	**$ 1,738,282**	
3.2	345kV Running Angle Pole (3-40 deg angle) Ave 114ft	28.0	EA	$ 58,743	$ 35,246	$ 93,989	**$ 2,631,686**	
3.3	345kV Tangent Pole Ave 112ft	302.0	EA	$ 37,890	$ 22,734	$ 60,624	**$ 18,308,448**	
3.4	345kV / ~~2 - 115kV~~ Dead End / Strain Pole (30-90 deg angle) Ave 168ft	2.0	EA	$ 151,938	$ 91,163	$ 243,101	**$ 486,202**	
3.5	345kV / ~~2 - 115kV~~ Running Angle Pole (3-40 deg angle) Ave 164ft	4.0	EA	$ 111,440	$ 66,864	$ 178,304	**$ 713,215**	
3.6	345kV / ~~2 - 115kV~~ Tangent Pole Ave 163ft	5.0	EA	$ 56,000	$ 33,600	$ 89,600	**$ 447,998**	
3.7	230kV Steel Dead End or Strain Pole (30-90 deg angle) Ave 86ft	8.0	EA	$ 32,834	$ 19,700	$ 52,534	**$ 420,273**	
3.8	230kV Steel Running Angle Pole (3-40 deg angle) Ave 117ft	18.0	EA	$ 43,265	$ 25,959	$ 69,224	**$ 1,246,026**	
3.9	230kV Steel Tangent Pole Ave 110ft	70.0	EA	$ 22,610	$ 13,566	$ 36,176	**$ 2,532,298**	
3.10	Install Grounding	452.0	Structure		$ 5,000	$ 5,000	**$ 2,260,000**	Supply & Install
TOTAL - STRUCTURES TRANSMISSION LINE:							**$ 30,784,427**	
4. CONDUCTOR, SHIELDWIRE, OPGW								
4.1	Bundled Rail ACSR Conductor, 954 kcmil, 45/7, 3 Phases	47.0	Mile	$ 79,200	$ 158,400	$ 237,600	**$ 11,167,200**	
4.2	Ortolan ACSR Conductor, 1033.5kcmil, 45/7, 3 Phases	12.1	Mile	$ 39,600	$ 79,200	$ 118,800	**$ 1,437,480**	
4.3	½" HS Steel (includes 2 x for 345kV, 1 x for 230kV)	560,208.0	Ft	$ 1	$ 5	$ 6	**$ 3,193,186**	
TOTAL: CONDUCTOR, SHIELDWIRE, OPGW:							**$ 15,797,866**	
5. TRANSMISSION LINE INSULATOR, FITTINGS, HARDWARE								
5.1	Tangent - Insulator Sets	1,131.0	Set	$ 900	$ 720	$ 1,620	**$ 1,832,220**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Comments:
5.2	Dead End / Angle - Insulator Sets	450.0	Set	$ 1,300	$ 1,040	$ 2,340	**$ 1,053,000**	
5.3	Post Insulators	75.0	Set	$ 1,500	$ 1,350	$ 2,850	**$ 213,750**	
5.4	OHSW Assembly - Angle / DE (2 x shieldwires 345kV, 1 x 230kV single EHS)	248.0	Set	$ 500	$ 400	$ 900	**$ 223,200**	
5.5	OHSW Assembly - Tangent (2 x shieldwires 345kV, 1 x 230kV single EHS)	684.0	Set	$ 250	$ 150	$ 400	**$ 273,600**	
5.6	Spacer Dampers	6,795.0	Ea	$ 50	$ 35	$ 85	**$ 577,575**	
5.7	Vibration Dampers - Conductor	5,436.0	Ea	$ 32	$ 20	$ 52	**$ 282,672**	
5.8	Shieldwire / OPGW Dampers, Misc Fittings	1.0	Sum	$ 30,000	$ 12,000	$ 42,000	**$ 42,000**	
TOTAL: TRANSMISSION LINE INSULATORS, FITTINGS, HARDWARE:							**$ 4,498,017**	
6. STOLLE ROAD SUBSTATION WORKS:								
	345kV Works							
6.1	Low Profile Foundations	22.0	Ea		$ 5,000	$ 5,000	**$ 110,000**	Supply & Install
6.2	Circuit Breaker Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
6.3	Below Grade Conduit & Grounding	1.0	Sum		$ 300,000	$ 300,000	**$ 300,000**	Supply & Install
6.4	Bus Support 1ph	12.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 36,000**	
6.5	Switch Stands	2.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 22,000**	
6.6	Misc. Structures	1.0	Sum		$ 27,000	$ 27,000	**$ 27,000**	
6.7	LA Stands	3.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 10,500**	
6.8	Instrument Transformers - 345kV	1.0	Sum		$ 146,000	$ 146,000	**$ 146,000**	
6.9	Motor Operated Disconnect Switches	2.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 60,000**	
6.10	Circuit Breaker 345kV	1.0	Ea	$ 300,000	$ 80,000	$ 380,000	**$ 380,000**	
6.11	Arrestors (3 per line)	3.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 22,500**	
6.12	Line Traps	1.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 21,000**	
6.13	Control Cables	1.0	Sum		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
6.14	Protection, Telecom and Metering Equipment	1.0	Sum		$ 90,000	$ 90,000	**$ 90,000**	Supply & Install
	230kV Works							
6.15	Demo 3ph VT Structure and Foundation	1.0	Sum		$ 15,000	$ 15,000	**$ 15,000**	Supply & Install
6.16	Low Profile Foundations	21.0	Ea		$ 5,000	$ 5,000	**$ 105,000**	Supply & Install
6.17	Caisson Dead End Foundation	4.0	Ea		$ 50,000	$ 50,000	**$ 200,000**	Supply & Install
6.18	Circuit Breaker Foundation	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
6.19	Lightning Mast Foundation	1.0	Ea		$ 15,000	$ 15,000	**$ 15,000**	Supply & Install
6.20	Below Grade Conduit & Grounding	1.0	Sum		$ 300,000	$ 300,000	**$ 300,000**	Supply & Install
6.21	Bus Support 3ph	1.0	Ea	$ 4,500	$ 2,000	$ 6,500	**$ 6,500**	
6.22	Switch Stands	2.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 22,000**	
6.23	Misc. Structures - 230kV	1.0	Sum		$ 33,000	$ 33,000	**$ 33,000**	
6.24	A-frame Dead End	1.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 25,000**	
6.25	LA Stands	3.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 10,500**	
6.26	Lightning Mast	1.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 12,000**	
6.27	Circuit breaker - 230kV	1.0	Ea	$ 250,000	$ 75,000	$ 325,000	**$ 325,000**	
6.28	Instrument Transformers - 230kV	1.0	Sum		$ 146,000	$ 146,000	**$ 146,000**	
6.29	Switches - 230kV	1.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 30,000**	
6.30	Arrestors (3 per line)	3.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 22,500**	
6.31	Line Traps	1.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 21,000**	
6.32	VT's 230kV Relocated	3.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 63,000**	
6.33	Control Cables	1.0	Sum		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
6.34	Protection, Telecom and Metering Equipment	1.0	Sum		$ 90,000	$ 90,000	**$ 90,000**	Supply & Install
6.35	Misc Above / Below Ground Works (345kV and 230kV)	1.0	Sum		$ 700,000	$ 700,000	**$ 700,000**	Supply & Install
TOTAL - STOLLE RD SUBSTATION WORKS:							**$ 3,616,500**	

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Comments:
7. GARDENVILLE 230kV SUBSTATION WORKS								
7.1	Site Works including sediment controls, access roads, rough grading, final grading	0.3	Sum		$1,000,000.00	$ 1,000,000	**$ 300,000**	Supply & Install
7.2	Substation Fence	200.0	LF		$200	$ 200	**$ 40,000**	Supply & Install
7.3	New microwave antenna pole foundation - caisson type	1.0	Sum		$75,000	$ 75,000	**$ 75,000**	Supply & Install
7.4	Relocate microwave antenna steel pole and ancillary equipment	1.0	Sum		$50,000	$ 50,000	**$ 50,000**	Supply & Install
7.5	Demo microwave antenna pole foundation	1.0	Sum		$20,000	$ 20,000	**$ 20,000**	Supply & Install
7.6	Switches 3ph	2.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 14,000**	
7.7	Line Switches 3 ph w/ motor operators	1.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 30,000**	
7.8	Instrument Transformers	1.0	Sum		$ 260,000	$ 260,000	**$ 260,000**	
7.9	Breakers	1.0	Ea	$ 250,000	$ 75,000	$ 325,000	**$ 325,000**	
7.10	Arrestors (3 per line)	3.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 22,500**	
7.11	Line Traps	1.00	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 21,000**	
7.12	Low Profile Foundations	31.0	Ea		$ 5,000	$ 5,000	**$ 155,000**	Supply & Install
7.13	Caisson DE Foundations	4.0	Ea		$ 50,000	$ 50,000	**$ 200,000**	Supply & Install
7.14	Circuit Breaker Foundations	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
7.15	Lightning Mast Foundations	1.0	Ea		$ 15,000	$ 15,000	**$ 15,000**	Supply & Install
7.16	Control Cables	1.0	Sum	$ 50,000	$ 50,000	$ 100,000	**$ 100,000**	
7.17	Protection , Telecom and Metering Equipment	1.0	Ea		$ 140,000	$ 140,000	**$ 140,000**	Supply & Install
7.18	SCADA and Communications	1.0	Sum		$ 50,000	$ 50,000	**$ 50,000**	Supply & Install
7.19	Control Conduits from Cable Trench to Equipment	1.0	Sum		$ 100,000	$ 100,000	**$ 100,000**	Supply & Install
7.20	Grounding	1.0	Sum		$ 100,000	$ 100,000	**$ 100,000**	Supply & Install
7.21	Bus Support 3 Ph	3.0	Ea	$ 4,500	$ 2,000	$ 6,500	**$ 19,500**	
7.22	Bus Support 1 Ph	3.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 9,000**	
7.23	Switch Stands	3.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 33,000**	
7.24	Misc. Structures	1.0	Sum		$ 13,000	$ 13,000	**$ 13,000**	
7.25	Substation A-Frame Structures Standalone	1.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 25,000**	
7.26	Lightning Masts	1.0	Ea	$ 10,000	$ 2,000	$ 12,000	**$ 12,000**	
7.27	Arrestor Stands	3.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 10,500**	
7.28	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 1,200,000	$ 1,200,000	**$ 1,200,000**	Supply & Install
TOTAL - GARDENVILLE SUBSTATION WORKS:							**$ 3,414,500**	
8. NIAGARA SUBSTATION WORK								
8.1	Site Works including sediment controls, access roads, rough grading, final grading	0.6	Sum		$ 1,000,000	$ 1,000,000	**$ 600,000**	Supply & Install
8.2	Substation Fence	320.0	LF		$ 200	$ 200	**$ 64,000**	Supply & Install
8.3	Switches 3ph	2.0	Ea	$ 5,000	$ 2,000	$ 7,000	**$ 14,000**	
8.4	Line Switches 3 ph w/ motor operators	1.0	Ea	$ 15,000	$ 15,000	$ 30,000	**$ 30,000**	
8.5	Instrument Transformers	1.0	Sum		$ 121,000	$ 121,000	**$ 121,000**	
8.6	Breakers	1.0	Ea	$ 250,000	$ 75,000	$ 325,000	**$ 325,000**	
8.7	Arrestors (3 per line)	6.0	Ea	$ 6,500	$ 1,000	$ 7,500	**$ 45,000**	
8.8	Line Traps	1.0	Ea	$ 13,000	$ 8,000	$ 21,000	**$ 21,000**	
8.9	345 kV buses	0.5	Ea	$ 25,000	$ 35,000	$ 60,000	**$ 30,000**	
8.10	Low Profile Foundations	37.0	Ea		$ 5,000	$ 5,000	**$ 185,000**	Supply & Install
8.11	Caisson DE Foundations	4.0	Ea		$ 50,000	$ 50,000	**$ 200,000**	Supply & Install
8.12	Circuit Breaker Foundations	1.0	Ea		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install
8.13	Control Cables	1.0	Sum	$ 50,000	$ 50,000	$ 100,000	**$ 100,000**	
8.14	Protection , Telecom and Metering Equipment	1.0	Sum		$ 90,000	$ 90,000	**$ 90,000**	Supply & Install
8.15	SCADA and Communications	1.0	Sum		$ 250,000	$ 250,000	**$ 250,000**	Supply & Install
8.16	Control Conduits from Cable Trench to Equipment	1.0	Sum		$ 75,000	$ 75,000	**$ 75,000**	Supply & Install

SECO SUBSTATION ENGINEERING COMPANY

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Comments:
8.17	Cable Trench Systems for Control Cables	1.0	Sum		$ 350,000	$ 350,000	**$ 350,000**	Supply & Install
8.18	Grounding	1.0	Sum		$ 125,000	$ 125,000	**$ 125,000**	Supply & Install
8.19	Underground Riser Structures	6.0	Ea	$ 2,500	$ 1,000	$ 3,500	**$ 21,000**	
8.20	Bus Support 1 Ph	6.0	Ea	$ 2,000	$ 1,000	$ 3,000	**$ 18,000**	
8.21	Switch Stands	2.0	Ea	$ 8,000	$ 3,000	$ 11,000	**$ 22,000**	
8.22	Misc. Structures	1.0	Ea	$ 1,000	$ 1,000	$ 2,000	**$ 2,000**	
8.23	Substation A-Frame Structures Standalone	1.0	Ea	$ 20,000	$ 5,000	$ 25,000	**$ 25,000**	
8.24	Arrestor Stands	6.0	Ea	$2,500	$ 1,000	$ 3,500	**$ 21,000**	
8.25	Miscellaneous Materials and Above / Below Ground Works	1.0	Sum		$ 200,000	$ 200,000	**$ 200,000**	Supply & Install
8.26	345kV underground cable with terminations. (680 Circuit Ft.)	1.0	Ea		$ 1,200,000	$ 1,200,000	**$ 1,200,000**	Supply & Install
TOTAL - NIAGARA SUBSTATION WORKS:							**$ 4,209,000**	
9. MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:								
	Contractor Mobilization / Demobilization							
9.1	Mob / Demob	1.0	Sum		$ 1,500,000	$ 1,500,000	**$ 1,500,000**	
	Project Management, Material Handling & Amenities					$ -	**$ -**	
9.2	Project Management & Staffing (includes PM, Field Engineers / Supervision,	32.0	Months		$ 350,000	$ 350,000	**$ 11,200,000**	
9.3	Site Accommodation, Facilities, Storage	1.0	Sum		$ 2,000,000	$ 2,000,000	**$ 2,000,000**	
	Engineering					$ -	**$ -**	
9.4	Design Engineering	1.0	Sum		$ 7,200,000	$ 7,200,000	**$ 7,200,000**	
9.5	LiDAR	1.0	Sum		$ 800,000	$ 800,000	**$ 800,000**	
9.6	Geotech	1.0	Sum		$ 1,700,000	$ 1,700,000	**$ 1,700,000**	
9.7	Surveying/Staking	1.0	Sum		$ 1,000,000	$ 1,000,000	**$ 1,000,000**	
	Testing & Commissioning							
9.8	Testing & Commissioning of TRANSMISSION LINE and Equipment	1.0	Sum		$ 1,800,000	$ 1,800,000	**$ 1,800,000**	
	Permitting and Additional Costs					$ -	**$ -**	
9.9	Environmental Licensing & Permitting Costs	1.0	Sum		$ 2,859,705	$ 2,859,705	**$ 2,859,705**	
9.10	Environmental Mitigation	1.0	Sum		$ 18,601,683	$ 18,601,683	**$ 18,601,683**	
9.11	Warranties / LOC's	1.0	Sum		$ 786,713	$ 786,713	**$ 786,713**	
9.12	Real Estate Costs (New)	1.0	Sum		$7,017,412	$ 7,017,412	**$ 7,017,412**	
9.13	Real Estate Costs (Incumbent Utility ROW)	1.0	Sum		$2,774,000	$ 2,774,000	**$ 2,774,000**	
9.14	Legal Fees	1.0	Sum		$ 3,500,000	$ 3,500,000	**$ 3,500,000**	
9.15	Sales Tax on Materials	1.0	Sum	$ 3,864,884		$ 3,864,884	**$ 3,864,884**	
9.16	Fees for permits, including roadway, railroad, building or other local permits	1.0	Sum		$ 200,000	$ 200,000	**$ 200,000**	
TOTAL - MOB/DEMOB, ENGINEERING, PERMITTING, T&C, PM & INDIRECTS:							**$ 66,804,397**	
10. SYSTEM UPGRADE FACILITIES								
SUF 1.1	Niagara Falls Blvd to Packard 115kV Line 130 Reconductor	3.67	Mile		$ 400,000	$ 400,000	**$ 1,468,000**	Rate for reconductor is pro-rated from National Grid Niagara - Packard reconductor. Note that rate does not include upgrades to structures or foundations.
SUF 1.2	Engineering, T&C, PM, Indirects FOR suf 1.1 (15%)					$ -	**$ 220,200**	
SUF 2.1	Reconductor National Grid 115kV Line 133	9.78	Mile		$ 400,000	$ 400,000	**$ 3,912,000**	Rate for reconductor is pro-rated from National Grid Niagara - Packard reconductor. Note that rate does not include upgrades to structures or foundations.
SUF 2.2	Engineering, T&C, PM, Indirects FOR SUF 2.2 (15%)					$ -	**$ 586,800**	

COST ESTIMATE

Item	Description	Quantity	Unit	Supply Rate	Labor & Equipment Rate	Total Unit Rate:	TOTAL:	Comments:
SUF 3.1	Depew to Erie Street 115kV Transmission Line 921. Terminal Allowance included. See comments.	1.00	Ea		$ 500,000	$ 500,000	**$ 500,000**	Relay was replaced and line ratings increased to 124/137/158 (NOR/LTE/STE) resulting ratings are below line conductor ratings. Scope is to remove all limitations on the circuit so is it limited by the line conductor ratings, 125/152/181 (NOR/LTE/STE). The limiting equipment is not known - scope undefined. Assumed 15% to cover all misc costs
SUF 3.2	Engineering, T&C, PM, Indirects FOR SUF 3.1(15%)					$ -	**$ 75,000**	
SUF 4.1	Packard to Huntley Reconductor	19.62	Mile		$ 400,000	$ 400,000	**$ 7,848,000**	
SUF 4.2	Engineering, T&C, PM, Indirects for SUF 4.1 (15%)					$ -	**$ 1,177,200**	
SUF 5	SYSTEM UPGRADE FACILITIES CONTINGENCY (SEE ASSUMPTIONS & CLARIFICATIONS)						**$ 7,500,000**	Contingency for possible additional SUF upgrades
TOTAL SYSTEM UPGRADE FACILITIES:							**$ 23,287,200**	

PROJECT TITLE WNY PROJECT EVALUATION- ENVIRONMENTAL LICENSING & PERMITTING COST ELEMENTS						ENVIRONMENTAL LICENSING & PERMITTING COST ESTIMATE RANGE FOR PROPOSED WNY TRANSMISSION PROJECT - T017	
FEDERAL							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans	Min.	Max.
USACE	Waters of the US under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act (including regulated wetland areas)	Nationwide Permits (NWP) or Individual Permit (IP)	Any work within the boundaries of regulated wetlands (with the exception of isolated wetlands) or waterways to the spring high tide or ordinary high water mark	If project qualifies for a NWP (<0.5 acre disturbance and within NWP project type parameters), a pre-construction notification (PCN) is typically required. NWPs have a 45 day review period starting from when project logged in system (up to 6wk backlog delay in logging projects) If an IP is triggered, USACE will require Alternative Analysis and Public Notice/Hearing. IPs could also trigger restrictive environmental work windows. IPs have a 120 day review period starting from when permit is "deemed complete"	Wetland Delineation; Wetland Function & Value Assessment; Stream Delineation; Restoration Plan	$46,760	$126,050
USFWS	Endangered Species Act Section 7 (ESA) Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act	Consultation (Formal or Informal); Special Use Permit	Any work that may have an affect on listed species or their habitat; or projects within National Wildlife Refuges	USACE coordinates consultation with USFWS for ESA listed species during their permit review. Also includes the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act compliance. Season restrictions on construction could be imposed.	Rare, Threatened & Endangered Species Search; Preparation of Reports and Conservation Plans	$80,800	$200,000
FAA	Airports / Airspace	Federal Aviation Administration (FAA) Notification	New or Replacement Structures near Airports	Depending on construction locations, this permit may only be needed for OP work.	Obstruction Analysis, Mitigation Plan (assumes Engineering Cost)	$3,000	$9,000
STATE							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
NYS Public Service Commission / Department of Public Service (NYSDPS)	Article VII	Article VII: Certificate of Environmental Compatibility and Public Need and Environmental Management & Construction Plan (EM&CP)	Article 7: Major electric transmission facilities with design capacity of 100kV or more extending for at least 10 miles or 125kV and over extending a distance of 1 mile or more (some exclusions for underground transmission applies)	Article 7 will incorporate all of the required State and Local approvals (costed separately), as well as Engineering and Environmental Studies and Public Outreach. Intervenor Fund payment expected to be $350,000. An Environmental Management & Construction Plan (EM&CP) must be prepared and approved by the PSC. (see 16 NYCRR Parts 85 through 88)	Includes Reports and Plans required for State and Federal Agency Permits, as well as EM&CP, EMF, Noise, Air, Visual Impact Assessment, Invasive Species Control Plan, Mitigation Plans	$850,000	$3,350,000

NYSDEC	Article 15 Stream Disturbance; Article 24 Wetlands, Open Waters, Wetlands Buffers (100' for Freshwater Wetland)	Individual Permit (IP) (unless developer has General Permit (GP))	Any work within the boundaries of regulated waterways or wetlands, and wetland adjacent areas	Any disturbance within wetlands and/or below mean high tide will require an IP. Areas of temporary disturbance will likely require restoration, including a monitoring and maintenance period. Permanent disturbance will require offsite mitigation up to 3:1 area ratio; also includes a monitoring and maintenance period. GP may only be applicable if project ground disturbance is located outside of wetlands areas (above MHW).	Wetland Delineation; Wetland Restoration/Mitigation Plan	$12,000	$53,000
NYSDEC	Stormwater (If >1 Acre Soil Disturbance)	SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 & SWPPP	Project areas of soil disturbance	If project involves 1 acre or more soil disturbance, then the GP is required. If located within a Regulated MS4 Municipality, additional coordination may be needed. Weekly inspections by a Qualified Inspector during construction will be required.	SWPPP (assumes Engineering Cost includes Sediment & Erosion Control Plan, Hydraulic & Hydrology Studies, Stormwater Management Design)	$11,200	$38,000
NYSDOS	State Coastal Management Program Mapped Coastal Area Boundary	Coastal Consistency Concurrence	Projects within the NYSDOS designated Coastal Zone; and consistency with Local Waterfront Revitalization Plans (LWRPs); e.g., Town of Grand Island LWRP	Online mapping available to check if within coastal zone, a significant coastal fish & wildlife habitat (SCFWH), a local waterfront revitalization program area (LWRP), or a comprehensive management program areas (CMP)		$3,400	$15,000
NYSHPO	National Historic Preservation Act (NHPA) Section 106: State and Federal Historic Places; State Mapped Archeologically Sensitive Areas	Cultural Resource Information System (CRIS) Determination	Local, State, or Federal eligible or designated historic places and/or areas of archeological sensitivity (in off-road areas and areas that have not been previously disturbed)	NYSDEC EAF Online Mapper identifies State or National Register of Historic Places and archeological sensitive areas within or adjacent to the project site. Formally enter project information and supporting documents into SHPO's online CRIS program. Staff will review and email a determination of impacts letter	Phase 1A & 1B Archaeological Studies (not included in costing)	$34,400	$112,600
NYS NHP	Threatened and Endangered Species	Consultation	Activities that may affect T&E species or their habitat.		See USFWS	$1,200	$6,400
NYSDOT/NYS Thruway Authority/FHWA	State Roadways	Highway Work Permit/Utility Permit, Vegetation Management Permit; Easement	Any work within or crossing State highway ROW	May require restoration landscaping coordination. Typically requires compliance with NEPA including SHPO and USFWS effects determination	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$17,000	$200,000
NYS Canal Corporation	Erie Canal - jurisdiction varies along edge	Canal Occupancy & Work Permit (TA-W99072)	Any work involving the Erie Canal	Must coordinate with Division Permit Engineer about particular section of canal being affected. Commercial permit fee = $25 plus $2,000,000 additional General Aggregate Liability Insurance	Work Zone Traffic Control (WZTC) Plan (assumes included in Engineering Cost)	$3,800	$3,800

ENVIRONMENTAL LICENSING AND PERMITTING

NYS Dept. of Agriculture and Markets	All agricultural lands (including Agricultural Districts)	Part of Article 7 & Article 10 Review process	Any work impacting agricultural land	Must minimize impacts and restore damage to agricultural land, and coordinate with County Soil & Water Conservation District; Vineyards are a major concern in WNYS. Pre-application conference with PSC, DEC and Ag& Markets recommended. Must develop EM&CP in conformance with Art. 7/10 Certificate Conditions. Agricultural Monitor must oversee construction & restoration; requisite 2-yrs post restoration monitoring.	Crop/Pasturing Mitigation Plan (not included in costing)	$11,000	$24,000
REGIONAL							
Railroads	Railroad crossings	Consultation-permits may be required; Easement	Access / new structures on RR property		Easement area survey (not included in costs)	$11,000	$200,000
LOCAL/MUNICIPAL							
Agency	Jurisdiction	Permit/Approval	Primary Regulated Areas	General Permitting Notes	Potential Studies/Plans		
County Dept. of Public Works	County Roadways	Lane Closure Permit, Highway Work or Access Permit	Work within county roadways and right-of-ways			$6,000	$40,000
Town, City or Village	Municipal Stormwater (MS4) Review	Approval of SWPPP or EM&CP	Project areas of soil disturbance		See NYSDEC SPDES	$6,000	$35,000
Town, City or Village	Variable	Building Permits	New Structures	Individual Towns/Villages must be consulted on a project specific basis to determine notification and/or permitting procedures. Permit application names vary (e.g. road obstruction permit)		$18,000	$92,000
Town, City or Village	Municipal Roadways	Highway Work Permit; Road Opening Permit	Work within municipal roadways and right-of-ways			$6,000	$35,000
Town, City or Village	Wetlands	Wetland Permit / Conservation Approvals	Mapped wetlands and wetland adjacent areas (buffer width variable)		See USACE / NYSDEC Art. 24	$6,000	$52,000

		Minimum	Maximum
ENVIRONMENTAL LICENSING & PERMITTING COST (EXCLUDING MITIGATION)	**PROJECT T017 TOTAL**	**$1,127,560**	**$4,591,850**
Excluded cost: Mitigation or restoration for impact to regulated wetlands; agricultural land and tree clearing	**Expected Value**	**$2,859,705**	

Client: NYISO
Project: Western Transmission Project Evaluation
Subject: Cost Estimate
Document No: T017 - Exelon Transmission

ENVIRONMENTAL MITIGATION ESTIMATE

Revision: 3

WNY TRANSMISSION PROJECT - ENVIRONMENTAL MITIGATION COST ESTIMATE FOR T017

	Offsite Wetland Mitigation*		Farmland**	
	Min.	Max.	Min.	Max.
Area	106 acres	106 acres	68.5 acres	137 acres
Cost/Acre	$50,000	$100,000	$503	$503
Ratio	1:1	3:1	1:1	1:1
Total	$5,300,000	$31,800,000	$34,455	$68,911

T017 MITIGATION TOTAL	Minimum	Maximum	Expected Value
	$5,334,455	**$31,868,911**	**$ 18,601,683**

*Offsite wetland mitigation area assumes clearing of NWI Forested/Shrub Wetland Approx. 6.68 miles (35270 LF) by 125' ROW width and 0.43 miles (2270 LF) by 95' ROW width; Max. cost per acre assumes additional mitigation required for permanent impacts of proposed structures in non-forested wetlands; cost per acre Min. and Max. reduced due to area total over 50 acres; includes design and installation costs only; does not include land acquisition or long term monitoring.

**Farmland mitigation based on corn bushel yield at 129 BU/Acre and $3.9/BU (production numbers from 2016 USDA NYS Agriculture Overview), area assumes 22.6 miles (119328 LF) based on Agricultural District Lands adjacent to the project route (GEI calculation) by 25' Wide (Min.) or 50' Wide (Max.); does not include land acquisition

Revision: 3

REAL ESTATE ESTIMATE
(NEW ROW)

COUNTY: NIAGARA & ERIE
DEVELOPER: EXELON (T017)
SEGMENT: NIAGARA - DYSINGER - STOLLE SEGMENT

		Area (Acres)	Total Cost
A	**NIAGARA COUNTY**		
	Sub Total (A)	52.72	$ 404,006.00
B	**ERIE COUNTY**		
	Sub Total (B)	0.68	$ 4,376.00
	Total (A + B)	53.40	$ 408,382.00

Revision: 3

REAL ESTATE ESTIMATE
(NEW ROW)

COUNTY: ERIE
DEVELOPER: EXELON (T017)
SEGMENT: STOLLE TO GARDENVILLE SEGMENT

		Area (Acres)	Total Cost
	Total	124.71	5,518,485.00

REAL ESTATE ESTIMATE
(INCUMBENT UTILITY ROW)

COUNTY: NIAGARA AND ERIE
DEVELOPER: EXELON (T017)
SEGMENT: NIAGARA TO STOLLE TO SEGMENT

	DEVELOPER	SEGMENT	COUNTY	INCUMBENT UTILITY (ROW) (ACRES)	TOTAL ROW COST
T017	Exelon Transmission	Niagara to Stolle - 47.12 miles	Niagara	358.49	$ 2,701,000
			Erie	296.31	
		Stolle Rd SS to Gardenville SS - 12.10 miles	Erie	14.63	$ 73,000

Revision: 3

REAL ESTATE ESTIMATE
(HOUSES)

COUNTY: ERIE
DEVELOPER: EXELON
SEGMENT: STOLLE ROAD SS TO GARDENVILLE SS

		Total Valuation of Property with 3% Escalation/year (as of 2017)
	Total Valuation Cost	$ 1,090,544.99

ASSUMPTIONS AND CLARIFICATIONS

Revision: 3

a) Cost Estimate is based on 2017 rates.
b)We have assumed a construction schedule of 10 months, with no breaks in the schedule. Six months have been added to the construction schedule PM time for start up and close out works and float.
c) Stringing rates allow for protection over crossings (such as rider poles).
d) We have assumed a typical work week (6 x 10 hour days).
e) We have assumed the Access Road included in Developer Estimate will be Type 1 Gravel Type.
f) Costs will vary for handling and disposal of contaminated spoils, depending on type of contaminants and availability / location of the appropriate tipping facility. Since there is not enough information to provide a quantified estimate for this item, allowance is included in the contingency monies.
g) Costs have been developed based on historical data from Projects of a similar nature (AACE Class 5 and 4 Estimating Practices). We have not engaged any subcontractors or material vendors for formal quotes.
h) Estimated quantities have been used for items in red text in Section 1 of the Estimate (CLEARING & ACCESS FOR T-LINE CONSTRUCTION). These items were not quantified in the Developers Estimate, however we believe that they are necessary for the works.
i) Foundation rates include supply and installation of materials. Drilled Pier rates include supply and testing of concrete, rebar cage and the use of temp or permanent casing.
j) Assumes all environmental data and project details provided are accurate unless noted otherwise
k) Considers entire route for costing (Niagara to Packard, Niagara to Stolle, Gardenville to Stolle)
l) USFWS T&E Assumes that ¼ of the Total Line in Right of Way will require field survey for T&E (Approx. 15.6 miles)
m) NEPA-Assumes no NEPA because Art VII
n) SHPO-Assumes consultation and Phase 1A/1B archeological studies with field survey for 50% of Total Line in Right of Way (Approx. 31.2 miles)
o) NYSDOT/FHWA-Assumes any required NEPA coordination/requirements are covered under Article VII
p) Assumes no coordination with National Parks Service or OPRHP/State Parks
q) USACE wetland delineation costs based on total Line Miles in Wetlands (8.94) - NWI and NYSDEC totals calculated by GEI for Niagara to Stolle (7.59 miles) and Stolle to Gardenville (1.35 miles)
r) NYSDEC delineations overlap and are accounted for in USACE costing.

ASSUMPTIONS AND CLARIFICATIONS

s) Offsite wetland mitigation area costs based on a total of approximately 6.68 miles of impacts anticipated by clearing of NWI Forested/Shrub Wetland for Niagara to Stolle and 0.43 miles for Stolle to Gardenville (calculated by GEI based on NWI mapper legend categories) Assumes clearing a width of 125 feet within the Niagara to Stolle Road Right of Way and a width of 95 feet in the Stolle to Gardenville ROW. Minimum costs at $50,000/acre and 1:1 ratio, maximum costs at $100,000/acre and 3:1 ratio for additional permanent impacts of proposed structures in non-forested wetlands. Costing includes design and installation costs only and does not include land acquisition or long term monitoring. Minimum and maximum costs for this proposal assumes a reduced mitigation cost/acre due to size of mitigation.
t) Agricultural mitigation assumes timber matting impacts and pad impacts on a total of 22.56 calculated by GEI from miles of adjacent agriculture district land (Niagara to Stolle and Stolle to Gardenville) requires crop damage payments based on USDA 2016 NYS Agriculture Overview corn yield and bushel price/acre. Minimum assumes 25-foot-wide impact, Maximum assumes 50-foot-wide impact.
u) No tree survey or replanting required outside regulated wetlands areas
v) Article VII Intervenor Fund payment expected to be $350,000
w) Mitigation costs for landscaping only (no paving, sidewalks, sound walls, etc.)
x) SUF pricing is included at the end of the estimate workbook (costs excluded from main estimate).
y) SUF pricing includes 35% to cover Contractor markup (15%) and contingency (20%)
z) SUF reconductor rate is based on Niagara-Packard (National Grid) reconductor estimate, pro-rated to a rate / mile. Note that this is based on conductor, shieldwire and hardware pricing only and does not include structure or foundation works.
aa) System Upgrade Facilities Contingency is allowance for potential additional system upgrades including overdutied breakers, protection changes, unidentified thermal issues, etc that may be identified as detailed studies are completed.

Appendix E – Market Monitoring Unit Report

NYISO MMU Evaluation of the Proposed Public Policy Transmission Projects in Western New York

POTOMAC ECONOMICS

By:

David B. Patton, Ph.D.
Pallas LeeVanSchaick, Ph.D.
Raghu Palavadi Naga

Market Monitoring Unit
for the New York ISO

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I. EXECUTIVE SUMMARY

Pursuant to FERC Order 1000, the NYISO developed tariff provisions to allow for recovery of the costs of transmission projects proposed to achieve public policy objectives through the NYISO's transmission rates. The tariff requires NYISO to issue a report detailing its evaluation of the proposed projects and identifying which (if any) is the more efficient or cost-effective project for satisfying the Public Policy Transmission Need ("PPTN"). [1] The tariff also requires the Market Monitoring Unit ("MMU") to "review and consider" any impact on the ISO-administered markets from regulated transmission solutions proposed to satisfy the PPTN, and then the MMU is to provide a report containing its evaluation to stakeholders before the Management Committee advisory vote on the Public Policy Transmission Planning Report. [2]

The NYPSC issued an order finding that "significant environmental, economic, and reliability benefits could be achieved by relieving the transmission congestion identified in Western New York." The order directed the NYISO to consider solutions to "fully utilize Niagara and simultaneously maximize imports from Ontario, including at least 1,000 MW under emergency conditions" (known as the "Viability and Sufficiency Criteria"). [3]

Developers submitted 12 proposed projects, and the NYISO identified ten that would satisfy the Viability and Sufficiency Criteria. The NYISO performed a thorough analysis estimating the costs and benefits of these ten projects.

In particular, the NYISO estimated the overnight costs and assessed potential development risks of each project against the projected:

- Economic benefits from lower electricity production costs,
- Environmental benefits from reduced CO_2 emissions from fossil-fuel generators,
- Reliability benefits from helping satisfy operating requirements, and
- Other benefits from enhancing the bulk power system such as: expandability of new infrastructure, operability of transmission equipment, and performance of the project.

To evaluate the market effects of the public policy projects, we begin with the premise that uneconomic projects can harm the electricity markets by inefficiently altering energy and capacity prices in the short-term, crowding-out efficient market-based investment, and inflating

1 See NYISO Open Access Transmission Tariff Section 31.4.11.

2 See NYISO Market Services Tariff Section 30.4.6.8.5.

3 PSC Case No. 14-E-0454, *In the Matter of New York Independent System Operator, Inc.'s Proposed Public Policy Transmission Needs for Consideration, Order Addressing Public Policy Requirements for Transmission Planning Purposes* (July 20, 2015), at p. 27.

market risks in the long-term. The determination of whether projects are economic must include factors that are not fully priced in the NYISO markets. Hence, public policy projects that generate large unpriced benefits are more likely to be economic and, thus, are less likely to harm the markets. For projects that are uneconomic (i.e., whose costs exceed the priced and unpriced benefits they would produce), the MMU shall assess the harm to the NYISO markets. This principle is discussed in more detail in Section II.A.

The remainder of this executive summary discusses our evaluation and conclusions. Section II provides a more detailed presentation of our evaluation, including an assessment of the metrics supporting the NYISO staff's recommendation of Project T014 and a discussion of the assumptions underlying the NYISO's analysis.

Qualitative and Quantitative Evaluation Metrics

The NYISO presented several quantitative and qualitative metrics of the impacts and costs of each project and outlined how these metrics were ultimately considered in its recommended selection of Project T014. While estimates of cost and economic value are relatively straight-forward, it can be difficult to evaluate metrics that are either qualitative or quantified in non-dollar terms. So, the following summarizes how we consider the diverse set of metrics for satisfying the PPTN, which focused on the economic, environmental, and reliability benefits of reduced congestion:

- Environmental and Economic Benefits – We consider environmental benefits to include the value of CO_2 emissions abatement across New York, New England, Ontario, and PJM that would result from a proposed project. Economic benefits would include reductions in fuel costs, variable O&M costs, and any other generation costs besides emissions allowance costs across the same region.[4]
- Reliability Benefits – A large share of the reliability benefits of the transmission projects are embedded in the quantification of economic benefits, including reducing congestion that can arise as resources are dispatched to satisfy the system's real-time reliability needs. However, this analysis does not capture the additional potential benefits of improving resource adequacy by making resources more deliverable. These additional reliability benefits are best measured by how the projects affect the loss of load

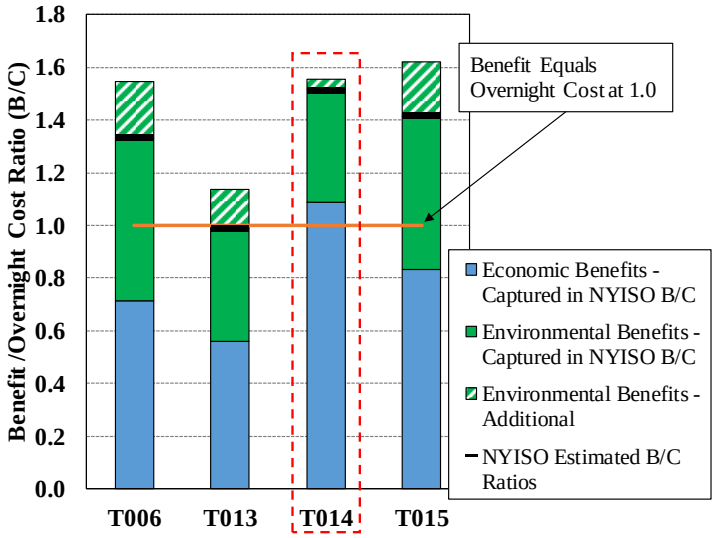
[4] Although the Economic and Environmental Benefits are based on the GE MAPS simulations, the sum of these benefits is not equal to the NYCA Production Costs Savings discussed in Table 4-1 of the WNY PPTP Report because NYCA Production Costs do not consider the benefits of emission reductions in neighboring areas with no CO_2 pricing regime. Note, NYCA Production Costs measure changes in net import charges to NYCA, but this may not be equal to the change in production costs of generators on the other side of the border. Nonetheless, we believe that the changes in net import charges are a reasonable proxy for changes in production costs in neighboring areas.

expectation ("LOLE"). However, the NYISO found that none of the proposed projects would have improved LOLE significantly. This indicates that the resource adequacy benefits of these projects would be negligible, although they likely produce other reliability benefits.[5]

The NYISO also identified several qualitative benefits categories, including (a) Performance – How the proposed project may affect the utilization of the system (e.g. increased Niagara and Ontario generation), and (b) Operability – The extent that a given project affects flexibility in operating the system, such as dispatch of generation, access to operating reserves, access to ancillary services, or the ability to remove transmission for maintenance. The NYISO found that projects with phase-shifting transformers and projects that are more integrated with the existing grid provide operational flexibility superior to other projects. Some of these qualitative metrics are reflected in the GE MAPS simulations, so they are partially reflected in the economic and environmental benefits.[6] Section II.C.discusses the use of these metrics in detail.

Summary of Assessment of Cost and Benefits for Tier 1 Projects

The following figure summarizes the NYISO's economic and environmental benefits for the four Tier 1 projects and shows benefit-cost ratios the NYISO calculated based on its production cost savings estimates for one scenario. Environmental benefits are broken into two categories: one indicating the environmental benefits that are reflected in the NYISO's benefit-cost metric, and one indicating additional environmental benefits from CO_2 abatement in areas with no CO_2 pricing regime. The Performance and Operability metrics are reflected in this figure to the extent that they influence the results of the GE MAPS simulations. The bars shown in the figure are for Scenario 2, which assumes that a federal CO_2 program is implemented in 2024 and which was utilized by the NYISO for *Table 4-1: Summary of Results*.



5 Note, transmission facilities can also provide transmission security benefits in the planning horizon or in market operations. The WNY PPTP Report did not quantify the monetary value of transmission security benefits in the planning horizon from the proposed projects. In market operations, the benefits of improved transmission security would reduce the cost of generation re-dispatch to manage transmission constraints, so these benefits are largely included in the results of the GE MAPS simulations. In Section II.C, we discuss certain caveats that may lead the GE MAPS simulations to under-estimate the value of congestion relief.

6 Note, in Section II.C, we discuss certain caveats that may lead the GE MAPS simulations to under-estimate the value of performance and operability during certain market conditions.

The results in this figure support several key conclusions:

- The proposed projects would provide significant environmental benefits by increasing utilization of the Ontario generation fleet, which has low marginal costs and low CO_2 emissions-intensity relative to the adjacent U.S. markets.
- A large share of the production cost savings measured in the NYISO's B/C ratios using the GE MAPS model are actually environmental benefits. This is because CO_2 pricing programs provide generators with incentives to incorporate the marginal value of CO_2 emissions abatement in their offers.
- The overall benefits of the proposed transmission is dependent on the future prices of CO_2 allowances in the respective regions with higher allowance prices implying higher environmental benefits.
- Tier 1 projects exhibit estimated economic and environmental benefits that exceed their estimated overnight cost. Projects T006, T014, and T015 exhibit similar overall B/C ratios with Project T014 exhibiting higher economic benefits and lower environmental benefits than the other two.
- Because the B/C ratio for Project T014 is greater than 1.0 based purely on its economic benefits, the finding that it is economic is less subject to uncertainties regarding future allowance prices.

As discussed above, our assessment of whether the project will adversely affect the market is based on whether the project's benefits are expected to exceed its costs. An uneconomic project would be harmful because it would undermine the current and future market prices, which are critical for providing incentives to govern long-term investment and retirement decisions. Thus, we find that the recommended project (T014) appears to satisfy a basic cost-benefit test under a variety of conditions, allowing us to conclude that it will not adversely affect the NYISO wholesale electricity markets. Given these cost-benefit results and the other factors considered by the NYISO, we find that NYISO's recommendation is reasonable.

Comments on Modeling Assumptions and Aspects of the PPTP Process

This report also discusses aspects of the public policy transmission project ("PPTP") evaluation process that may be important to enhance in future PPTP processes. While some of these factors, if considered, would have increased the B/C ratios, others would have reduced them. Ultimately, if all of these factors were addressed, it is unlikely that it would affect the finding that the recommended project would be cost-effective. Section II.C discusses these factors in greater detail.

II. Evaluation the Market Effects of Public Policy Projects

A. Principles for the Evaluation of Market Effects

The purpose of the PPTP process is to identify transmission investments that would provide significant public policy and wholesale market benefits, but which would not move forward based on the other planning processes and/or market incentives for transmission. Nonetheless, it is critical for the PPTP process to function in a manner that supports the NYISO's competitive wholesale markets. This section discusses the principles we use for evaluating the qualitative and quantitative benefit metrics against the estimated costs of proposed projects, and ensuring that the PPTP process does not undermine the wholesale market.

Transmission upgrades can provide many wholesale market and public policy benefits to the system. Additional transmission capability can:

- Increase the utilization of low-cost generation, which lowers production costs; and
- Satisfy public policy objectives, such as reducing environmental emissions by facilitating increased development and dispatch of lower-emitting resources.

Therefore, to assess the value of a proposed transmission project, it is important to fully quantify these benefits to determine whether the project is economic.[7] The NYISO's economic transmission planning process (CARIS) does not consider several wholesale market and public policy benefits. This is partly why no transmission project proposal has ever been deemed to be cost-effective under CARIS. The PPTP process allows the NYISO to consider additional benefits for a more complete assessment of whether a proposed project is truly economic.

In Section II.B of this report, we discuss a framework for quantifying the different categories of wholesale market and public policy benefits. This framework incorporates economic benefits, reliability benefits, and environmental benefits into a single metric that assists in evaluating the impact on wholesale electricity markets from the proposed projects.

Although reducing wholesale market congestion will always produce benefits, these benefits must exceed the costs of the transmission project to conclude that the project is economic. Uneconomic transmission investment can inefficiently reduce wholesale prices, crowd-out efficient private investment, and ultimately increase the cost of satisfying public policy objectives. Therefore, our criteria for determining that a public policy transmission project is economic for purposes of this evaluation is: *the priced and unpriced benefits of the project exceeds its costs.*

7 We recognize that some of the public policy benefits are subjective and may not be quantified easily.

Projects that do not satisfy this general principle will harm the markets and ultimately raise costs to consumers in New York. Therefore, we evaluate the costs and benefits of each of the proposed projects, which includes a review of the assumptions used to estimate the projects' benefits. We then apply this principle to determine whether the project recommended for selection by the NYISO would adversely affect the NYISO's wholesale electricity markets.

As a general matter, projects will be more likely to be economic if the PPTN is defined in a manner that is focused on the ultimate public policy objective, and not unnecessarily prescriptive. To the extent that the PPTN requires specific characteristics for the transmission solutions, it will likely foreclose opportunities for the most efficient proposals to come forward in the PPTP process. For example, rather than specifying the amount of additional transmission desired to achieve a public policy objective, it would be better for the PPTN to specify the ultimate objective. This would allow developers to propose more creative and cost-effective solutions.

Finally, although there is substantial overlap, these principles and metrics for evaluating market effects are not the only factors considered by NYISO in selecting a recommended project. The NYISO considers other qualitative factors that are not fully reflected in the benefit-cost evaluation. In this case, for example, these qualitative factors provide additional support for the NYISO's recommendation of Project T014.

B. Framework for Integrating Qualitative and Quantitative Metrics

The NYISO presented several quantitative and qualitative metrics of the impacts and costs of each project and outlined how these metrics were ultimately considered in its recommended selection of Project T014. While estimates of cost and economic value are relatively straight-forward to interpret, it can be difficult to evaluate metrics that are either qualitative or quantified in non-dollar terms. This section discusses how we consider the results of the metrics that the NYISO used to assess the effects of each project. This section discusses: (a) our approach to quantifying the economic, environmental, and reliability benefits which were the basis for the PPTN; and (b) our comments on the qualitative metrics that the NYISO uses to assess each project.

1. Economic, Environmental, and Reliability Benefits

The NYISO employed a diverse set of metrics for satisfying the PPTN, which can be used to assess the economic, environmental, and reliability benefits that would come from transmission investment in western New York.

Environmental benefits – The primary environmental benefit from the proposed transmission projects is that they would allow zero-emission and relatively low carbon-intensity generation in Ontario to generate more for export to New York. This would reduce the amount of generation

from New York, New England, and PJM, which is typically produced by higher carbon-intensity generation. Consequently, additional transmission in western New York would reduce overall CO_2 emissions. The NYISO estimated the value of CO_2 emissions reductions using projected CO_2 allowance prices in Ontario, Quebec, New York, New England, and PJM. Thus, these environmental benefits are reflected in the GE MAPS production cost savings to the extent that the simulations treated CO_2 allowance prices as a cost of generation.[8]

Economic benefits – The primary economic benefit from the proposed transmission projects is that it allows increased generation from sources with low fuel and variable O&M costs, which displaces generation from higher-cost sources. This production cost savings is measured using GE MAPS software. This category does not include reductions in CO_2 allowance costs because those are categorized as environmental benefits.

We calculate the economic and environmental benefits of the Tier 1 projects based on GE MAPS simulations, same as the NYISO. However, we calculate the benefits slightly differently and attempt to distinguish between the purely economic benefits and the environmental benefits. These two classes of benefits are both included in the NYISO's single production cost savings value. The following examples illustrate how we calculated the economic and environmental benefits from the GE MAPS simulations:

- Example 1 – A NY generator with fuel and variable O&M costs equal to $2/MWh and no emissions increases output by 1 MW, while a NY generator with fuel and variable O&M costs equal to $20/MWh and emissions costs of $8/MWh decreases output by 1 MW.
  - Environmental Benefit = $8 = $8 reduction of allowance costs minus $0 increase
  - Economic Benefit = $18 = $20 reduction of fuel/VOM costs minus $2 increase
  - NYCA Production Cost Savings = $26 = $28 reduction of generator costs minus $2 increase = Environmental Benefit + Economic Benefit
- Example 2 – An Ontario generator with fuel and variable O&M costs equal to $2/MWh and no emissions increases output by 1 MW, while a PJM generator with fuel and variable O&M costs equal to $20/MWh and emissions costs of $8/MWh decreases output by 1 MW.
  - Environmental Benefit = $8 = $8 reduction of allowance costs minus $0 increase
  - Economic Benefit = $18 = $20 reduction of fuel/VOM costs minus $2 increase

[8] Most of the NYISO's scenarios assumed a federal CO_2 allowance program would be implemented in the fourth year of the study (i.e., 2024), so these benefits are not quantified in the production cost savings from the GE MAPS model from 2021 to 2023. However, in Scenario 8, the NYISO assumed no federal CO_2 emission pricing program for the entire study period.

- NYCA Production Cost Savings = $18 = $20 reduction of import costs minus $2 increase < Environmental Benefit + Economic Benefit

While our environmental and economic benefits are the same for Example 1 and Example 2, the NYCA Production Cost Savings would not be the same for Example 2. This is because if there is no CO_2 pricing regime in the neighboring area (which was assumed to be the case for most of PJM from 2021 to 2023 in most of the GE MAPS scenarios), the production costs savings would exclude the value of emission reductions in such areas. [9]

Reliability benefits – Transmission can improve reliability in a variety of ways, including improving transmission security and the robustness of the system in general, as well as by improving resource adequacy by making resources more deliverable and able to be deployed when system contingencies occur. The GE MAPs simulations capture a substantial share of these reliability benefits. However, the simulations do not capture the resource adequacy benefits, which are primarily reflected in the capacity market and the revenues it produces for generators and demand response resources. Resource adequacy benefits can be measured by the loss of load expectation ("LOLE"), which is the resource adequacy metric used in the NYISO planning models. Therefore, it is possible to value the resource adequacy benefits from new transmission by measuring how much generation or demand response would be compensated for providing an equivalent LOLE improvement.[10] The NYISO found that none of the proposed projects would have improved LOLE significantly, implying that the resource adequacy value of these projects would be negligible. However, the magnitude of these resource adequacy benefits may be much larger in a future PPTP evaluation.

2. Evaluation of the Economics of the Proposed Public Policy Transmission Projects

We have reviewed the GE MAPs simulation analyses of the Tier 1 public policy transmission projects. Using these simulation results and the project costs presented in the NYISO report, we calculated the economic and environmental benefits for each project and compared these benefits to the project costs. The NYISO also calculated benefit-cost ratios for each project and used these results along with its assessment of qualitative benefits to recommend one of the Tier 1 projects, Project T014.

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9 In principle, the NYCA Production Cost Savings would also differ because they measure changes in the cost of imports rather than changes in generation costs in neighboring regions. However, we used changes in the cost of imports as a proxy for changes in the generation costs in neighboring regions.

10 Note, transmission facilities could also provide transmission security benefits in the planning horizon or in market operations. The WNY PPTP Report did not quantify the monetary value of transmission security benefits in the planning horizon from the proposed projects. In market operations, the benefits of improved transmission security would reduce the cost of generation re-dispatch to manage transmission constraints, so these benefits are largely included in the results of the GE MAPS simulations. In Section II.C, we discuss certain caveats that may lead the GE MAPS simulations to under-estimate the value of congestion relief.

Figure 1 summarizes the NYISO's economic and environmental benefits for the four Tier 1 projects, and shows the benefit-cost ratios the NYISO calculated based on its production cost savings estimates. Environmental benefits are broken into two categories: one indicating the environmental benefits that are reflected in the NYISO's production cost savings metric (which was used to calculate the B-C ratios), and one indicating additional environmental benefits from CO_2 abatement in areas with no CO_2 pricing regime. The bars shown in the figure are for Scenario 2, which assumes that a federal CO_2 program is implemented in 2024 and which was utilized by the NYISO for *Table 4-1: Summary of Results*.

We find that it is appropriate to rely more on Scenario 2 than the base case scenario for evaluating the economics of the Tier 1 projects because Scenario 2 reflects recent additions to the transmission system that were not in service when the proposals were submitted.[11] Nevertheless, the NYISO found that its other scenarios were generally supportive of the conclusion that T014 was the superior project.

Figure 1: Results for Tier 1 Projects

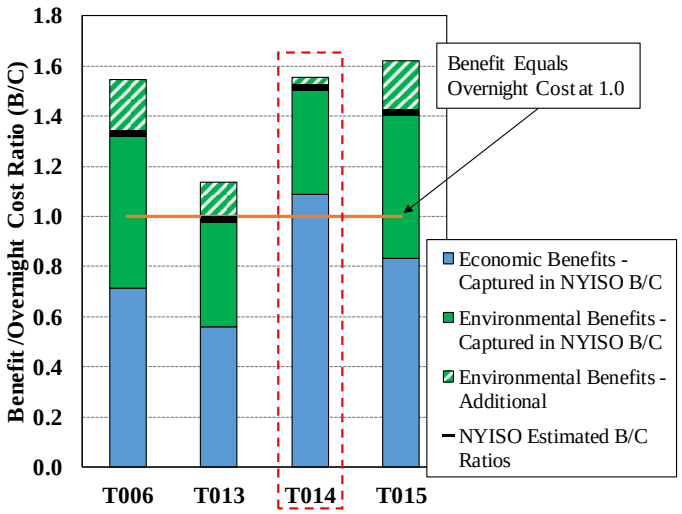

Figure 1 shows that the aggregate economic and environmental benefits we calculate are slightly higher than the production cost benefits reported by the NYISO. To the extent that the areas modeled in the simulations include a CO_2 pricing program, the NYISO's production cost savings will include the value of the CO_2 emissions reductions. This is the case because generators located in areas with a CO_2 program will include the cost of emission allowances in their offers, just as they do with fuel or other types of production costs. In our results, we separate these environmental benefits from the residual economic benefits included in the production cost savings. For those areas that are not covered by a CO_2 program, we estimated environmental benefits that were in addition to the production cost savings reflected in GE MAPS. [12]

These results indicated that each of the proposed projects would provide significant environmental benefits. These benefits are achieved by increasing utilization of generation in Ontario, which generally exhibits lower production costs and lower CO_2 emissions-intensity relative to the adjacent U.S. markets. Therefore, increased imports from Ontario will displace

11 Specifically, Scenario 2 includes the series reactors at Huntley, which modify the pattern of flows across the transmission system in Western New York.

12 This calculation is described in Section II.B.1.

higher-emitting generators in the U.S. and result in lower CO2 emissions. In fact, our analysis shows that a large share of the production cost savings measured in the NYISO's B/C ratios using the GE MAPS model are actually environmental benefits. These benefits are determined by the future prices of CO_2 allowances in the respective regions. Hence, uncertainty regarding future allowance prices will translate to comparable uncertainty regarding the environmental benefits. The economic benefits also depend on future conditions and factors that are uncertain, such as future fuel prices. However, the uncertainty of the economic benefits are likely lower than the uncertainty of the environmental benefits.

Overall, our analysis of the economic and environmental benefits and costs of the Tier 1 projects lead to the following key conclusions:

- Each of the Tier 1 projects exhibit estimated economic and environmental benefits that exceed their estimated overnight cost.
- Projects T006, T014, and T015 exhibit similar overall B/C ratios. However, Project T014 exhibits higher economic benefits and lower environmental benefits than the other two projects.
- Because the B/C ratio for Project T014 is significantly greater than 1.0, we find that this project will not harm the NYISO wholesale electricity markets.
- Additionally, because T014 exhibits a B/C ratio greater than 1.0 based purely on its economic benefits, the finding that it is economic is less subject to the uncertainty associated with future allowance prices.
- For each of these reasons, we find that the NYISO's recommendation of Project T014 is reasonable and consistent with its mandate under the PPTP process.

Although our evaluation of the costs and benefits is consistent with the NYISO's evaluation and we find its recommendation to be reasonable, we nonetheless provide a discussion in the next two subsections of the NYISO's qualitative metrics and the assumptions it used in calculated the costs and benefits of the PPTPs.

3. Qualitative Metrics

The NYISO identified several benefits categories that were qualitative in its evaluation, which included: "Performance," "Operability," and "Expandability." The NYISO also identified project risks using qualitative designations. While these categories are inherently difficult to estimate, when interpreting the results, it is important to consider the extent to which these qualitative risks and benefits are reflected in the quantitative metrics.

Performance. Defined as how the proposed project may affect the utilization of the system. In the WNY PPTP Report, this was based on the amount by which a project would increase Ontario imports plus Niagara generation. Initially, the NYISO estimated these amounts under four

scenarios varying the amounts of generation from the Niagara generator and wind generation in western New York. The estimated economic and environmental benefits of this performance is largely reflected in the production cost savings, since the GE MAPS model varies output from Niagara and wind generation over the study period, so the qualitative assessment of Performance is not an entirely distinct benefit. Moreover, the GE MAPS model estimates how much of the additional capability would likely be used. Later, the NYISO examined how its Performance metric would vary under certain transmission outage conditions, which was instructive since the NYISO's GE MAPS scenarios do not include transmission outages.

Operability. The extent that a given project affects flexibility in operating the system, such as dispatch of generation, access to operating reserves, access to ancillary services, or the ability to remove transmission for maintenance. The NYISO considered how the proposed projects may affect the cost of operating the system, such as how they may affect the need for operating generation out of merit for reliability needs, reduce the need to cycle generation, or provide more balance in the system to respond to system conditions that are more severe than design conditions. The NYISO found that projects with phase-shifting transformers and projects that are more integrated with the existing grid provide operational flexibility superior to other projects. We believe that a large share of the benefits of this operability metric are already reflected in the GE MAPS simulations. However, operational flexibility may become more important during significant transmission outages or other changes in system conditions that are not considered in the GE MAPS estimates.

Expandability. Considers the impact of the proposed solution on future construction and the extent to which any subsequent expansion of the system will continue to use a proposed transmission project. The potential benefits of future expansion are not reflected in the NYISO's quantitative metrics, although the NYISO assessed that this is not a significant distinguishing factor for the Tier 1 projects.

Permitting and other risks to the project timeline. The permitting agency may require changes that increase the overnight or life costs, or it may not grant the use of certain rights of way. A project may take more time to develop than anticipated, which tends to increase project financing costs and reduces the net present value of benefits from the project. These risks were considered in the NYISO's estimated duration of development for each project, however, the NYISO's evaluation does not consider project financing costs or how the estimated duration of development would affect the net present value of production cost savings.

C. Key Assumptions Used to Estimate Benefits and Costs

This section discusses key assumptions used in the NYISO's estimates of the costs and benefits of the proposed projects. We also discuss several factors that were not considered in the NYISO's estimates. Ultimately, we find that addressing these factors:

- Would *not* affect our conclusion that the recommended project would be economic and would not adversely affect the NYISO markets; and

- Would affect the proposed projects relatively uniformly and, thus, would likely have had limited effects on the overall ranking of projects.

However, these factors may be more important in a future PPTP process, so we recommend the NYISO consider addressing issues in future evaluations. Subsection 1 discusses the estimation of individual project costs. Subsection 2 addresses the NYISO's assumptions regarding retirements and new entry over the study period. Subsection 3 evaluates the assumptions used in the production cost simulation model.

1. Factors Affecting Costs of Proposed Projects

In accordance with its Tariff, the NYISO considered only the overnight capital costs of the proposed projects. The NYISO requested detailed project information from the developers, but it ultimately utilized an independent consultant to estimate the overnight costs of the proposed projects. We find that the NYISO costs estimates are reasonable in this evaluation, but recommend the following improvements in estimating project costs in future PPTP evaluations.

First, the NYISO's evaluation does not consider non-capital costs such as O&M costs that would be incurred by proposed projects, although these are a significant portion of the life cycle costs of the project. To illustrate, in the AC Transmission Proceeding, the Brattle Group estimated that the O&M costs for transmission projects typically add ~23 percent to the net present value of the project's revenue requirement.[13] The final revenue requirement associated with any transmission asset would reflect the asset's O&M cost, so not incorporating this cost in the B/C metric could lead to overstating the efficiency of the proposed projects. However, incorporating O&M costs would not likely influence the conclusions in this case.

Second, the NYISO's evaluation considers only the initial capital costs and does not account for the life cycle capital costs of the new equipment. Some of the proposed projects would utilize equipment that have higher life cycle costs than others. For instance, some commenters indicated that the choice of wooden poles (versus steel poles) would reduce overnight costs while

[13] See slides 46 and 112 of the Brattle Group's September 15th 2015 presentation on *Benefit-Cost Analysis of Proposed New York AC Transmission Upgrades*. The Brattle Group utilized a spreadsheet provided by the DPS to estimate the O&M costs in its analysis. The NYISO posted the DPS spreadsheet at http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Planning_Studies/Public_Policy_Documents/AC_Transmission_PPTN/DPS_AC_Transmission_PVRR_Model.xls

increasing life cycle costs. Thus, consideration of life cycle costs could result in a more accurate benefit-cost ratio of certain projects and provide incentives for more economic projects.[14]

Third, the NYISO in its evaluation did not utilize capital cost estimates that were submitted by the developers, and instead relied entirely on independent estimates provided by its consultant. Several developers indicated that the NYISO's cost estimates are significantly different from their own estimates. For instance, one developer indicated that SECO's cost estimate was ~20 percent higher than its own estimate.[15] If developers were able to make firm offers and take on the risk of cost overruns related to their proposed projects, it would be reasonable and beneficial to rely on the developers' cost estimates. Unfortunately, this is not allowed under the current tariff and rules so utilizing an independent third party to develop an unbiased cost estimate is reasonable. However, the fact that this option is unavailable to the developers precludes an efficient assignment of risk and realization of the full benefits of competition for the ratepayers. Hence, it would be beneficial to develop tariff provisions that would allow developers to take this risk by guaranteeing their costs.

2. Assumptions for Resource Mix

A number of evaluation metrics considered by the NYISO (including production cost savings, performance, reduction in CO_2 emissions) are significantly impacted by the assumed regarding the mix of resources in NYCA and neighboring regions over the study period. The NYISO utilized the 2016 CARIS Phase 2 database and made several changes to it for the purpose of production cost simulations.[16] While it is reasonable to rely on the models and methodologies that have been developed in the NYISO's well-established economic transmission planning process (i.e., CARIS), we identify several assumptions that might be enhanced in future PPTP processes.

First, the NYISO assumes new entry would occur such that the system meets the minimum resource adequacy standard throughout the study period (i.e., that LOLE does not exceed one day in ten years). As a result, the NYISO capacity market is designed to incentivize investment to maintain a small excess capacity margin, so the average LOLE would not be expected to

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14 See July 25th 2017 comments of North American Transmission on Draft Western New York Public Policy Transmission Planning Report available at: http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_espwg/meeting_materials/2017-07-27/NAT%20Comments%20Attachments%207%2025%2017%20Public.pdf

15 *Ibid*.

16 See NYISO's response to question 1 (page 2) in its January 31st 2017 FAQ document available at: http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Planning_Studies/Public_Policy_Documents/Western_NY/WNY_PPTN_Phase_2_FAQ_Final.pdf

exceed 0.7 days per ten years.[17] Consequently, the NYISO assumes an unrealistically low capacity margin from 2026 to 2040 in its evaluation. The lower the capacity margin leads to higher the estimated production cost savings, which may overstate the economic benefits of the project. Based on our examination of the annual production cost savings estimates, if the NYISO used more realistic assumptions about the excess capacity margin, we would expect roughly a ~10 percent reduction in the NPV of the economic and environmental benefits over the period. This reductions would not change the conclusions of our evaluation.

Second, the NYISO's GE MAPS and GE MARS scenarios did not consider how new transmission lines would affect future entry and exit decisions by generators, although one of the principal rationales for Order 1000 was to facilitate certain public policy objectives, such as promoting the development of new renewable generation.[18] Thus, we recommend that the NYISO incorporate a model for entry and exit decisions of renewable and fossil-fuel generators upstream and downstream of the constraint in its future PPTP assessments.[19]

Third, the NYISO also assumed that Fitzpatrick and Ginna nuclear units will retire, while Indian Point will continue to operate during the evaluation period. There are several clear indicators that would justify alternative assumptions about the future operation of these three plants.[20] The assumptions regarding new entry and the nuclear units' operation most likely increase the estimated production cost savings for all the proposed projects.

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17 See page 55 of the *2016 State of the Market Report for the New York ISO Markets* by Potomac Economics available at: http://www.nyiso.com/public/webdocs/markets_operations/documents/Studies_and_Reports/Reports/Market_Monitoring_Unit_Reports/2016/NYISO_2016_SOM_Report_5-10-2017.pdf

18 Notwithstanding, the NYISO's Expandability metric does consider the impact of the proposed solution on future construction potential and the extent to which any subsequent expansion of the system will continue to use a proposed transmission project. However, this metric does not attempt to quantify the economic, environmental, and/or reliability value of future expansion.

19 It would be particularly important to incorporate an entry/ exit model when evaluating solutions to future PPTNs that are justified based on their ability to incent new (renewable or conventional) generation. This would likely require the NYISO to evaluate each project relative to prices and other conditions in the project case, which would differ from the current paradigm that measures benefits using a comparison of a project case to a base case without the project.

20 Under the Zero Emissions Credit program of the Clean Energy Standard, the three upstate nuclear plants (Fitzpatrick, Ginna and Nine Mile) will receive payments for every MWh produced by the plants. See the NYPSC's Order approving the program at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B44C5D5B8-14C3-4F32-8399-F5487D6D8FE8%7D. Consequently, the plant economics are likely to be favorable enough to continue their operations. For instance, the Fitzpatrick unit was refueled and continues to operate beyond its proposed retirement date of January 2017.

The State of New York and the owner of the Indian Point facility have indicated that they reached an agreement in which the two remaining reactors would be permanently retired by 2021. See http://www.entergynewsroom.com/latest-news/entergy-ny-officials-agree-indian-point-closure-2020-2021.

Ultimately, if the NYISO implemented the first two recommendations listed in this subsection, it would make the estimated benefits less sensitive to the NYISO's assumptions regarding the status of any particular unit such as Fitzpatrick or Ginna. This is because the exclusion of an existing generator (e.g., Fitzpatrick) would lead to new entry earlier in the study period, so the effects of these assumptions would be moderated significantly.

3. Production Cost Modeling Assumptions

Over the past decade, the NYISO has developed its production cost simulation models in the economic transmission planning process (i.e., CARIS), and the NYISO relied on these for evaluating proposed projects in this PPTP process. The NYISO utilized the GE-MAPS software to model the electrical system and estimate the production cost savings associated with the proposed projects. This was the primary model that was used to estimate economic and environmental benefits. While it is reasonable for the NYISO to rely primarily on the CARIS models, there are several modeling assumptions that could be modified in future PPTP processes to improve the accuracy of the estimated production cost savings.

First, loop flows that move around Lake Erie and through the West zone are highly variable, and have contributed to significant price volatility in the recent years. However, this source of variability is not modeled in the GE-MAPS simulations used by the NYISO. Considering loop flow and unforeseen variations in other non-modeled flows would likely reveal additional benefits from the new transmission lines. This is underscored by the fact that the most severe congestion in Western NY arises during periods with significant clock-wise loop flow around Lake Erie.[21] Furthermore, the NYISO performed two scenarios in which GE MAPS was run holding flows constant at 2013 levels between Ontario and the MISO constant. These scenarios resulted in higher levels of exports from Ontario to the NYISO and, thereby, 15 to 62 percent higher production cost savings from each Tier 1 project.[22] Thus, these two scenarios support the contention that the benefits from additional transmission in Western New York would rise if the variability of loop flows was modeled.

Second, the current GE-MAPS model does not include transmission outages and unforeseen factors such as load forecast error that exacerbate congestion during actual market operations and, as such, does not fully capture the value of new transmission lines that may help mitigate the impact of such factors. Transmission outages drive a large share of congestion in market operations, especially in areas with renewable generation. For example, we have found that most

21 See Appendix Section III.D of the *2016 State of the Market Report for the New York ISO Markets* for a discussion of the impact of loop flows on West Zone congestion.

22 See WNY PPTP Report, Table 3-19 Historical IESO-MISO Flow Modeled results versus 2017 Baseline results. Also see Table 3-20 results versus Table 3-19 SR on 77/78 In-Service results.

export-congestion from the North Zone is caused by transmission outages.[23] Moreover, in the AC Transmission Proceeding, the Brattle Group report found that transmission outages and other unforeseen factors led actual market outcomes to exhibit 56 percent more congestion than the GE MAPS model would simulate.[24] Considering such factors would significantly increase the estimated benefits of new transmission.[25] We recommend that future production cost simulations incorporate such factors.

Third, estimated production cost savings are greatly affected by forecasted prices for natural gas and emissions allowances. The NYISO's sensitivity analysis revealed that both factors have a considerable impact on the estimated production cost savings. New investments in gas pipelines, LNG infrastructure, and generation assets in New York and neighboring regions are likely to affect congestion in the gas system, forecasted gas price levels, and gas price spreads in the region. Further, natural gas pipeline congestion has been the been the principal driver of congestion in the NYISO market since 2012. Hence, quality gas price forecasts and sensitivities are essential for evaluating the cost-effectiveness of new transmission investments.

23 For a discussion of the transmission outages and related congestion patterns, see Appendix Section III.B of the *2016 State of the Market Report for the New York ISO Markets*.

24 See slide 84 of the Brattle Group's September 15th 2015 presentation on *Benefit-Cost Analysis of Proposed New York AC Transmission Upgrades*.

25 While the NYISO evaluated the reliability benefits from the proposed projects under various maintenance conditions as part of the Operability metric, this metric does not include a monetary valuation of the economic, environmental, and reliability impacts under maintenance conditions.

III. CONCLUSIONS

The NYPSC issued an order identifying a PPTN related to congestion in western New York. It directed the NYISO to consider solutions that would provide access to increased output from Niagara and additional imports from Ontario. The NYISO, in accordance with the PPTP component of its comprehensive system planning process, evaluated 12 projects that were proposed to address the western New York PPTN. The NYISO published the Public Policy Transmission Planning report that summarizes the need, the proposed projects, V&S assessment, and the evaluation and selection of the most economic project.

We reviewed the NYISO's report and evaluated the costs and benefits of the proposed projects in the context of assessing their effects on the NYISO markets. Based on this evaluation, we find the NYISO's recommended project (Project T014) is economic under a variety of conditions, allowing us to conclude that it will not adversely affect the NYISO wholesale electricity markets. Additionally, the NYISO also assesses qualitative factors that are not fully reflected in the quantified benefits, which further supports the NYISO's selection of Project T014.

This is the first public policy transmission evaluation performed by NYISO. In general, we found the NYISO's methodologies for this assessment to be sound. However, we identify several methodological enhancements for NYISO to consider in future public policy transmission evaluations. Recommended enhancements are summarized in the following table.

Table 1: Summary of Recommended Enhancements

Issue:	Section:
Consider incorporating additional priced and unpriced benefits of new transmission projects into a single B/C metric.	II.A
Include non-capital costs and life cycle capital costs in the B/C metric.	II.C.1
Develop tariff provisions for allowing developers to take on risk of project cost overruns.	II.C.1
Model entry and exit decisions for generators in a manner that is consistent with the expected competitive market outcomes.	II.C.2
Refine assumptions for future operation of key plants in New York based on latest available information.	II.C.2
Consider modeling variability resulting from loop flows around Lake Erie in production cost simulations.	II.C.3
Consider transmission outages and other unforeseen factors in estimating production cost savings.	II.C.3
Enhance quality of natural gas and emission allowance price forecasts.	II.C.3

Appendix F – Additional Analysis Results

Appendix F – Additional Analysis Results

F.1 Production cost changes for the Tier 1 projects

Production Cost Change: NYCA + Imports - Exports (2017 M$)

Scenario	Project	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Baseline	T006	(7)	(8)	(2)	(8)	(5)	(7)	(6)	(5)	(6)	(6)	(4)	(3)	(5)	(5)	(4)	(4)	(4)	(3)	(5)	(3)
	T013	(19)	(19)	(11)	(17)	(12)	(15)	(12)	(10)	(11)	(11)	(8)	(8)	(9)	(8)	(6)	(8)	(6)	(5)	(6)	(6)
	T014	(18)	(21)	(11)	(14)	(11)	(14)	(11)	(11)	(11)	(10)	(7)	(7)	(8)	(8)	(5)	(9)	(7)	(6)	(7)	(6)
	T015	(7)	(9)	0	(9)	(5)	(7)	(6)	(7)	(5)	(7)	(4)	(3)	(5)	(4)	(4)	(5)	(5)	(3)	(4)	(4)
Scenario 1	T006	(8)	(4)	(2)	(10)	(5)	(6)	(5)	(7)	(3)	(6)	(7)	(6)	(4)	(7)	(5)	(3)	(4)	(3)	(4)	(3)
	T013	(16)	(14)	(12)	(16)	(13)	(14)	(11)	(14)	(11)	(10)	(13)	(11)	(9)	(12)	(11)	(9)	(7)	(8)	(8)	(9)
	T014	(17)	(16)	(13)	(13)	(12)	(13)	(11)	(12)	(9)	(10)	(11)	(10)	(7)	(11)	(9)	(7)	(7)	(7)	(6)	(7)
	T015	(6)	(5)	(3)	(9)	(5)	(7)	(5)	(7)	(3)	(4)	(7)	(5)	(3)	(7)	(5)	(3)	(5)	(3)	(2)	(4)
Scenario 2	T006	(17)	(11)	(10)	(16)	(11)	(13)	(11)	(14)	(10)	(11)	(12)	(8)	(9)	(11)	(9)	(8)	(7)	(7)	(7)	(7)
	T013	(16)	(14)	(12)	(16)	(13)	(14)	(11)	(14)	(11)	(10)	(13)	(11)	(9)	(12)	(11)	(9)	(7)	(8)	(8)	(9)
	T014	(22)	(21)	(17)	(19)	(16)	(16)	(14)	(16)	(13)	(13)	(15)	(12)	(9)	(13)	(11)	(10)	(9)	(10)	(9)	(11)
	T015	(14)	(12)	(12)	(17)	(13)	(14)	(11)	(14)	(11)	(12)	(12)	(9)	(9)	(12)	(11)	(9)	(8)	(8)	(8)	(8)
Scenario 8	T006	(17)	(11)	(10)	(6)	(8)	(8)	(7)	(5)	(6)	(4)	(4)	(3)	(4)	(3)	(0)	(2)	(2)	(2)	(2)	(2)
	T013	(16)	(14)	(12)	(8)	(9)	(9)	(7)	(6)	(9)	(7)	(6)	(5)	(5)	(5)	(3)	(3)	(4)	(4)	(4)	(3)
	T014	(22)	(21)	(17)	(12)	(12)	(13)	(13)	(11)	(11)	(10)	(10)	(7)	(9)	(7)	(5)	(6)	(6)	(6)	(7)	(6)
	T015	(14)	(12)	(12)	(8)	(7)	(8)	(7)	(3)	(5)	(4)	(5)	(4)	(5)	(3)	(1)	(2)	(3)	(3)	(2)	(2)

F.2 Interface Energy Flow for the Tier 1 projects

BASELINE

PROJECT	DELTA NET IMPORTS (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
T006	PJM - NYISO (AC only)	(282)	(348)	(359)	(129)	(155)	(149)	(211)	(175)	(154)	(178)	(139)	(116)	(150)	(151)	(170)	(131)	(139)	(208)	(183)	(203)
	ISONE - NYISO	40	(17)	29	38	55	(0)	83	93	28	48	140	(9)	142	25	111	128	48	51	64	112
	IESO - NYISO	358	367	269	277	251	293	186	219	275	304	174	230	243	236	257	170	153	194	200	184
T013	PJM - NYISO (AC only)	(414)	(533)	(517)	(118)	(129)	(107)	(182)	(123)	(147)	(155)	(111)	(78)	(112)	(72)	(130)	(111)	(104)	(166)	(161)	(163)
	ISONE - NYISO	(108)	(144)	(159)	(36)	(23)	(113)	28	37	(3)	(15)	96	(79)	49	(35)	70	36	(20)	66	20	91
	IESO - NYISO	875	880	745	783	721	770	673	657	659	653	511	603	604	615	544	537	551	489	573	504
T014	PJM - NYISO (AC only)	(413)	(453)	(475)	(67)	(88)	(98)	(134)	(102)	(116)	(111)	(86)	(76)	(74)	(62)	(101)	(74)	(86)	(134)	(109)	(122)
	ISONE - NYISO	(132)	(176)	(124)	(29)	25	(19)	(2)	10	(12)	16	143	(17)	47	16	56	(29)	(5)	11	43	71
	IESO - NYISO	849	872	746	627	534	612	568	578	534	521	407	454	454	471	402	494	466	439	479	405
T015	PJM - NYISO (AC only)	(196)	(276)	(288)	(124)	(149)	(157)	(197)	(158)	(154)	(168)	(138)	(117)	(156)	(132)	(167)	(130)	(127)	(202)	(176)	(196)
	ISONE - NYISO	(65)	(88)	(48)	(0)	15	(23)	15	55	17	(22)	76	(32)	70	35	86	55	13	15	43	79
	IESO - NYISO	379	376	288	332	250	319	191	309	254	345	217	213	263	235	227	245	229	213	196	236

SCENARIO 1 (2017 BASELINE)

PROJECT	DELTA NET IMPORTS (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
T006	PJM - NYISO (AC only)	(296)	(368)	(318)	(145)	(143)	(174)	(191)	(201)	(155)	(206)	(158)	(166)	(185)	(130)	(192)	(178)	(210)	(254)	(190)	(270)
	ISONE - NYISO	26	3	(23)	(62)	(58)	(30)	32	(8)	103	37	(8)	60	25	(26)	125	21	14	36	51	59
	IESO - NYISO	347	310	306	296	257	266	215	298	138	220	375	158	127	333	240	172	232	147	198	208
T013	PJM - NYISO (AC only)	(602)	(636)	(552)	(109)	(128)	(163)	(171)	(164)	(178)	(250)	(160)	(204)	(182)	(125)	(250)	(250)	(277)	(309)	(272)	(378)
	ISONE - NYISO	(159)	(140)	(173)	(103)	(36)	(113)	(74)	(139)	5	(44)	(121)	(26)	(76)	(105)	31	(114)	(140)	(48)	(118)	(135)
	IESO - NYISO	827	785	796	729	689	701	661	753	611	614	837	614	603	786	668	672	687	586	737	740
T014	PJM - NYISO (AC only)	(496)	(555)	(494)	(90)	(86)	(122)	(143)	(109)	(150)	(169)	(112)	(144)	(140)	(74)	(155)	(167)	(204)	(206)	(168)	(250)
	ISONE - NYISO	(121)	(217)	(149)	(96)	(5)	(45)	(10)	(71)	35	45	(15)	46	18	(21)	4	34	(17)	1	(18)	(30)
	IESO - NYISO	816	802	816	578	534	517	520	615	476	528	593	448	391	626	486	473	554	503	508	577
T015	PJM - NYISO (AC only)	(231)	(286)	(206)	(138)	(119)	(163)	(163)	(176)	(153)	(196)	(149)	(165)	(180)	(120)	(175)	(176)	(177)	(219)	(174)	(228)
	ISONE - NYISO	(83)	(100)	(81)	(72)	(71)	(52)	(7)	(59)	79	5	(24)	35	(12)	(27)	42	1	(26)	25	(12)	(48)
	IESO - NYISO	353	338	320	316	273	269	238	332	122	216	389	154	158	354	270	156	328	180	144	326

SCENARIO 2 (SR ON 77/78 IN FOR ALL PROJECTS)

PROJECT	DELTA NET IMPORTS (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
T006	PJM - NYISO (AC only)	(603)	(654)	(585)	(126)	(140)	(161)	(197)	(184)	(193)	(258)	(166)	(193)	(191)	(131)	(254)	(254)	(278)	(317)	(297)	(387)
	ISONE - NYISO	(137)	(132)	(173)	(160)	(53)	(137)	(32)	(108)	43	(5)	(58)	(16)	(54)	(71)	24	(104)	(124)	(38)	(139)	(64)
	IESO - NYISO	826	766	774	760	667	735	674	774	615	651	795	584	588	764	674	673	691	574	750	657
T013	PJM - NYISO (AC only)	(602)	(636)	(552)	(109)	(128)	(163)	(171)	(164)	(178)	(250)	(160)	(204)	(182)	(125)	(250)	(250)	(277)	(309)	(272)	(378)
	ISONE - NYISO	(159)	(140)	(173)	(103)	(36)	(113)	(74)	(139)	5	(44)	(121)	(26)	(76)	(105)	31	(114)	(140)	(48)	(118)	(135)
	IESO - NYISO	827	785	796	729	689	701	661	753	611	614	837	614	603	786	668	672	687	586	737	740
T014	PJM - NYISO (AC only)	(610)	(629)	(577)	(90)	(118)	(136)	(164)	(123)	(166)	(205)	(148)	(185)	(154)	(100)	(232)	(222)	(252)	(295)	(245)	(349)
	ISONE - NYISO	(194)	(271)	(219)	(228)	(83)	(149)	(155)	(185)	(68)	(55)	(142)	(28)	(128)	(186)	(54)	(116)	(104)	(106)	(218)	(175)
	IESO - NYISO	1048	1012	1018	892	772	750	742	874	773	750	877	639	595	844	735	756	813	724	820	898
T015	PJM - NYISO (AC only)	(615)	(603)	(520)	(127)	(126)	(169)	(175)	(178)	(197)	(257)	(183)	(207)	(208)	(140)	(277)	(258)	(280)	(329)	(292)	(391)
	ISONE - NYISO	(192)	(201)	(218)	(179)	(112)	(178)	(68)	(181)	8	(72)	(135)	(20)	(120)	(159)	(78)	(129)	(167)	(98)	(195)	(137)
	IESO - NYISO	811	784	814	783	733	726	700	794	646	718	821	628	623	820	715	678	757	643	801	757

SCENARIO 8 (NO NATIONAL CO2 AND SR ON 77/78 IN FOR ALL PROJECTS)

PROJECT	DELTA NET IMPORTS (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
T006	PJM - NYISO (AC only)	(603)	(654)	(585)	(632)	(624)	(623)	(689)	(755)	(728)	(731)	(672)	(804)	(784)	(754)	(952)	(945)	(945)	(810)	(1064)	(1043)
	ISONE - NYISO	(137)	(132)	(173)	(146)	(99)	(71)	(76)	(54)	(58)	30	(141)	(43)	21	(43)	24	(43)	20	(39)	(3)	88
	IESO - NYISO	826	766	774	610	643	641	595	590	599	504	575	579	567	545	566	592	546	554	646	611
T013	PJM - NYISO (AC only)	(604)	(633)	(552)	(584)	(603)	(623)	(660)	(743)	(676)	(666)	(638)	(791)	(828)	(738)	(902)	(916)	(904)	(772)	(1049)	(1038)
	ISONE - NYISO	(159)	(144)	(173)	(150)	(91)	(60)	(45)	(67)	(66)	(16)	(133)	(55)	52	(76)	13	(62)	(16)	(58)	15	65
	IESO - NYISO	832	784	793	631	646	652	618	623	623	560	609	607	596	583	611	611	605	588	676	649
T014	PJM - NYISO (AC only)	(610)	(629)	(577)	(633)	(629)	(694)	(726)	(745)	(748)	(769)	(705)	(807)	(794)	(742)	(957)	(960)	(877)	(898)	(1031)	(963)
	ISONE - NYISO	(194)	(271)	(219)	(216)	(165)	(109)	(148)	(218)	(126)	(86)	(178)	(189)	(100)	(130)	(69)	(89)	(193)	(71)	(62)	(110)
	IESO - NYISO	1048	1012	1018	855	879	875	865	875	862	812	837	810	838	799	833	849	848	825	925	911
T015	PJM - NYISO (AC only)	(615)	(603)	(520)	(593)	(590)	(564)	(644)	(722)	(679)	(654)	(629)	(707)	(737)	(729)	(885)	(903)	(799)	(777)	(973)	(927)
	ISONE - NYISO	(192)	(201)	(218)	(161)	(185)	(178)	(129)	(104)	(109)	(39)	(229)	(159)	(48)	(105)	7	(113)	(165)	(52)	(49)	(34)
	IESO - NYISO	811	784	814	636	645	635	613	602	571	505	587	581	575	538	559	600	555	547	630	596