Western New York Public Policy Transmission Planning Report

A Report by the
New York Independent System Operator

DRAFT
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Executive Summary

This report presents the results of the Public Policy Transmission Planning Process administered by the New York Independent System Operator (NYISO) for the Western New York Public Policy Transmission Need. This represents the culmination of a multi-year joint effort by the NYISO, the New York State Public Service Commission (PSC), developers, and stakeholders to address transmission needs in Western New York that are driven by Public Policy Requirements for greater utilization of renewable energy from the Niagara hydroelectric facility and through imports from Ontario. This report describes the extensive evaluations performed for the proposed transmission projects and sets forth the NYISO's recommendations for ranking and selection of the more efficient or cost effective transmission solution.

The NYISO commenced the Public Policy Transmission Planning Process for the first time with the solicitation of proposed transmission needs driven by Public Policy Requirements from NYISO's stakeholders and other interested parties. The NYISO filed for consideration by the PSC the proposed transmission needs and, upon considering various comments submitted, the PSC 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 ("Western NY Need").

The NYISO performed baseline analysis to identify the specific transmission constraints in Western New York that restrict the delivery of power from Niagara and Ontario to the rest of New York State. Following review of the baseline analysis and discussions with stakeholders and prospective developers, the NYISO issued a solicitation for solutions to address the Western NY Need. The NYISO received 15 proposals, for which the NYISO assessed the viability and sufficiency of each project to address the need. The NYISO issued the Western New York Viability and Sufficiency Assessment that identified ten viable and sufficient projects, and recommended certain non-bulk transmission upgrades to fulfill the objectives of the Western NY Need. Following the PSC's review of the Viability and Sufficiency Assessment and consideration of public comments, the PSC issued an order confirming the Western NY Need.

Upon issuance of the order confirming the need for transmission, the NYISO immediately commenced a detailed evaluation of each viable and sufficient transmission proposal with the assistance of its independent consultant, Substation Engineering Company (SECO). The transmission projects include four proposals from North America Transmission, two from National

Grid, one from New York Power Authority (NYPA) and New York State Electric & Gas (NYSEG), two from NextEra Energy Transmission New York, and one from Exelon Transmission Company. No two projects are identical; the proposals offer a variety of options at the 345 kV, 230 kV, and 115 kV levels as well as a variety of grid interconnection approaches. Details of the proposed projects are provided in Section 3.

In determining which of the eligible proposed transmission projects is the more efficient or cost effective solution to satisfy the Western NY Need, the NYISO considered a number of metrics set forth in the tariff and ranked each proposed project based on the its performance under these metrics. These metrics include capital costs, cost per MW, expandability, operability, performance, property rights and routing, schedule, and other metrics such as production cost savings, locational based marginal price (LBMP) savings, emissions savings, and congestion.

A core concept of the NYISO's evaluation and selection process is the use of an independent consultant to review each proposed project and apply a consistent methodology across all projects for establishing cost estimates, schedule estimates, and routing assessments. Utilizing detailed project information provided by the developers, SECO developed independent capital cost and schedule estimates considering material and labor cost by equipment, engineering and design work, permitting, site acquisition, procurement and construction work, and commissioning needed for the proposed project. SECO's cost estimates for the proposed transmission projects range from $158 million to $479 million, with schedules ranging from 40 months to 71months following NYISO selection.

A key objective of the Western NY Need is to fully utilize Niagara hydroelectric generation while simultaneously maximizing imports from Ontario. Each project's efficiency in achieving this objective is measured in a number of ways utilizing power flow and production cost simulations under a variety of system dispatches and conditions. Power flow results indicate that average transfer capabilities across the Niagara ties for the proposed projects range from 216 MW to 1,796 MW. To determine the cost effectiveness of each project, the NYISO compared these electrical results to SECO's independent capital cost estimate for each project. The cost-per-MW ratios for the projects range from 0.11 $M/MW to 0.84 $M/MW, with an average of 0.23 $M/MW. Further, the increased transfer capability and alleviation of associated New York transmission constraints would result in production cost savings of as much as $274 million over the first 20 years of a project being in-service. The achieved savings may vary for each transmission project depending on system conditions in the future. The ratios of production cost savings to capital costs range from 0 to 1.5, with an average of 0.9.

The NYISO also considers qualitative metrics such as expandability, operability, and performance. Significant amounts of existing and potential renewable resources in Ontario and Western New York could be made available to the rest of New York State depending on a project's proposed design and ability to expand and adapt to new or modified system interconnections in the future. The NYISO also considered how the proposed projects affect the flexibility in operating the system, such as dispatch of generation, access to operating reserves, access to ancillary services, or ability to remove transmission for maintenance. Certain projects afford greater expandability opportunities through substation design and transmission line configurations, and certain projects offer greater operability of the system through the use of controllable devices or better integration of facilities with the overall system.

Based on the NYISO staff's consideration of all the evaluation metrics for efficiency or cost effectiveness, the Western NY Public Policy Transmission Projects are divided into two tiers based on their performance relative to their cost. Three metrics that significantly impacted this tiered ranking are (1) the total capital cost, (2) the production cost savings relative to the total capital cost, and (3) the cost per MW ratio for the increased Ontario to New York thermal transfer limits over the Niagara Ties. The four Tier 1 projects offer increased efficiencies in the overall performance and utilization of the transmission system resulting in greater access to renewable energy, while also offering cost effective designs that would provide economic advantages to the New York electric grid. The Tier 1 projects are:

- T006: North America Transmission Proposal 1
- T013: NYPA/NYSEG Western NY Energy Link
- T014: NextEra Energy Transmission New York Empire State Line Proposal 1
- T015: NextEra Energy Transmission New York Empire State Line Proposal 2

[THE FOLLOWING PARAGRAPHS WILL BE COMPLETED FOLLOWING REVIEW AND DISCUSSION WITH ESPWG & TPAS]

Based on consideration of all the evaluation metrics for efficiency or cost effectiveness, and consideration of input from stakeholders, the NYISO staff recommends for selection **T### -**

<NAME> as the more efficient or cost effective transmission solution to satisfy the Western New York Public Policy Transmission Need. The in-service date for the selected project shall be **MM-DD-YYYY**. The NYISO staff determined that **T###** is the more efficient or cost effective transmission solution because… **[TO BE DETERMINED]**.

1. The Public Policy Transmission Planning Process

The Public Policy Transmission Planning Process (PPTPP) is the newest component of the NYISO's Comprehensive System Planning Process and considers transmission needs driven by Public Policy Requirements in the local and regional transmission planning processes. The Public Policy Transmission Planning Process was developed in consultation with NYISO stakeholders and the New York State Public Service Commission (PSC) and approved by the Federal Energy Regulatory Commission (FERC) under Order No. 1000.[1] At its core, the Public Policy Transmission Planning Process provides for the NYISO's evaluation and selection of transmission solutions to satisfy a transmission need driven by Public Policy Requirements. The process was developed to encourage both incumbent and non-incumbent transmission developers to propose projects in response to an identified need.

The NYISO is responsible for administering the Public Policy Transmission Planning Process in accordance with Attachment Y to its Open Access Transmission Tariff (OATT). Consistent with its obligations to regulate and oversee the electric industry under New York State law, the PSC has the primary responsibility for the identification of transmission needs driven by Public Policy Requirements.

A Public Policy Transmission Planning Process cycle typically commences every two years following the posting of the draft Reliability Needs Assessment study results, and consists of four core steps—(1) the identification of a Public Policy Transmission Need, (2) developers proposing solutions to satisfy the identified Public Policy Transmission Need, (3) an evaluation of the viability and sufficiency of the proposed Public Policy Transmission Projects and Other Public Policy Projects, and (4) a comparative evaluation of the viable and sufficient projects for the NYISO Board of Directors to select the more efficient or cost effective Public Policy Transmission Project that satisfies the Public Policy Transmission Need, if the PSC confirms that there is a need for transmission. The selected Public Policy Transmission Project is eligible for cost allocation and cost recovery under the NYISO's tariffs.

[1] *See New York Indep. Sys. Operator, Inc.*, Order on Compliance Filing, 143 FERC ¶ 61,059 (April 18, 2013); *New York Indep. Sys. Operator, Inc.*, Order on Compliance Filing, 148 FERC ¶ 61,044 (July 17, 2014); *New York Indep. Sys. Operator, Inc., Order on Compliance Filing*, 151 FERC ¶ 61,040 (April 16, 2015); *New York Indep. Sys. Operator, Inc., Order on Compliance Filing*, 155 FERC ¶ 61,037 (April 18, 2016).

1.1 Identification of a Public Policy Transmission Need

For each cycle of the Public Policy Transmission Planning Process, the NYISO begins the process by inviting stakeholders and interested parties to submit proposed transmission needs driven by Public Policy Requirements. A Public Policy Requirement includes an existing federal, state, or local law or regulation, or a new legal requirement that the PSC establishes after public notice and comment under New York State law.

Following the submission of proposals, the NYISO posts all submittals on its website and provides those submissions, including any proposal from the NYISO, to the PSC. The NYISO separately provides any submission that proposes the identification of transmission needs driven by Public Policy Requirements within the Long Island Transmission District to the Long Island Power Authority (LIPA). The PSC and LIPA, as applicable, consider the proposals in order to identify any Public Policy Transmission Needs, and the PSC determines whether the NYISO should solicit solutions to any of the identified needs.

1.2 Solicitation for Proposed Solutions

After the PSC determines that a Public Policy Transmission Need or a transmission need solely within the Long Island Transmission District driven by a Public Policy Requirement should be evaluated and considered by the NYISO for selection and regional cost allocation, the NYISO solicits proposed solutions that developers believe will satisfy the identified need. Developers are afforded 60 days to propose their solutions and are required to provide specific developer qualification and project information as detailed in Attachment Y to the OATT, the Public Policy Transmission Planning Process Manual, and the NYISO's solicitation.

Under the Public Policy Transmission Planning Process, proposed solutions fall into two categories—(i) Public Policy Transmission Projects and (ii) Other Public Policy Projects. A Public Policy Transmission Project is a transmission project or a portfolio of transmission projects proposed by a qualified developer to satisfy an identified Public Policy Transmission Need and for which the developer seeks 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 (*i.e.*, generation or demand-side projects) or a portfolio of transmission and non-transmission projects proposed by a developer to satisfy an identified Public Policy Transmission Need. The NYISO will determine whether an Other Public Policy Project is viable and sufficient to meet a Public Policy Transmission Need. However, an Other Public Policy Project is not entitled to cost allocation and recovery under the NYISO OATT.

1.3 Evaluation for Viability and Sufficiency

In the first phase of analyses, the NYISO evaluates each proposed solution to the Public Policy Transmission Need to determine whether it is viable and sufficient. The NYISO assesses all resources types on a comparable basis within the same general timeframe. Under the viability evaluation, the NYISO considers a developer's qualification and the project information data to determine whether the project is technically practicable, whether there is the ability to obtain the necessary rights-of-way within the required timeframe, and whether the project could be completed within the required timeframe. Under the sufficiency evaluation, the NYISO evaluates the degree to which each proposed solution independently satisfied the Public Policy Transmission Need, including any specific criteria established by the PSC in its order identifying the need. Following the viability and sufficiency evaluations, the NYISO presents the assessment to stakeholders, interested parties, and the PSC for review and comments.

Following the NYISO's presentation of the Viability and Sufficiency Assessment, the Public Policy Transmission Planning Process requires the PSC to review the assessment and issue an order. If the PSC concludes that there is no longer a transmission need driven by a Public Policy Requirement, the NYISO will not perform an evaluation, or make a selection of, a more efficient or cost-effective transmission solution for that planning cycle. If the PSC modifies the transmission need driven by a Public Policy Requirement, the NYISO will restart its Public Policy Transmission Planning Process as an out-of-cycle process. This out-of-cycle process will begin with the NYISO's solicitation of Public Policy Transmission Projects to address the modified Public Policy Transmission Need. The NYISO will evaluate the viability and sufficiency of the proposed Public Policy Transmission Projects. The NYISO will then proceed to evaluate the viable and sufficient Public Policy Transmission Projects for purposes of selecting the more efficient or cost-effective transmission solution to the modified Public Policy Transmission Need.

1.4 Evaluation for Selection as the More Efficient or Cost Effective Solution

Once the PSC determines that there remains a transmission need driven by a Public Policy Requirement, the NYISO proceeds with the evaluation of the proposed Public Policy Transmission Projects. The NYISO only considers those Public Policy Transmission Projects that it determined to be viable and sufficient and that have provided the required notifications to proceed with the evaluation for selection as the more efficient or cost effective solution to the identified need.

The NYISO's selection is based on the totality of its evaluation of the eligible projects using the pre-defined metrics set forth in Attachment Y of the OATT and others set by the PSC and/or in consultation with stakeholders. The NYISO uses the project information provided by the developer at the start of the process, in addition to any other information available to the NYISO. In performing its evaluation, the NYISO, or an independent consultant, reviews the reasonableness and comprehensiveness of the information submitted by the developer for each project that is eligible to be evaluated for selection as the more efficient or cost effective solution to be used against the specific evaluation metrics (*see* Section 4.3, below).

In determining which of the eligible proposed regulated Public Policy Transmission Projects is the more efficient or cost effective solution to satisfy the Public Policy Transmission Need, the NYISO considers each project's total performance under all of the selection metrics. The NYISO may develop scenarios that modify certain assumptions to evaluate the proposed Public Policy Transmission Projects under differing system conditions. The NYISO considers and ranks each proposed solution based on its performance under the metrics. Based upon its evaluation of each viable and sufficient Public Policy Transmission Project, the NYISO staff recommends in the draft Public Policy Transmission Planning Report what project is the more efficient or cost effective solution to satisfy the Public Policy Transmission Need, if any. After the draft report is reviewed through the collaborative governance process and by the Market Monitoring Unit, the NYISO Board of Directors may approve the report or propose modifications.

1.5 Identifying a Cost Allocation Methodology for the Public Policy Transmission Need

Under the Public Policy Transmission Planning Process and consistent with FERC's directives under Order No. 1000, a regulated transmission project that is selected as the more efficient or cost effective solution to satisfy an identified Public Policy Transmission Need will be eligible to receive cost allocation and recovery under the OATT. The Public Policy Transmission Planning Process contains an approved load ratio share cost allocation methodology, and a multi-step process for identifying any alternative methodology. This process was designed to provide flexibility in prescribing a methodology that would allocate the costs of a selected Public Policy Transmission Project consistent with the Public Policy Requirement driving the identified transmission need and roughly commensurate with the derived benefits. In allocating the costs of the selected Public Policy Transmission Project, the NYISO will use the default methodology under Attachment Y to the

OATT or an alternative methodology proposed in this process and accepted by FERC. The cost allocation methodology eventually accepted by the Commission has no bearing on the NYISO's selection of the more efficient or cost effective transmission project to meet the Public Policy Transmission Need.

2. Western New York Public Policy Transmission Need

2.1 Identification of Western New York Public Policy Transmission Need

The NYISO issued a letter on August 1, 2014, inviting stakeholders and interested parties to submit proposed transmission needs driven by Public Policy Requirements to the NYISO on or before September 30, 2014.[2] On October 3, 2014, the NYISO filed the proposed needs with the PSC.[3] These proposed needs had two common and recurring themes: (i) increase transfer capability between upstate and downstate, and (ii) mitigate transmission constraints in Western New York to facilitate full output from the Niagara hydroelectric power plant and imports from Ontario. The PSC issued notices soliciting public comments on the proposed needs on November 12, 2014 and April 3, 2015, and numerous parties submitted comments.[4]

On July 20, 2015, the PSC issued an order identifying the relief of congestion in Western New York, including access to increased output from the Niagara hydroelectric facility and additional imports of renewable energy from Ontario, as a Public Policy Transmission Need ("Western NY Need").[5] The PSC noted that congestion in Western New York was adversely impacting the performance of the bulk power transmission system, by limiting the output of the state's largest renewable resource, the Niagara hydroelectric power plant. It further determined that relieving congestion in Western New York would increase access to additional imports of renewable energy from Ontario. The PSC noted that "Increased dispatch of these renewable and economic resources could produce significant benefits to the State in terms of reduced air emission and energy costs."[6] The PSC determined that significant environmental, economic, and reliability benefits could be achieved by relieving the transmission congestion identified in Western New York, including access to increased output from the New York Power Authority (NYPA) Niagara hydroelectric facility, additional imports of renewable energy from Ontario, and system reliability benefits, specifically,

[2] The NYISO's letter can be obtained at the following link: http://www.nyiso.com/public/markets_operations/services/planning/planning_studies/index.jsp.

[3] The proposed needs and the NYISO's submission of the needs can be obtained at the following link: http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=14-E-0454&submit=Search.

[4] The notices seeking comments were issued under PSC Case No. 13-E-0488 and PSC Case No. 14-E-0454, and the comments can be obtained from the Department of Public Service website: http://www.dps.ny.gov/.

[5] 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) ("July 2015 Order").

[6] July 2015 Order, at p 27.

increased operational flexibility, efficiency, and avoiding the need to maintain generation that would otherwise retire.

Therefore, the PSC 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).

In this Order, the PSC identified several metrics for consideration in the evaluation of the proposed solutions to satisfy the Western NY Need, such as changes in production costs, location-based marginal prices, emissions, Installed Capacity prices, Transmission Congestion Contract revenues, transmission congestion, impacts on transfer limits, and resource deliverability.

2.2 Development of Solutions

Throughout the months of August, September, and October 2015, the NYISO performed analyses to establish a baseline of constraints on the Western New York transmission system against which proposed projects would be measured. The NYISO presented these analytical baselines to stakeholders and obtained their feedback at the Electric System Planning Working Group (ESPWG) and Transmission Planning Advisory Subcommittee (TPAS). Power flow cases were provided by the NYISO to all qualified developers to use in developing their projects.

These results confirmed that there is insufficient transmission capability out of the Niagara area. Figure 2-1, below, depicts the transmission system in Western New York. Table 2-1 and Table 2-2 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 and normal transfer criteria. Table 2-1 reports the line loadings observed when the Packard 230 kV #77 and #78 series reactors are bypassed and Table 2-2 reports the line loadings observed when the series reactors are in-service. Appendix C provides greater detail regarding the nature of the overloads.[7]

[7] The full results with the Packard series reactors bypassed are posted on the NYISO's website 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. The full results with the Packard series reactors in service are posted at: http://www.nyiso.com/public/webdocs/markets_operations/

Figure 2-1: Western New York Transmission Map

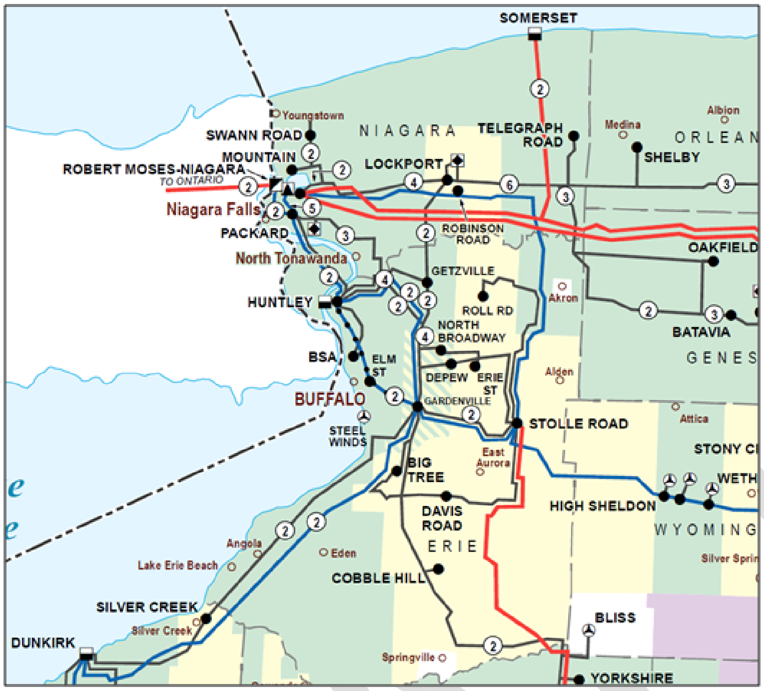

Table 2-1: Summary of Baseline Results with Packard Series Reactors Bypassed

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%

services/planning/Planning_Studies/Public_Policy_Documents/Western_NY/Western_NY_PPTN_Baseline_Results_2015-10-27_SR-in.xls.

Table 2-2: Summary of Baseline Results with Packard Series Rectors 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%

On November 1, 2015, the NYISO issued a 60-day solicitation for proposed solutions of all types (transmission, generation, and demand side) to the Western NY Need. The list of the proposed projects submitted to the NYISO and considered in the Viability and Sufficiency assessment is included in Table 2-3, below.

Table 2-3: Proposed Projects

Developer	Project Name	Project ID	Category	Type	Location (County/State)
NRG Dunkirk Power	Dunkirk Gas Addition	OPP02	OPPP	ST	Chautauqua, NY
North America Transmission	Proposal 1	T006	PPTP	AC	Niagara-Erie, NY
North America Transmission	Proposal 2	T007	PPTP	AC	Niagara-Erie, NY, Wyoming, NY
North America Transmission	Proposal 3	T008	PPTP	AC	Niagara-Erie, NY, Wyoming, NY
North America Transmission	Proposal 4	T009	PPTP	AC	Niagara-Erie, NY, Wyoming, NY
ITC New York Development	15NYPP1-1 Western NY AC	T010	PPTP	AC	Niagara-Erie, NY
National Grid	Moderate Power Transfer Solution	T011	PPTP	AC	Niagara-Erie, NY
National Grid	High Power Transfer Solution	T012	PPTP	AC	Niagara-Erie, NY
NYPA/NYSEG	Western NY Energy Link	T013	PPTP	AC	Niagara-Erie, NY, Wyoming, NY
NextEra Energy Transmission New York	Empire State Line Proposal 1	T014	PPTP	AC	Niagara-Erie, NY
NextEra Energy Transmission New York	Empire State Line Proposal 2	T015	PPTP	AC	Niagara-Erie, NY
Exelon Transmission Company	Niagara Area Transmission Expansion	T017	PPTP	AC	Niagara-Erie, NY
PPTP = Public Policy Transmission Project OPPP = Other Public Policy Project		ST = Steam Turbine AC = Alternating Current Transmission			

2.3 Viability and Sufficiency Assessment

Through the first quarter of 2016, the NYISO assessed the viability and sufficiency of all proposed projects. It presented a draft Western New York Public Policy Transmission Need Viability and Sufficiency Assessment to stakeholders at the ESPWG/TPAS in May 2016. After receiving and addressing comments from stakeholders, the NYISO posted on its website the final Viability and Sufficiency Assessment report on May 31, 2016 and filed the same at the PSC in Case

No. 14-E-0454 on June 1, 2016.[8] [9] This assessment is included in this report as Appendix C.[10]

The NYISO determined the following projects are viable and sufficient to satisfy the Western NY Need:

T006: North America Transmission – Proposal #1

T007: North America Transmission – Proposal #2

T008: North America Transmission – Proposal #3

T009: North America Transmission – Proposal #4

T011: National Grid – Moderate Power Transfer Solution

T012: National Grid – High Power Transfer Solution

T013: NYPA/NYSEG – Western NY Energy Link

T014: NextEra Energy Transmission New York – Empire State Line #1

T015: NextEra Energy Transmission New York – Empire State Line #2

T017: Exelon Transmission Company – Niagara Area Transmission Expansion

In assessing the viability and sufficiency of the proposed projects relative to the New York Bulk Power Transmission Facilities (BPTF), the NYISO identified remaining overloads on non-BPTF facilities solely to inform the PSC and local transmission owner of local transmission upgrades that would be advisable in order for the proposed BPTF projects to fulfill the objectives of the Western NY Need. The overloads on the non-BTPF facilities did not affect the NYISO's evaluation of the proposed projects for their viability and sufficiency. Accordingly, the NYISO stated in its viability and sufficiency assessment that:

> 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

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[8] The NYISO's filing can be obtained at the following link: http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=14-E-0454&submit=Search.

[9] On July 29, 2016, the NYISO notified stakeholders and interested parties that although it had acted diligently in administering the current process, it would extend the 2014 cycle of the Public Policy Transmission Planning Process beyond two years as permitted by the tariff. See OATT § 31.4.1; http://www.nyiso.com/public/markets_operations/services/planning/planning_studies/index.jsp

[10] The NYISO's "Western New York Public Policy Transmission Need Viability and Sufficiency Assessment" can be obtained at the following link: http://www.nyiso.com/public/markets_operations/services/planning/planning_studies/index.jsp.

> 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 replacement of limiting terminal equipment for line #54 at the Gardenville 115 kV station.

Accordingly, the NYISO recommended that the PSC determine that the identified non-BPTF upgrades should be made to relieve existing congestion on those facilities, and thereby maximize the benefits of the upgrades to Bulk Power Transmission Facilities and fulfill the objectives of the Western NY Need.

2.4 Confirmation of Need for Transmission

On October 13, 2016, following consideration of public comments, the PSC issued an order confirming the Western NY Need. The October 2016 Order stated that "[t]he Commission continues to identify congestion relief in Western New York as a Public Policy Transmission Need and directs the NYISO to proceed with its evaluation and selection under the PPTPP of the more efficient or cost-effective transmission solution," and determined that the NYISO should evaluate and select a transmission solution to fulfill that need.[11] The PSC determined that, with respect to acquisition of rights of way, current non-ownership of essential utility rights-of-way should not disqualify potential developers from competing in the NYISO's evaluation and that utilities with rights-of-way are expected to bargain in good faith to reach an agreement as to property access and compensation with the developer of the Public Policy Transmission Project selected by the NYISO.[12] The PSC further stated that "[t]o ensure the NYISO can adequately consider risk mitigation in its evaluation, the NYISO should incorporate into its remaining process, as practicable, a mechanism for implementing risk mitigation measure and cost overrun-sharing incentives." The PPTPP provides that the NYISO shall "apply any criteria specified by the Public Policy Requirements or provided by the PSC and perform the analyses requested by the PSC, to the extent compliance with such criteria and analyses are feasible." Per its tariff and FERC orders to date, the NYISO considers the capital cost estimates for any proposed regulated Public Policy Transmission Project, including the accuracy of the proposed estimates. The tariff states that cost recovery and cost overrun issues

[11] 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 Transmission Need for Western New York (October 13, 2016) ("October 2016 Order"), at 17.

[12] October 2016 Order, at pp 16–17.

will be submitted to and decided by FERC.

The October 2016 Order also directed National Grid to undertake the necessary upgrades on the non-bulk transmission facilities, stating "[t]he Commission further determines that the non-bulk transmission facility projects identified by the NYISO in its Viability and Sufficiency Assessment should be undertaken to meet the Public Policy Transmission Need."[13] The PSC determined that National Grid should receive reimbursement for the costs of the non-BPTF projects, and that the costs of these projects should not be a distinguishing factor in the selection process.[14]

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[13] October 2016 Order, at p 17.

[14] October 2016 Order, at p 17.

3. Evaluation for Selection of the More Efficient or Cost Effective Solution

Upon issuance of the October 2016 Order confirming the need for transmission, the NYISO immediately commenced a detailed evaluation of each viable and sufficient transmission proposal with the assistance of its independent consultant, Substation Engineering Company (SECO). This section of the report details the NYISO's analysis, and the results of its evaluation.

3.1 Overview of Proposed Viable and Sufficient Solutions

There are ten viable and sufficient transmission solutions. A brief description of each of the ten viable and sufficient projects is provided below.

3.1.1 T006: North America Transmission – Proposal #1

Figure 3-1 is a map showing the location of the components of the North America Transmission Proposal #1. The map also shows the locations of the components for the other North American Transmission Proposals (Proposal #2, Proposal #3, and Proposal #4) described in Section 3.1.2, Section 3.1.3, and Section 3.1.4.

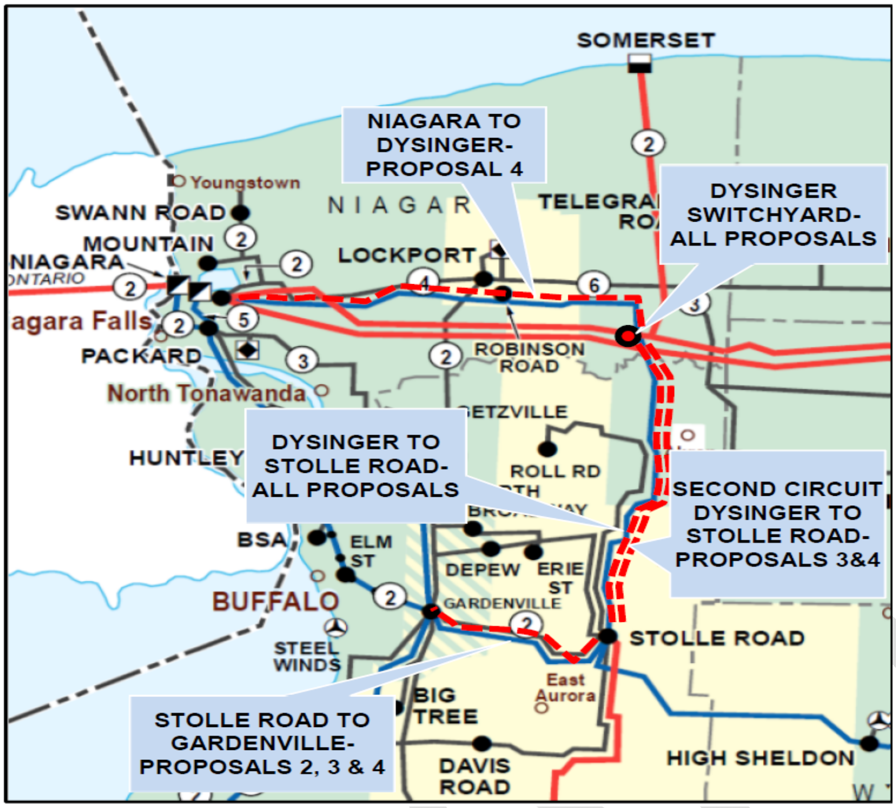
North America Transmission Proposal #1 includes the following components:

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

Below are proposed system upgrades that are required to support Proposal #1:

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

Figure 3-1: Map of North America Transmission Proposals



3.1.2 T007: North America Transmission – Proposal #2

North America Transmission Proposal #2 builds on Proposal #1 by adding a new 345 kV line between Stolle Road and Gardenville and a new 345/230kV transformer at Gardenville.

North America Transmission Proposal #2 includes the following components:

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

Below are proposed system upgrades that are required to support Proposal #2:

- Gardenville to Stolle Road 230 kV terminal upgrades
- Depew to Erie 115 kV terminal upgrades

- Swann Road to Shawnee Station 115 kV line reconductoring
- Roll Road 115/34.5 kV transformer replacement
- Lockport to Shaw 115 kV terminal upgrades
- New South Perry 230/115 kV transformer

3.1.3 T008: North America Transmission – Proposal #3

North America Transmission Proposal #3 builds on Proposal #2 by adding a second new 345 kV line between Dysinger and Stolle Road.

North America Transmission Proposal #3 includes the following components:

- New Dysinger 345 kV Switchyard (loops Niagara-Somerset & Niagara-Rochester 345 kV lines)
- 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

Below are proposed system upgrades that are required to support Proposal #3:

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

3.1.4 T009: North America Transmission – Proposal #4

North America Transmission Proposal #4 builds on Proposal #3 by adding a new Niagara to Dysinger 345kV line.

North America Transmission Proposal #4 includes the following components:

- New Dysinger 345 kV Switchyard (loops Niagara-Somerset & Niagara-Rochester 345 kV lines)

- 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
- New Niagara-Dysinger 345 kV line

Below are additional identified system upgrades required to support Proposal #4:

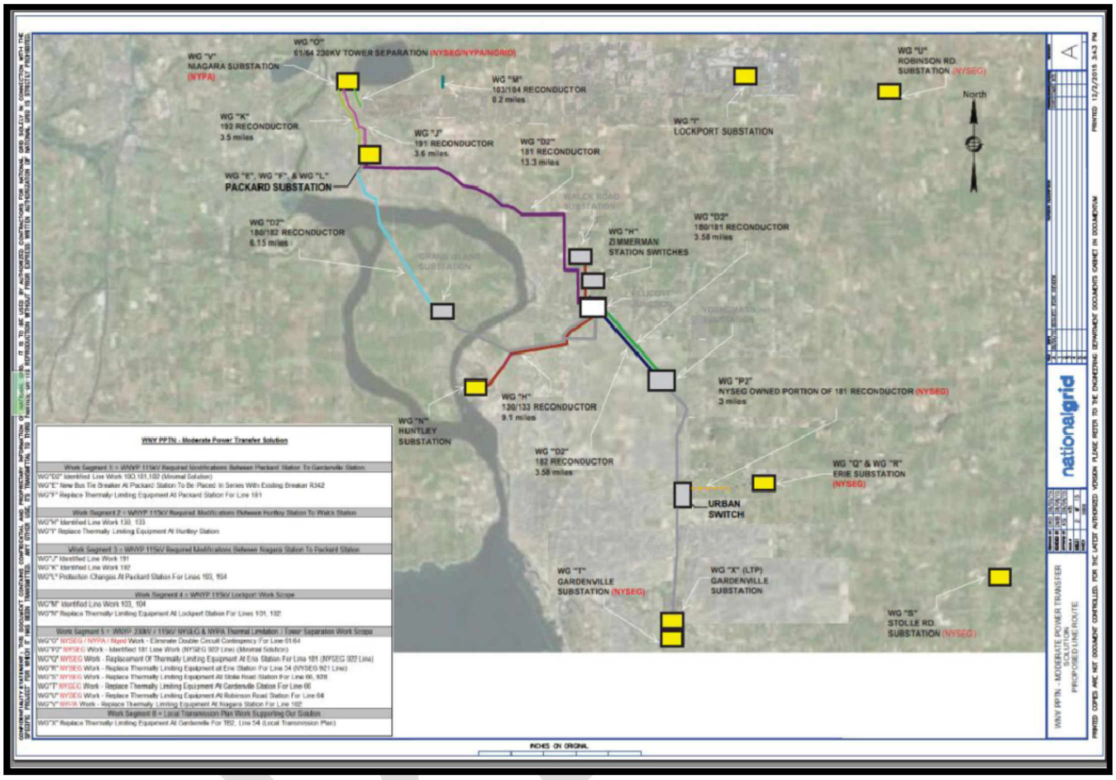
- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV line reconductoring
- Roll Road 115/34.5 kV transformer replacement
- Lockport to Shaw 115 kV terminal upgrades
- New South Perry 230/115 kV transformer

3.1.5 T011: National Grid – Moderate Power Transfer Solution

Figure 3-2 is a map showing the location of the components of the National Grid Moderate Power Transfer Solution. National Grid Moderate Power Transfer Solution includes the following components:

- Reconductoring 115 kV lines (~62 miles worth) notably:
    - Niagara/Packard-Gardenville 115 kV (180, 181, 182) reconductoring ("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 Road, Erie Street and Niagara stations.

Figure 3-2: Map of National Grid Moderate Power Transfer Solution



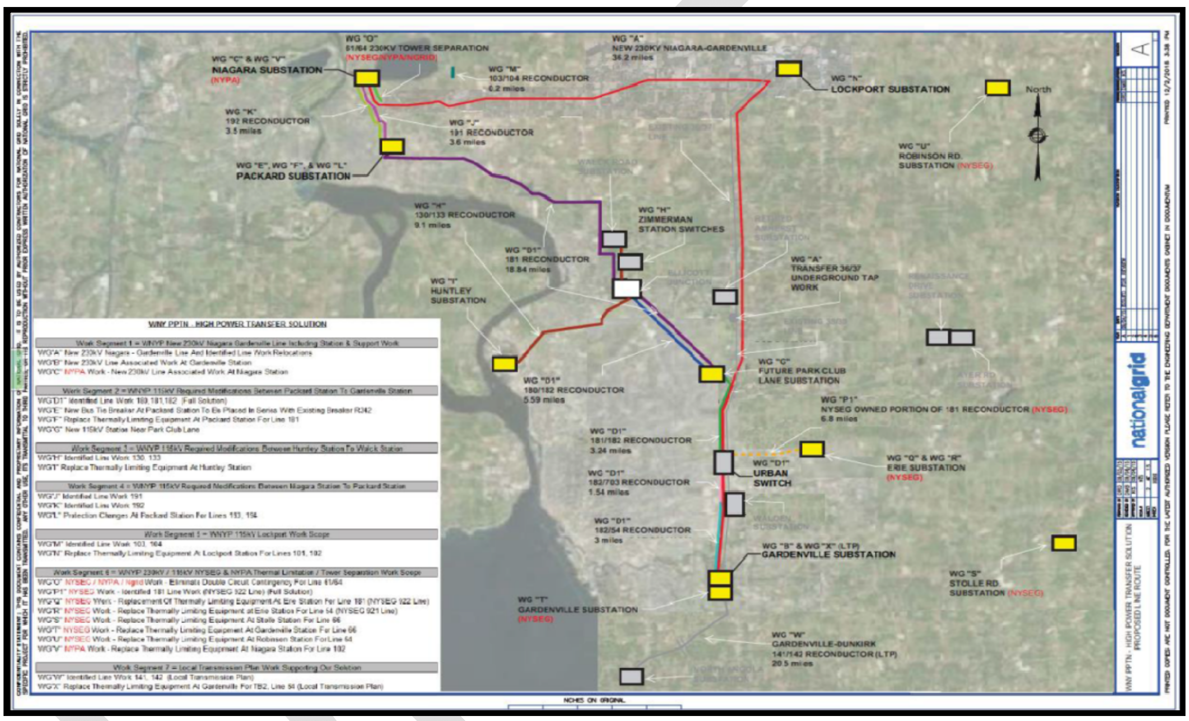
3.1.6 T012: National Grid – High Power Transfer Solution

Figure 3-3 is a map showing the location of the components of the National Grid High Power Transfer Solution. National Grid High Power Transfer Solution includes the following components:

- New Niagara-Gardenville 230 kV line
- New Park Club Lane 115 kV switching station (connects to Packard, Stolle Rd., Gardenville)
- Reconductoring 115 kV lines (~76 miles worth) notably:
- Niagara/Packard-Gardenville 115 kV (180, 181, 182) reconductoring ("Full solution")
- Niagara-Packard (191, 192) reconductoring
- Packard-Huntley (130, 133) partial reconductoring

- Niagara-Lockport (103, 104) partial reconductoring
- Gardenville-Depew (54) reconductoring
- Tower separation of 61/64 230 kV lines
- Replacement of thermally limiting equipment at Packard, Huntley, Lockport, Robinson Road, Erie Street and Niagara stations.

Figure 3-3: Map of National Grid High Power Transfer Solution



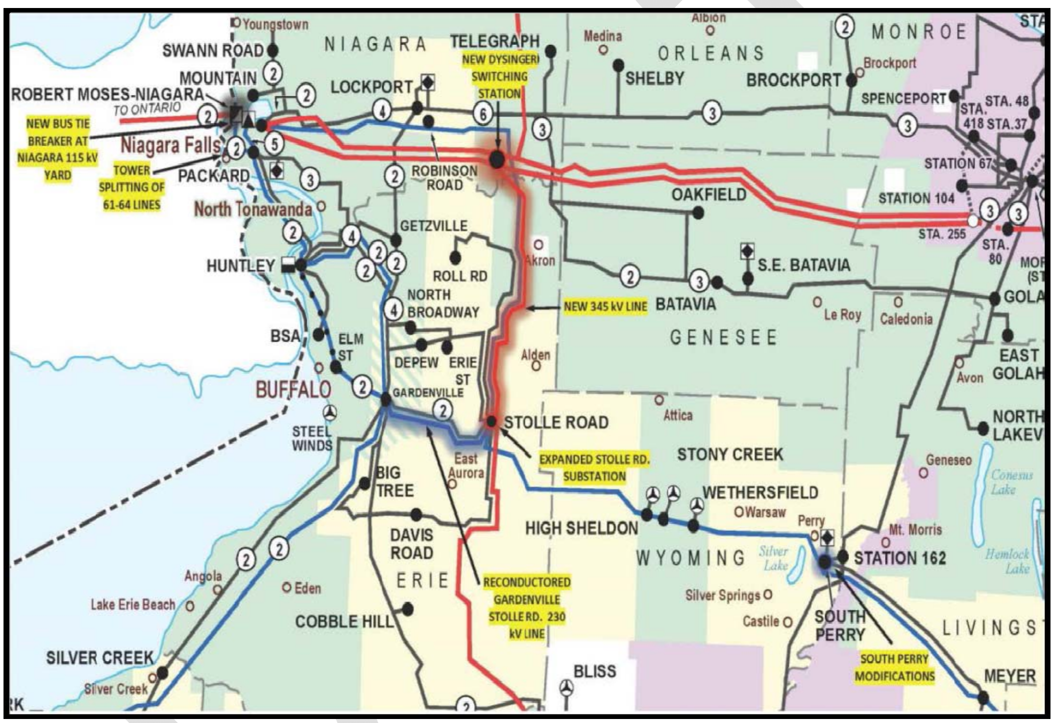
3.1.7 T013: NYPA/NYSEG – Western NY Energy Link

Figure 3-4 is a map showing the location of the components of the NYPA/NYSEG Western NY Energy Link Solution. NYPA/NYSEG Western NY Energy Link Solution includes the following components:

- 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 61/64 230 kV lines at Niagara
- New 230/115 kV transformer at South Perry
- New 115 kV PAR at South Perry substation (on South Perry – Meyer 115 kV line))

Figure 3-4: Map of NYPA/NYSEG Western NY Energy Link Solution



3.1.8 T014: NextEra Energy Transmission New York – Empire State Line #1

Figure 3-5 is a map showing the location of the components of the NextEra Energy Transmission New York Empire State Line #1 Solution. NextEra Energy Transmission New York Empire State Line #1 Solution includes the following components:

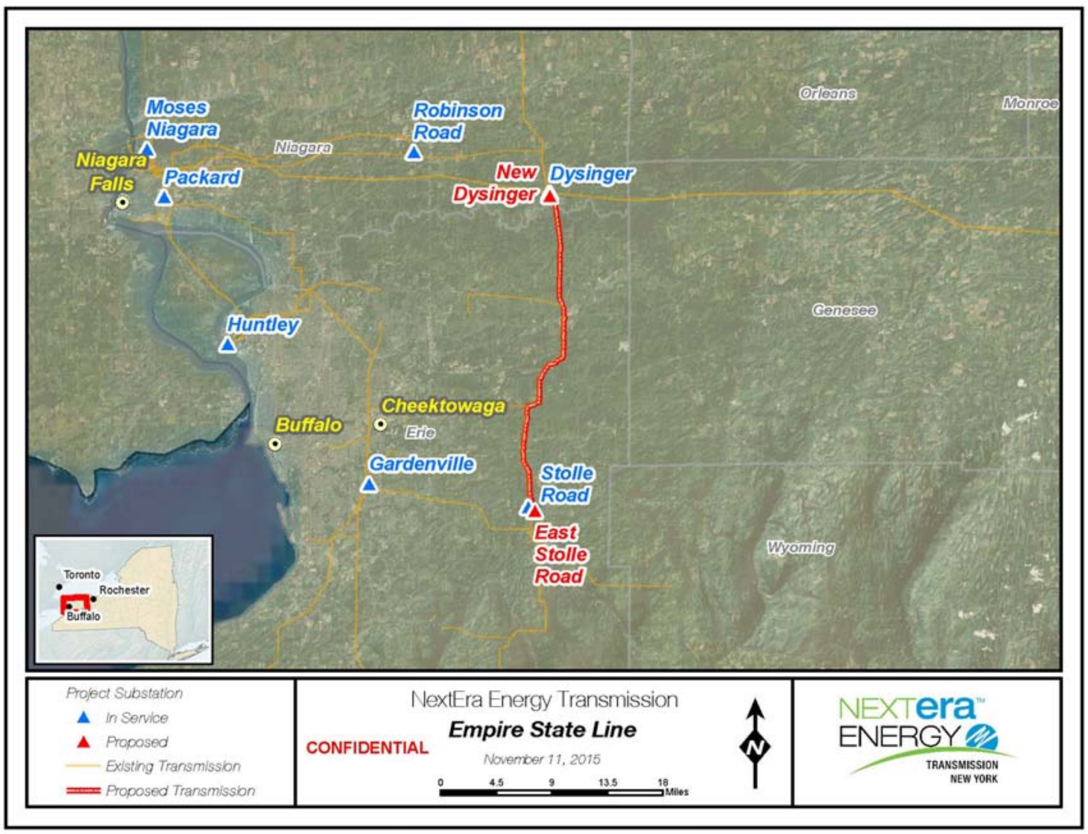
- New Dysinger 345 kV Switchyard (loops in Niagara-Somerset & Niagara-Rochester 345 kV lines, and cuts out the 345 kV line loop to Somerset 345 kV)
- New East Stolle Switchyard (near Stolle Road substation)

- New Dysinger-East Stolle 345 kV line with 700 MVA PAR on Dysinger end and a shunt reactor at East Stolle

Below are proposed system upgrades that are required to support the Empire State Line #1 Solution:

- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV (~12 miles line reconductoring)
- Roll Road - 40 MVAR capacitor bank
- 100 MVAR shunt reactor at Rochester

Figure 3-5: Map of NextEra Energy Transmission New York Empire State Line Solutions



3.1.9 T015: NextEra Energy Transmission New York – Empire State Line #2

The NextEra Energy Transmission New York Empire State Line #2 is the same project as T014 except that it does not have the PAR. NextEra Energy Transmission New York Empire State Line #2 Solution includes the following components:

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

Below are additional identified system upgrades required to support Empire State Line #2 Solution:

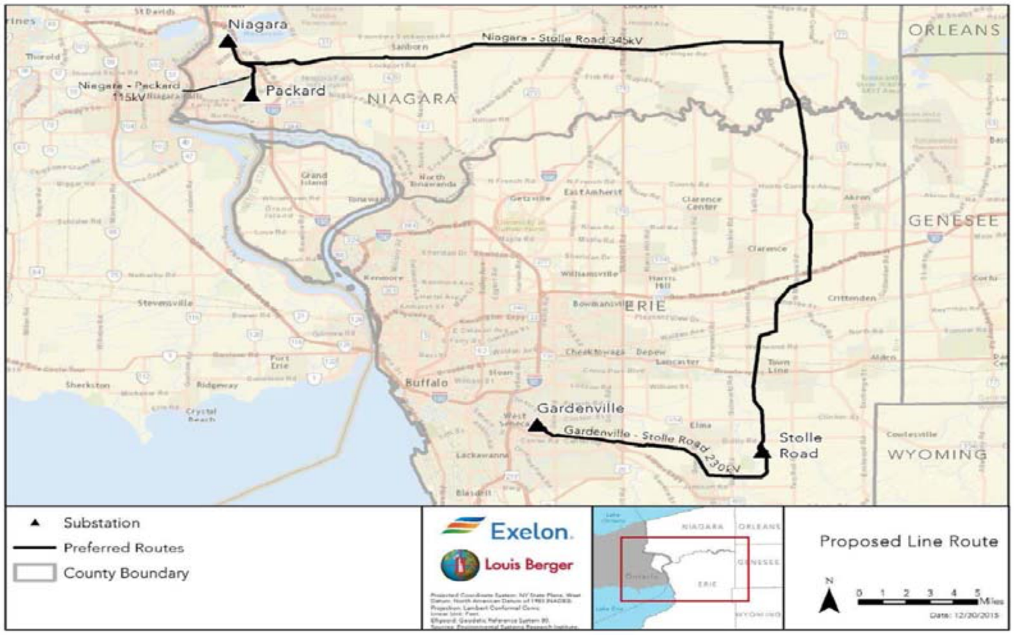
- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV (~12 miles line reconductoring)
- Roll Road - 40 MVAR capacitor bank
- 100 MVAR shunt reactor at Rochester

3.1.10 T017: Exelon Transmission Company – Niagara Area Transmission Expansion

Figure 3-6 is a map showing the location of the major components of the Exelon Transmission Company Niagara Area Transmission Expansion Solution. Exelon Transmission Company Niagara Area Transmission Expansion Solution includes the following components:

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

Figure 3-6: Map of Exelon Transmission Company Niagara Area Transmission Expansion Solution



3.2 Overview of Evaluation Assumptions

The process for the evaluation of solutions is described in the NYISO Public Policy Transmission Planning Process Manual, and evaluates the metrics set forth in the NYISO's tariff and the criteria prescribed by the PSC to the extent feasible. Notably, the NYISO's evaluation of Public Policy Transmission Projects differs from its evaluation of projects in its other planning processes because it can give varying levels of considerations to the baseline and the chosen scenarios based upon the nature of the proposed Public Policy Transmission Projects. In other words, certain projects may perform differently under normal operating conditions (*i.e.*, the baseline) and other potential operating conditions. Based upon the particulars of the Public Policy Transmission Need, the more efficient or cost effective solution may be chosen based upon a scenario or a combination of scenarios and the baseline cases.

The study method and assumptions used in evaluating qualitative metrics, such as production cost savings and cost per MW, are described in the following sections. The results of these analyses are described in Section 3.3.

3.2.1 Transfer Limit Analysis

Based on the Western NY Need, the NYISO determined that thermal transfer analysis for the Ontario to New York interface is the most applicable transfer analysis to evaluate the Western New York Public Policy Transmission Projects. The NYISO performed thermal transfer analysis for each proposed project to determine the impact of each project on the ability to transfer power from Ontario to New York across the Niagara ties. The NYISO performed the thermal transfer analysis for the interface in accordance with the Normal Transfer Criteria as defined by the New York State Reliability Council (NYSRC) Reliability Rules. The NYISO used the PowerGEM TARA program to perform the thermal transfer analysis. To determine the thermal transfer limits, the NYISO raised the power flow across the interface by uniformly increasing upstream generation and uniformly decreasing downstream generation. The long-term emergency (LTE) ratings of BPTF were monitored while simulating design contingency events. During transfer analysis, the NYISO additionally monitored all 100 kV and above facilities that are not BPTF. Whenever the post contingency power flow on the non-BPTF exceeded short-term emergency (STE) ratings, the NYISO would determine if the loss of the non-BPTF would cause other facilities to be overloaded. If the affected facility's loss causes other non-BPTF to exceed their STE ratings or BPTF to exceed their LTE ratings (consistent with the NYSRC Reliability Rules and Exceptions), the NYISO will determine a transfer limit that would allow the system to operate without the loss of multiple transmission facilities.

3.2.1.1 Baseline Transfer Analysis

For purposes of evaluating the proposed solutions, the NYISO performed a baseline transfer analysis on a base case system that was updated from what was used in the Western New York Public Policy Transmission Need Viability and Sufficiency Assessment. The Viability and Sufficiency Assessment used the NYISO 2014 Reliability Planning Process (2014 RPP) base case system representation of 2024 summer peak load conditions. Appendix C describes the detailed assumptions used in the Viability and Sufficiency Assessment. The NYISO made specific updates to the power flow cases as used in the Viability and Sufficiency Assessment for the baseline transfer analysis. Specifically, after the NYISO completed the Viability and Sufficiency Assessment and filed it with the NYSPC, NYSEG updated its Local Transmission System Plan to upgrade the terminals for the Gardenville – Stolle Road 230 kV Line #66, which was put in service in October 2016. Therefore, the NYISO modeled the terminal upgrades in the baseline transfer analysis. The NYISO recommended in the Viability and Assessment three non-BPTF facilities to be upgraded: Gardenville-Depew 115 kV #54 line, Niagara-Packard 115 kV #193 line, and Niagara-Packard 115 kV #194 line. The PSC Order issued on October 13, 2016 directed National Grid to undertake the upgrades necessary on the non-bulk system, such as those identified by the NYISO. National Grid's LTP addresses #54 line upgrades, so this specific LTP was included in the baseline transfer analysis. There is no existing LTP to address #193 and #194 lines, so generic upgrades were modeled in the baseline transfer analysis for Niagara-Packard 115 kV lines #193 and #194 by assuming large enough ratings. Section 3.6 further discusses these non-BPTF upgrades.

Consistent with the Viability and Sufficiency Assessment, the baseline transfer analysis also considered two dispatches with Niagara and Lewiston at full output of 2,700 MW:

- 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

The baseline transfer analysis also considered two dispatches for wind farms on Stolle Road – Hillside 230 kV path: 0% and 100% of nameplate power.

The developer of a Public Policy Transmission Project may elect to model the Packard – Huntley 230 kV series reactors in-service or bypassed. The baseline transfer analysis modeled the series reactor according to the desired status (in-service or bypassed) specified by developers.

3.2.1.2 Scenario Transfer Analysis

The NYISO performed a transfer analysis scenario based on the latest 2016 Reliability Planning Process [15] (2016 RPP) base case system representation of 2026 summer peak load to determine the performance of the Western New York Public Policy Transmission Projects. The 2016 RPP base

[15] The 2016 Reliability Needs Assessment is posted at: http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Planning_Studies/Reliability_Planning_Studies/Reliability_Assessment_Documents/2016RNA_Final_Oct18_2016.pdf

case has the latest updates based on the 2016 Load and Capacity Data Report including Gardenville-Stolle Road 230 kV line #66 terminal upgrades and National Grid's LTP for line #54. Generic upgrades were added in the transfer analysis scenario for Niagara-Packard 115kV lines #193 and #194 by assuming large enough ratings. The transfer analysis scenario also considered the same two dispatches for Niagara and Lewiston, and the same two dispatches for wind farms in Zones A, B and C as described in Section 3.2.1.1.

The 2016 RPP base case modeled the Packard – Huntley 230 kV series reactors in-service. Therefore, the transfer analysis scenario modeled the series reactors in service for all the projects regardless of the election by developers.

3.2.2 Resource Adequacy Analysis

The NYISO performed a resource adequacy evaluation of the New York power system for the Western New York Public Policy Transmission Need. The 2016 RPP base cases were used as a starting point and the NYCA load forecast was extended up to year 2045 to cover the study period. The New York State bulk power system is planned to meet an Loss of Load Expectation (LOLE) that, at any given point in time, is less than or equal to an involuntary load disconnection that is not more frequent than once in every 10 years, or 0.1 events per year. If criteria violations are identified, various amounts and locations of generic compensatory MW are determined. Compensatory MW amounts are determined by adding generic capacity resources to zones to effectively satisfy the needs. The compensatory MW amounts and locations are based on a review of binding transmission constraints and zonal LOLE determinations in an iterative process to determine various combinations that will result in reliability criteria being met. Due to the differing natures of supply and demand-side resources and transmission constraints, the amounts and locations of resources necessary to match the level of compensatory MW needs identified will vary.

Table 3-1 shows the pre-project baseline LOLE results for each of the study year. LOLE violations were identified starting from 2031. Generic compensatory MW were added in Zone K, totaling 250 MW, in different years to address the resource adequacy issues as shown in Table 3-1. These generic compensatory MW were added to the MAPS database to maintain a reliable system.

The NYISO also performed a resource adequacy analysis scenario, where the Western New York interfaces were relaxed. The results show no impact to the NYCA LOLE. While additional resources and/or transmission would be needed in 2031 to meet the statewide resource adequacy criterion, any additional transmission in Western New York will not assist in meeting such a need.

The ICAP metric calculated in the CARIS process consists of two steps. First, the MW impact of a project is determined through LOLE change between pre-project and post-project. The MW impact is indicative of reduced installed capacity requirement made possible by the projects. Second, the ICAP saving is calculated by translating the MW impact to a dollar amount through two pricing variations. According to the resource adequacy analysis that relaxes the Western New York interfaces, the MW impact would be near zero for the Western New York Public Policy Transmission Projects if the same CARIS methodology was used. Therefore, the capacity saving is not a significant distinguishing factor between the proposed transmission projects and further resource adequacy analysis is not required for the Western NY Need.

Table 3-1: NYCA LOLE and compensatory MW

Year	Baseline LOLE	Generic GTs added: MW	LOLE after adding generic GTs
2017	0.054		0.054
2018	0.050		0.050
2019	0.054		0.054
2020	0.034		0.034
2021	0.045		0.045
2022	0.047		0.047
2023	0.053		0.053
2024	0.056		0.056
2025	0.062		0.062
2026	0.078		0.078
2027	0.085		0.085
2028	0.087		0.087
2029	0.093		0.093
2030	0.097		0.097
2031	0.105	50	0.095
2032	0.111	50	0.092
2033	0.116		0.095
2034	0.121	50	0.093
2035	0.125		0.097
2036	0.127		0.098
2037	0.131	50	0.093
2038	0.133		0.099
2039	0.135		0.097
2040	0.135		0.099
2041	0.136		0.097
2042	0.136		0.100
2043	0.137	50	0.095
2044	0.137		0.094
2045	0.137		0.093

3.2.3 Production Cost Analysis

Production cost analysis evaluated the proposed Public Policy Transmission Projects and their impact on NYISO wholesale electricity markets.

3.2.3.1 Baseline

The Western NY Need production cost analysis baseline case is derived from the 2016 CARIS Phase 2 database.[16] Updates were made to the system while extensions were made for increasing the range of the study period (2016 – 2045). At the December 7, 2016 and January 24, 2017 ESPWG/TPAS meetings, the NYISO presented the starting database, updates, and extensions for the baseline production cost analysis.[17]

For purpose of evaluating the Western New York Public Policy Transmission Projects, contingency pairs were used to secure the Ontario to New York interface. Imports from Ontario Independent Electric System Operator into NYISO were modeled as dynamic rather than capped to a fixed interface limit based on historical flow. While some contingencies for the NYISO – PJM West ties and the Stolle Road – Hillside 230 kV path already exist, additional contingencies were deemed necessary to evaluate the potential impact of the projects on these existing facilities.

Due to the wider ranging study period of the Western NY baseline case, the load, fuel and emissions forecasts needed to be extended. While the fuel and emissions forecasts would affect the four pool system (IESO, ISO-NE, NYISO, and PJM), the load forecast extensions would only impact the NYISO. Load forecasts for the external control areas only range from 2016 to 2024 consistent with the CARIS methodology. After 2024, external control area load would remain fixed to the 2024 schedule for 2025 – 2045.

The baseline production cost analysis modeled the series reactors on Packard to Huntley 230 kV lines according to the desired status (in-service or bypassed) specified by developers.

[16] 2016 CARIS Phase 2 assumptions and results are posted at: http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_espwg/meeting_materials/2016-07-05/CARIS%202%20Database.pdf

[17] The meeting materials are posted at: http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_espwg/meeting_materials/2016-12-7/WNY_PPTN_Ph2_Assumptions.pdf

http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_espwg/meeting_materials/2017-01-24/2_Updates_WNY_PPTN_Ph2_Assumptions.pdf

3.2.3.2. Scenarios

At the February 9, 2017 ESPWG meeting, the NYISO solicited from stakeholders the potential scenarios for evaluating the Western New York Public Policy Transmission Projects. Based on stakeholder feedback, the NYISO developed scenarios by modifying the baseline assumptions to evaluate the robustness of the proposed Public Policy Transmission Projects according to the selection metrics and the impact on NYISO wholesale electricity markets. The following sections describe the scenarios that assist in understanding the overall performance of the projects under various conditions. Scenario #1 modifies the baseline assumptions while all the other scenarios are based off Scenario #1.

3.2.3.3.1. Scenario #1: 2017 baseline

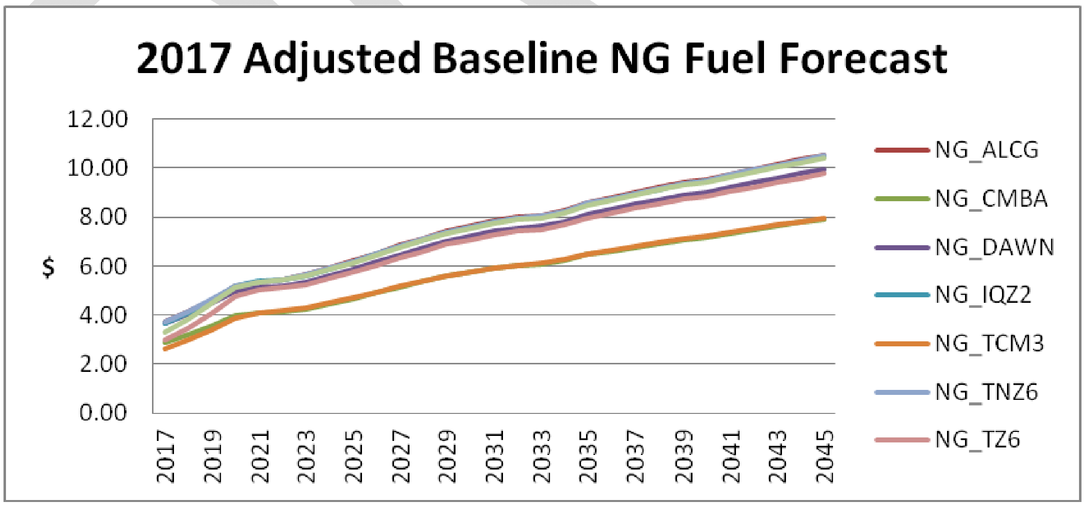
The baseline load forecast and fuel costs were updated according to the 2017 Load and Capacity Data Report and the latest natural gas forecast. Table 3-2 and Figure 3-7 show the load and fuel forecast data. Similar to the baseline, this scenario modeled the series reactors on Packard to Huntley 230 kV lines according to the desired status (in-service or bypassed) specified by developers.

Table 3-2: NYCA Load Forecast

NYCA Energy, Peak & Solar Forecast

	2017 Adjusted Baseline		
Year	Energy (GWh)	Peak (MW)	Solar (GWh)
2017	158,632	33,178	1,845
2018	157,996	33,078	2,592
2019	157,405	33,035	3,138
2020	156,752	32,993	3,623
2021	155,855	33,009	4,009
2022	155,444	33,034	4,334
2023	155,298	33,096	4,601
2024	155,135	33,152	4,828
2025	155,009	33,232	5,021
2026	154,920	33,324	5,186
2027	154,971	33,398	5,324
2028	155,314	33,660	5,444
2029	155,691	33,846	5,544
2030	156,115	34,036	5,634
2031	156,563	34,226	5,714
2032	157,092	34,429	5,784
2033	157,718	34,649	5,844
2034	158,396	34,875	5,894
2035	159,119	35,107	5,934
2036	159,827	35,329	5,964
2037	160,525	35,543	5,984
2038	161,238	35,755	5,994
2039	161,974	35,966	5,994
2040	162,793	36,191	5,994
2041	163,594	36,412	5,994
2042	164,377	36,628	5,994
2043	165,200	36,856	5,994
2044	166,036	37,087	5,994
2045	166,928	37,333	5,994

Figure 3-7: Natural Gas Forecast



3.2.3.3.2. Scenario #2: Series reactors in-service

The series reactors on Packard to Huntley 230 kV Lines 77 and 78 entered into service in 2016, with the NYISO having operational control over them. Therefore, the NYISO modeled the series reactors as in-service for all the projects in this scenario regardless of developers' election on the status of the series reactors.

3.2.3.3.3. Scenario #3: Historical IESO-MISO flow modeled

Baseline and Scenario #1 modeled the Ontario Independent Electric System Operator (IESO)-Midcontinent Independent System Operator (MISO) flow as free-flowing subject to interface limits and hurdle rates. By comparison, Scenario #3 modeled IESO-MISO flow as scheduled according to 2013 historical flows with the remainder of IESO exports flowing into the NYISO. This scenario tends to result in higher IESO-NYISO flow and a lower IESO-MISO flow. This scenario modeled the series reactors on Packard to Huntley 230 kV lines according to the desired status (in-service or bypassed) specified by developers.

3.2.3.3.4. Scenario #4 and #5: High fuel and low fuel

The NYISO also developed high and low fuel costs for the 2017 baseline case consistent with the fuel forecast methodology used in the CARIS process. Energy Information Administration's Annual Energy Outlook forecasts of the annual national delivered price were used to generate Low and High, respectively, natural gas price forecasts for each region. These scenarios modeled the series reactors on Packard to Huntley 230 kV lines according to the desired status (in-service or bypassed) specified by developers.

Figures 3-8 and 3-9 show the high and low natural gas forecast used in these scenarios.

Figure 3-8: High Natural Gas Forecast

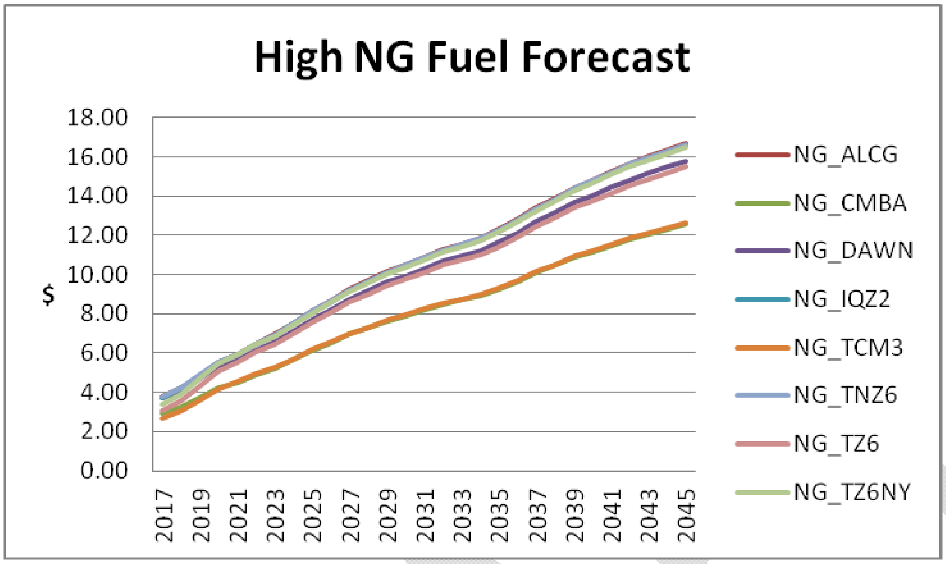
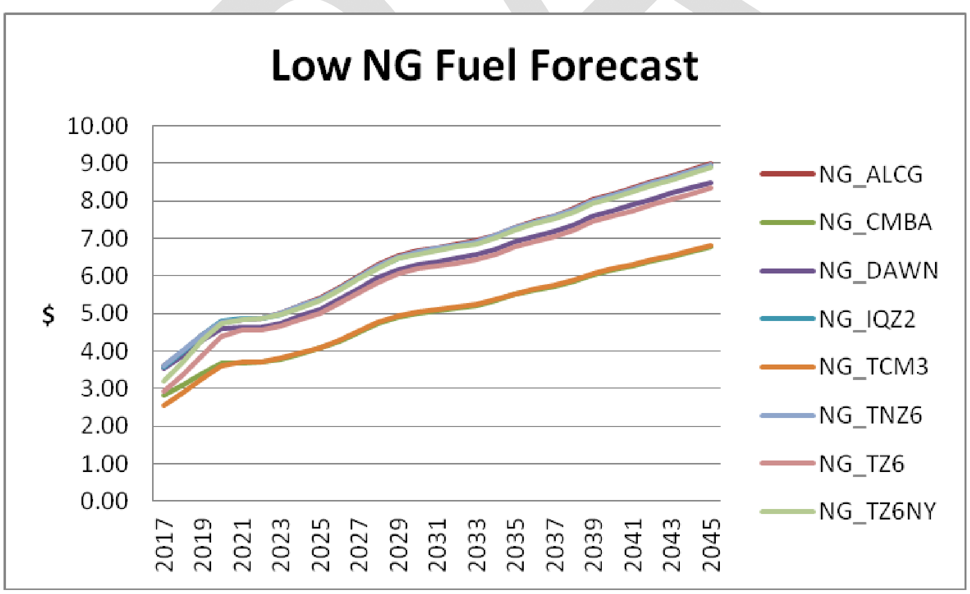


Figure 3-9: Low Natural Gas Forecast



3.2.3.3.6. Scenario #6 and #7: High load and low load forecast

The NYISO also developed high and low load forecasts for the 2017 baseline case. Table 3-3 shows the load forecasts used in these scenarios. These scenarios modeled the series reactors on

Packard to Huntley 230 kV lines according to the desired status (in-service or bypassed) specified by developers.

Table 3-3: High and Low Load Forecast

NYCA Energy, Peak, and Solar Forecast

	High Load Forecast			Low Load Forecast		
Year	Energy (GWh)	Peak (MW)	Solar (GWh)	Energy (GWh)	Peak (MW)	Solar (GWh)
2017	161,805	33,842	1,661	155,459	32,514	2,030
2018	161,156	33,905	2,333	154,836	32,251	2,851
2019	160,553	34,026	2,824	154,257	32,044	3,452
2020	159,887	34,148	3,261	153,617	31,838	3,985
2021	158,972	34,329	3,608	152,738	31,689	4,410
2022	158,688	34,569	3,901	152,465	31,536	4,767
2023	158,404	34,809	4,141	152,192	31,383	5,061
2024	158,589	35,001	4,345	151,681	31,303	5,311
2025	159,259	35,266	4,519	150,759	31,198	5,523
2026	160,031	35,539	4,667	149,809	31,109	5,705
2027	161,017	35,793	4,792	148,925	31,003	5,856
2028	162,370	36,236	4,900	148,258	31,085	5,988
2029	163,832	36,602	4,990	147,550	31,090	6,098
2030	165,415	36,972	5,071	146,816	31,100	6,197
2031	167,093	37,341	5,143	146,033	31,110	6,285
2032	168,925	37,723	5,206	145,260	31,135	6,362
2033	170,615	38,123	5,260	144,821	31,175	6,428
2034	172,399	38,528	5,305	144,394	31,222	6,483
2035	173,927	38,938	5,341	144,310	31,275	6,527
2036	175,984	39,339	5,368	143,670	31,320	6,560
2037	178,083	39,730	5,386	142,967	31,357	6,582
2038	180,441	40,118	5,395	142,036	31,393	6,593
2039	181,890	40,505	5,395	142,058	31,428	6,593
2040	183,418	40,905	5,395	142,168	31,478	6,593
2041	184,929	41,301	5,395	142,259	31,523	6,593
2042	186,420	41,692	5,395	142,333	31,564	6,593
2043	187,955	42,096	5,395	142,445	31,616	6,593
2044	189,504	42,503	5,395	142,568	31,671	6,593
2045	191,098	42,923	5,395	142,757	31,744	6,593

3.2.3.3.7. Scenario #7: National CO_2 removed and series reactors in-service

The baseline and Scenario #1 modeled a national CO_2 program starting from 2024, consistent with the 2016 CARIS Phase 2 database. The NYISO also developed Scenario #7 assuming the national CO_2 program is not in place. In this scenario, the series reactors on Packard to Huntley 230 kV lines were modeled in service for all the projects.

3.3 Evaluation Metrics

3.3.1 Capital Cost Estimate

The NYISO and its independent consultant, SECO, evaluated each developer's capital cost estimates for their proposed Public Policy Transmission Project for accuracy and reasonableness, and on a comparative basis with other proposed Public Policy Transmission Projects. Each developer was required to submit detailed and credible estimates for the capital costs associated with the engineering, procurement, permitting, and construction of a proposed transmission solution. SECO reviewed all the information submitted by the developers and developed independent cost estimates for each project based on material and labor cost by equipment, engineering and design work, permitting, site acquisition, procurement and construction work, and commissioning needed for the proposed Public Policy Transmission Projects. Appendix E details the analysis performed by SECO. Table 3-4 summarizes SECO's overnight capital cost estimates for each project in 2017 dollars. T014 and T015 also proposed alternative rights of way, so cost estimates for those projects were also developed. Section 3.3.7 discusses the alternative rights of way in more details.

Table 3-4: Independent Cost Estimate

Project ID	Independent Cost Estimate: 2017 $M
T006	158
T007	276
T008	348
T009	479
T011	182
T012	432
T013	232
T014	177
T014_Alt	219
T015	158
T015_Alt	199
T017	286

3.3.2 Cost Per MW Ratio

The cost per MW ratio metric was calculated by dividing the independent cost estimates from SECO by the MW value of increased transfer capability.

3.3.2.1 Cost Per MW: Transfer Limits

For the purpose of calculating cost per MW based on transfer limits, the NYISO calculated the Ontario to New York thermal transfer limits across the Niagara ties as stated in Section 3.2.1. Table 3-5 and 3-6 summarize the baseline and scenario transfer results.

Table 3-5: 2014 RPP OH to NY Transfer across Niagara Ties

Project ID	SR on 77/78	Wind@100%		Wind@ 0%	
		Dispatch 1	Dispatch 2	Dispatch 1	Dispatch 2
T006	Bypassed	611(1)	870(1)	130(1)	388(1)
T007	Bypassed	946(1)	1041(2)(A)	695(1)	906(1)
T008	Bypassed	1122(2)(A)	1053(2)(A)	952(1)	1152(1)
T009	Bypassed	1254(3)	1260(3)	1284(1)	1491(1)
T011	In	399(4)(B)	928(6)	28(4)(B)	502(6)
T012	In	1026(5)	1020(5)	1332(4)(B)	1968(7)
T013	In	1224(3)	1235(3)	1350(4)(B)	1716(8)
T014	Bypassed	970(5)	951(5)	730(1)	1033(1)
T015	Bypassed	561(1)	842(1)	43(1)	321(1)
T017	In	1189(5)	1176(5)	1254(4)(B)	1835(6)

Notes:

1. Packard- Sawyer 230 line 2 (78) at 644 MW LTE rating for L/O Huntley - Packard 230 (77)
2. Station 162 - Station 158 115 (924) at 159 MW STE rating for L/O Meyer 230 straight bus and Meyer-South Perry 115 (934)
3. Wethersfield - South Perry 230 (85/87 tapped at South Perry) at 494 MW LTE rating for L/O stuck breaker 302 at New Rochester 345 (Station 255)
4. Niagara West - Packard 230 line 1(61) at 841 MW STE rating for L/O Tower: Niagara - Packard 230 (62) and BP76B - Packard 230 (BP76)
5. Meyer 230/115/4.5 Transformer at 294 MW LTE rating for L/O stuck breaker at Stoney Ridge 230 Substation
6. Packard- Sawyer 230 line 1 (77) at 644 MW LTE rating for L/O Transformer Bank #3 at Packard 230 Substation
7. Beck - Niagara West 230 (PA27) at 460 MW LTE rating for L/O Beck - Niagara 345 (PA301)
8. Stony Creek - Wethersfield 230 (83) at 479 MW LTE rating L/O stuck breaker 302 at New Rochester 345 (Station 255)

A. Limit determined from cascading analysis simulations
B. NYSRC Reliability Rules Exception rule #13 applied - Post Contingency Flows on Niagara Project Facilities

Table 3-6: 2016 RPP OH to NY Transfer across Niagara Ties

Project ID	SR on 77/78	Wind@100%		Wind@ 0%	
		Dispatch 1	Dispatch 2	Dispatch 1	Dispatch 2
T006	In	1551(1)	1594(1)	1049(2)(B)	1565(5)
T007	In	1620(1)	1661(1)	1527(2)(B)	2007(7)
T008	In	1665(1)	1703(1)	1840(2)(B)	1977(7)
T009	In	1625(1)	1665(1)	1794(6)	1929(7)
T011	In	339(2)(B)	862(5)	-405(2)	69(5)
T012	In	1592(3)	1585(3)	924(2)(B)	1623(8)
T013	In	1510(2)(B)	1619(1)	1120(2)(B)	1679(5)
T014	In	1616(4)	1658(3)	1319(2)(B)	1824(5)
T015	In	1523(4)	1565(4)	991(2)(B)	1534(5)
T017	In	1786(3)	1774(3)	993(2)(B)	1592(5)

Notes:
1. Dysinger - New Rochester 345 (NR2) line 1 at 1501 LTE rating for L/O Somerset - New Rochester 345 (SRI-39)
2. Niagara West - Packard 230 line 1(61) at 841 MW STE rating for L/O Tower: Niagara - Packard 230 (62) and BP76B - Packard 230 (BP76)
3. Meyer 230/115/4.5 Transformer at 294 MW LTE rating for L/O stuck breaker at Stoney Ridge 230 Substation
4. Dysinger - New Rochester 345 (NR2) line 2 at 1501 LTE rating for L/O Dysinger - New Rochester 345 line 1
5. Packard- Sawyer 230 line 1 (77) at 644 MW LTE rating for L/O stuck breaker R3230 at Packard 230 Substation
6. Gardenville 345/230 kV Transformer at 717 MW LTE rating for L/O Tower: Packard - Huntley 230 (77&78)
7. Beck - Niagara 345 line 1 (PA302) at 1132 MW LTE rating for L/O stuck breaker 3008 at Niagara 345 Substation
8. Huntley - Sawyer 230 line 1 (79) at 654 MW LTE rating for L/O stuck breaker R873 at Gardenville 230 Substation

B. NYSRC Reliability Rules Exception rule #13 applied - Post Contingency Flows on Niagara Project Facilities

Table 3-7 displays the cost per MW ($M/MW) ratio based on transfer limits. The average limit (MW) is the average of the Ontario to New York transfer limits that were calculated for each of the four different dispatch scenarios.

Table 3-7: Cost Per MW Ratio

Project ID	Independent Cost Estimate: 2017 $M	Baseline (2014 RPP)			Scenario (2016 RPP)		
		SR on 77/78	Average Limit: MW	Cost/MW: $M/MW	SR on 77/78	Average Limit: MW	Cost/MW: $M/MW
T006	158	Bypassed	500	0.32	In	1,440	0.11
T007	276	Bypassed	897	0.31	In	1,704	0.16
T008	348	Bypassed	1,070	0.32	In	1,796	0.19
T009	479	Bypassed	1,322	0.36	In	1,753	0.27
T011	182	In	464	0.39	In	216	0.84
T012	432	In	1,336	0.32	In	1,431	0.30
T013	232	In	1,381	0.17	In	1,482	0.16
T014	177	Bypassed	921	0.19	In	1,604	0.11
T014_Alt	219	Bypassed	921	0.24	In	1,604	0.14
T015	158	Bypassed	442	0.36	In	1,403	0.11
T015_Alt	199	Bypassed	442	0.45	In	1,403	0.14
T017	286	In	1,364	0.21	In	1,536	0.19

3.3.2.2 Cost Per MW Ratio: MAPS results

Table 3-8 presents the cost per MW ratio for both the baseline and Scenario #2 utilizing MAPS production cost simulations based on the average hourly incremental power flow (MW) from Niagara generation and Ontario-to-Niagara ties. Note that the values in Table 3-8 are rounded to two decimal places, while the cost per MW ratio is based on non-rounded calculations.

Table 3-8: MAPS cost per MW ratio results

Project ID	Independent Cost Estimate: 2017 $M	MAPS Baseline			MAPS Scenario 2		
		SR on 77/78	Average Hourly Incremental : Niagara Gen + Niagara Ties (MW)	Cost/MW: $M/MW	SR on 77/78	Average Hourly Incremental : Niagara Gen + Niagara Ties (MW)	Cost/MW: $M/MW
T006	158	Bypassed	48	3.30	In	135	1.17
T007	276	Bypassed	77	3.59	In	137	2.01
T008	348	Bypassed	107	3.25	In	140	2.48
T009	479	Bypassed	140	3.43	In	157	3.05
T011	182	In	3	55.08	In	3	55.08
T012	432	In	73	5.92	In	73	5.92
T013	232	In	136	1.70	In	136	1.70
T014	177	Bypassed	91	1.95	In	150	1.18
T014_Alt	219	Bypassed	91	2.41	In	150	1.46
T015	158	Bypassed	46	3.43	In	140	1.13
T015_Alt	199	Bypassed	46	4.34	In	140	1.42
T017	286	In	144	1.98	In	144	1.98

Average hourly incremental: Niagara Gen + Niagara ties (MW) is calculated in the following steps:

1. For each project & base case study year, find the Annual: Niagara Gen + Niagara Ties (MW):

$$Annual\ Niagara\ Gen\ (MW; includes\ Lewiston\ Pump) + Annual\ Niagara\ Ties\ Flow\ (MW) = Annual: Niagara\ Gen + Niagara\ Ties\ (MW)$$

2. For each project & base case study year, convert the annual energy to an hourly average:

$$\frac{Annual: Niagara\ Gen + Niagara\ Ties\ (MW)}{\#\ of\ hours\ in\ the\ year} = Hourly: Niagara\ Gen + Niagara\ Ties\ (MW)$$

3. Calculate the difference in hourly energy between the project and the base case for each study year:

$$\left(Project\ Hourly: Niagara\ Gen + Niagara\ Ties\ (MW)\right) - \left(Base\ Case\ Hourly: Niagara\ Gen + Niagara\ Ties\ (MW)\right) = Hourly\ Incremental: Niagara\ Gen + Niagara\ Ties\ (MW)$$

4. Calculate the average of the hourly incremental energy for each project over the duration of their individual study periods:

$$\frac{\sum_{Start\ year}^{End\ year} Hourly\ Incremental: Niagara\ Gen + Niagara\ Ties\ (MW)}{20\ years} = Average\ Hourly\ Incremental: Niagara\ Gen + Niagara\ Ties\ (MW)$$

3.3.3 Expandability

In assessing the expandability of the proposed projects, the NYISO considers the feasibility and ease of physically expanding a facility, which can include consideration of future opportunities to economically expand a facility and the facilitation of future transmission siting. Such consideration may include future modifications to increase equipment ratings of the proposed facilities, staging or phasing of future transmission development, or otherwise benefiting from the proposed facilities for future reliability or congestion relief purposes. The details are summarized in the following sections.

3.3.3.1 Physical Expandability

The NYISO contracted the independent consultant, SECO, to perform the assessment based on the proposed substation design. The possibilities of facilitating future transmission expansion or generation interconnection as the result of the project proposal are noted in this section. SECO conducted evaluation of the expansion capability of the developers' proposals by using the projects' information submitted by the developers during the Viability and Sufficiency Assessment and additional information, specifically on expandability, provided by developers in response to a request for additional information by the NYISO.

A summary of SECO's findings is presented in Table 3-9.

Table 3-9: WNY Projects Expandability Analysis

Project ID	Transmission Line Expandability	Substation Expandability
T006 T007 T008 T009	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 Somerset to Rochester 345 kV line or the 230 kV Niagara to Stolle Rd line with the installation of a 345/230 kV transformer.
T011 T012	No significant expandability to National Grid's proposal beyond items common to all projects.	For T012, the proposed New Park Club Lane station will include a spare bay position.
T013	No significant expandability to NYPA/NYSEG proposal beyond the items common to all projects.	As proposed, the new 345 kV Dysinger station and the expansion of the 345 kV Stolle Rd. 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	No significant expandability to NextEra proposal beyond the items common to all projects.	NextEra's proposed design for the 345 kV Dysinger station includes one open bay position. Their initial design also includes the termination of both Niagara – Somerset – Rochester 345 kV lines into Dysinger.
T017	No significant expandability to Exelon proposal beyond the items common to all projects.	Dysinger substation could be constructed in the future to provide additional operating flexibility.

3.3.3.3.2 Electrical Expandability

This analysis focused on the potential incremental transfer limits of each proposed project if the limiting element or path is resolved by future additional transmission expansion.

The Ontario – New York transfer limits and the constraints summarized in Section 3.3.2.1 were analyzed to determine the most limiting element, the next most limiting element, and next most limiting path. The incremental transfer capability between the transfer limits constrained by the most limiting element and the second most limiting element captures the electrical benefits of future modifications to increase equipment ratings of the most limiting facilities. Furthermore, if expansion can be made to the entire constraint path, the electrical benefits could be approximated by the incremental transfer capability. Based on the results of the transfer limit analysis, four determined transfer paths are: (i) the Ontario – New York tie lines (ON-NY); (ii) the 345 kV Niagara – Rochester path (345); (iii) the 230 kV Niagara – Gardenville path (230S); and (iv) the 230 kV Niagara – Meyer path (230E).

Figure 3-10 summarizes the potential benefits based on different system representation (2014 RPP vs. 2016 RPP) and dispatch alternatives (D1 vs. D2, and wind 100% vs. wind 0%). The blue portion of the bars represents the transfer limits based on the project proposal, the red portion represents the transfer limits should the most limiting constraint being resolved, and the green portion represents the transfer limits should the most limiting transfer path be resolved.

Figure 3-10: Electrical Expandability Analysis

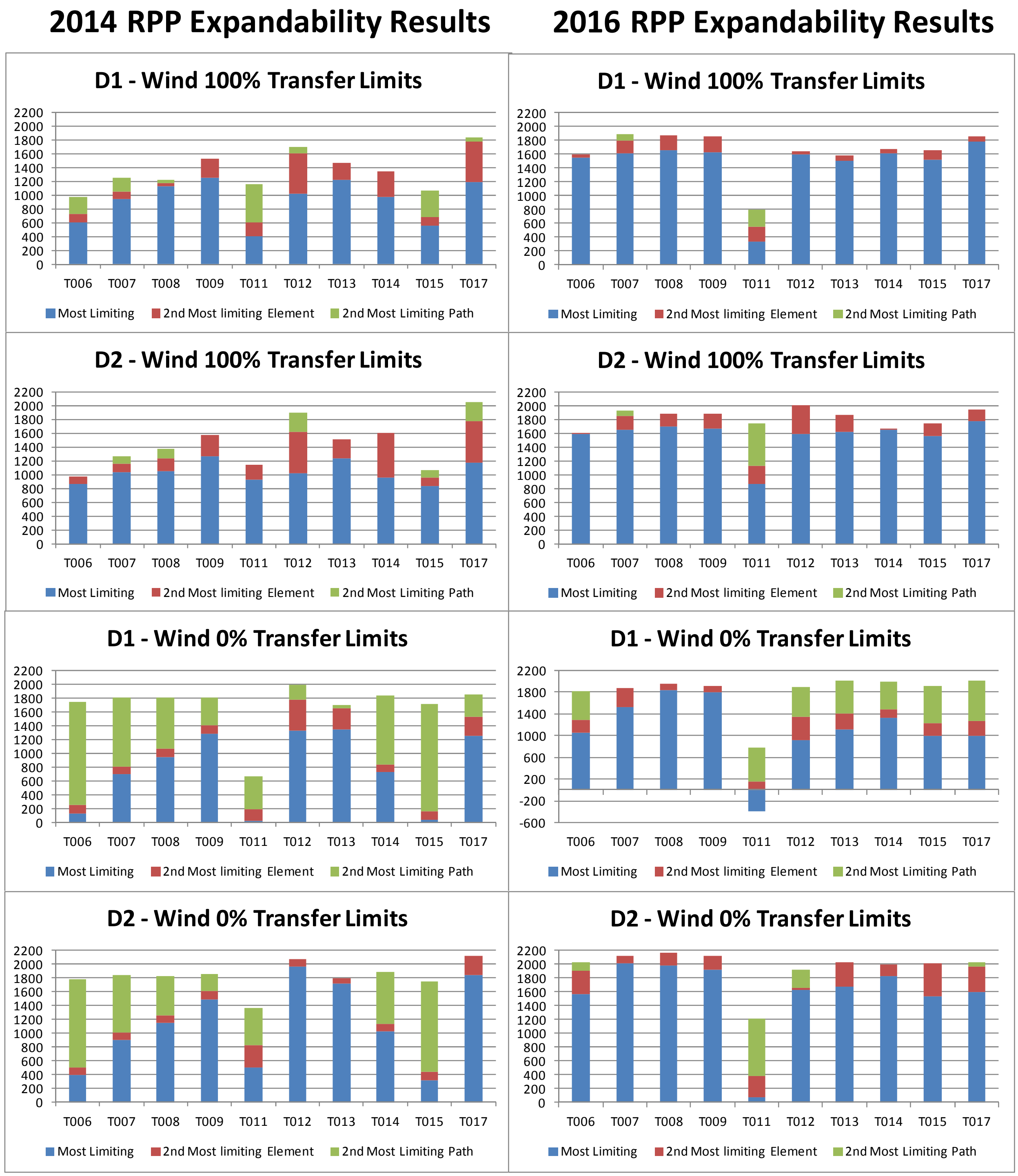


Table 3-10: Electrical Expandability Summary

Project	T006	T007	T008	T009	T011	T012	T013	T014	T015	T017
Most limiting transfer path	345,230S	345,230S,ON-NY,115	345,230S,ON-NY,115	34N,230S,ON-NY,230E	230S	230E,230S,ON-NY	230S,345,230E	345,230E,230S	34N,230S	230E,230S

3.3.3.3.3 Summary of Expandability Assessment

The NYISO used the assessment of incremental transfer limits as a proxy to determine the network strength and potential benefits if these project proposals could be expanded based on their substation designs. While not explicitly studied in the evaluation, the transfer limit analysis indicates that significant amounts of existing and potential renewable resources in Ontario and Western NY could be made available to the overall New York Control Area.

To summarize, the project proposals that has substation design with potentials to accommodate transmission expansion to significantly increase transfer limits are considered more favorable and ranked as "Good". However, if the transfer limits could be increased significantly but the current proposals by developers that do not have readily available options, those projects are ranked as "Fair".

Table 3-11: Expandability Summary

Project	Potential Electrical Expandability paths based on transfer limit analysis	Potential Physical Expandability Paths based on substation design	Notes	Ranking
T006	345, 230S	345, 230E	significantly higher transfer limits can be achieved if the proposed Dysinger 345 kV substation can be further expanded	Good
T007	345, 230S, ONT	345, 230E	significantly higher transfer limits can be achieved if the proposed Dysinger 345 kV substation can be further expanded	Good
T008	345, 230S, ONT	345, 230E	significantly higher transfer limits can be achieved if the proposed Dysinger 345 kV substation can be further expanded	Good
T009	345, 230S, ONT	345, 230E	significantly higher transfer limits can be achieved if the proposed Dysinger 345 kV substation can be further expanded	Good
T011	230S	-	has potential for higher transfer limits, though the current design does not offer readily available options	Fair
T012	230S, 230E	-	has potential for higher transfer limits, though the current design does not offer readily available options	Fair
T013	345, 230S	345, 230E	significantly higher transfer limits can be achieved and the current design of the Dysinger 345 kV substation already includes a spare bay	Good
T014	345, 230S, 230E	345	significantly higher transfer limits can be achieved if the proposed Dysinger 345 kV substation can be further expanded	Good
T015	345, 230S	345	significantly higher transfer limits can be achieved if the proposed Dysinger 345 kV substation can be further expanded	Good
T017	230S, 230E	345	has potential for higher transfer limits, though the current design does not offer readily available options	Fair

3.3.4 Operability

The NYISO considered how the proposed Public Policy Transmission Projects affect flexibility in operating the system, such as dispatch of generation, access to operating reserves, access to ancillary services, or 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.

3.3.4.1 Controllability

Two project proposals include controllable elements: T013 and T014. T013 proposes to add a phase angle regulator (PAR) at South Perry 115 kV substation, while T014 proposes a PAR at Dysinger 345 kV substation. In particular, the proposed 700 MVA PAR in T014 could regulate the direction and amount of MW flowing on the new 345 kV path between Dysinger and Stolle substation, and thus offer an additional degree of controllability to accommodate different system configurations.

3.3.4.2 Impact to Grid Operations during Construction

The projects that propose to upgrade or expand the existing facilities will likely require longer outages of the lines and substations during construction. For example, until the 345 kV Dysinger substation proposed by some developers would be constructed and energized, the 230 kV lines would be the most constrained elements of Western New York. Long outages of these existing facilities during construction would likely result in higher congestion cost and increasing complexity to operate the grid. Specifically, outages of 230 kV lines 61 Niagara - Packard, 64 Niagara – Robinson Road, and 66 Gardenville – Stolle Road have extensive impacts based on current operating experience.

Table 3-12: Impact to Grid Operations during Construction

,Project	Impact level during construction	Potential Impacted Facilities During Construction
T006	Low	345 kV substations: Niagara, Somerset, Rochester, Stolle Road
T007	Medium	345 kV substations: Niagara, Somerset, Rochester, Stolle Road 230 kV substation: Gardenville
T008	Medium	345 kV substations: Niagara, Somerset, Rochester, Stolle Road 230 kV substation: Gardenville
T009	Medium	345 kV substations: Niagara, Somerset, Rochester, Stolle Road 230 kV substation: Gardenville
T011	High	230 kV substation: Niagara, Packard, Robinson Road
T012	High	230 kV substation: Niagara, Packard, Robinson Road, Gardenville
T013	High	345 kV substations: Niagara, Somerset, Rochester, Stolle Road 230 kV substation: Niagara, Packard, Robinson Road, Gardenville, Stolle Road
T014	Low	345 kV substations: Niagara, Somerset, Rochester, Stolle Road

T015	Low	345 kV substations: Niagara, Somerset, Rochester, Stolle Road
T017	Medium	345 kV substations: Niagara, Stolle Road 230 kV substation: Gardenville, Stolle Road

3.3.4.3 Substation Configuration Assessment

The operability of the proposals was evaluated by the NYISO and also by the independent consultant, SECO. The following factors were considered in evaluating each of the proposals:

1. Level of Integration: Operational preference is for a project to integrate with the existing transmission system to the maximum extent possible. A project using an existing Right-of-Way (ROW) should not bypass existing substations on the ROW except for reasons such as short circuit limitations, space limitations and design perspective where a new substation is desirable.
2. Substation Design Configuration: Operational preference is for substation designs in the following order, notwithstanding the cost of the project: double-breaker-double-bus, a breaker-and-a-half, ring bus, main and transfer bus, sectionalized bus and straight (single) bus.
3. Control of Power Flow: From an operations perspective, a project is preferable if it has the ability to control power flow on the transmission network using devises such as: PAR(s), HVDC capability, FACTS devices, series capacitor compensation and (to a lesser extent) series reactors compensation.
4. Transfer Capability Impact with Project Component out of Service: From an operations perspective, it is desirable for a project not to lose its improvement to transfer capability as a result of the loss of the project's sub-component.

Two substations are most notable in this assessment: Stolle 345 kV and Dysinger 345 kV substation (if applicable). Based on the substation configuration, the findings and comparisons are summarized in Table 3-13 for Stolle 345 kV Substation and Table 3-14 for the new Dysinger 345 kV Substation. "N/A" is noted if a project does not propose modification or new additions to these new substations.

Table 3-13: Stolle Rd 345 kV Substation Arrangement Comparison

Project	# of new Lines and breakers	# of new Transformers (TR)	Proposed Configuration	Notes
T006	1 line, 3 (2 new) breakers	New third 345/115 kV TR connected to Stolle 115 kV	Ring	Three 345/115 kV TR share one breaker at the Stolle 345 kV substation. No connection to Stolle 230 kV substation.
T007	2 lines, 4 (3 new) breakers	New 345/230 kV TR connected to Gardenville	Ring	Existing two 345/115 kV TRs continue to share one breaker at the Stolle 345 kV substation
T008	3 lines, 8 (7 new) breakers	New 345/230 kV TR connected to Gardenville	Breaker & Half	Existing two 345/115 kV TRs continue to share one breaker at the Stolle 345 kV substation
T009	3 lines, 8 (7 new) breakers	New 345/230 kV TR connected to Gardenville	Breaker & Half	Existing two 345/115 kV TRs continue to share one breaker at the Stolle 345 kV substation
T011	N/A			
T012	N/A			
T013	1 line, 10 (9 new) breakers	Two 345/230 kV TR connected to Stolle 230 kV	Breaker & Half	Propose to separate the two existing 230/115 kV TRs by placing additional series breakers in between. The two 345/230 kV TRs are separated by new breakers.
T014	3 lines, 5 (4 new) breakers	0	Ring	Existing two 345/115 kV TRs continue to share one breaker at the Stolle 345 kV substation. No connection to Stolle 230 kV substation.
T015	3 lines, 5 (4 new) breakers	0	Ring	Existing two 345/115 kV TRs continue to share one breaker at the Stolle 345 kV substation. No connection to Stolle 230 kV substation.
T017	1 line, 2 (1new) breakers	0	Straight Bus	Existing two 345/115 kV TRs continue to share one breaker at the Stolle 345 kV substation. No connection to Stolle 230 kV substation.

T017 proposes the simplest solution with a single breaker to connect the new line from Dysinger substation. While the design is sufficient to meet reliability standards, it offers less operating flexibility. T013 proposes the most reliable and flexible system by placing transformers on separate breakers

Table 3-14: Dysinger 345 kV Substation Arrangement Comparison

Developer	# of new Lines and breakers	Proposed Configuration	Notes
T006	5 lines, 8 breakers	breaker & half, 3 bays	Developer proposes completing all site work and fencing for ultimate build-out of the substation. Control house will include space for future expansion.
T007	5 line, 8 breakers	breaker & half, 3 bays	Developer proposes completing all site work and fencing for ultimate build-out of the substation. Control house will include space for future expansion.
T008	6 lines, 9 breakers	breaker & half, 3 bays	Developer proposes completing all site work and fencing for ultimate build-out of the substation. Control house will include space for future expansion.
T009	7 lines, 11 breakers	breaker & half, 4 bays	Developer proposes completing all site work and fencing for ultimate build-out of the substation. Control house will include space for future expansion.
T011	N/A		
T012	N/A		
T013	5 lines, 8 breakers	breaker & half, 3 bays	Developer's proposed layout is based on a known design utilized at a existing substation, and states the switchyard will be designed with space for additional bays. Control house will include space for future expansion.
T014	7 lines, 11 breakers, 700 MVA phase shifting transformer	breaker & half, 4 bays	Developer states that additional area within the proposed parcels could be developed to provide a 230 kV ring bus if necessary
T015	7 lines, 11 breakers	breaker & half, 4 bays	Developer states that additional area within the proposed parcels could be developed to provide a 230 kV ring bus if necessary
T017	N/A	N/A	N/A

T014 and T015 are the only two projects that propose to cut out the 345 kV line loop to Somerset 345 kV substation and bring both 345 kV lines from Somerset 345 kV substation into the Dysinger 345 kV substation. This proposal not only shortens the equivalent impedance from Niagara to Rochester 345 kV but also providing for additional operating flexibility.

3.3.4.4 Dispatch Flexibility

The network configuration, load levels, and generation available for dispatch vary from day to day and sometimes from second to second. While the transfer limit analysis was conducted for the peak load condition assuming all generation available, the analysis in this section identified the range of the incremental transfer limits that could vary due to generation dispatch.

A set of transfer limits with a small standard deviation indicates that the transfers are not strongly affected by changes in the system's generation dispatch, and the incremental transfer limit due to the addition of the proposed project is likely to maintain. In contrast, a set of transfer limits with a large standard deviation means that the project's ability to deliver power is sensitive to the system's generation dispatch.

The transfer limit analysis was performed on the four dispatch sensitivities, and the resulting average transfer limits along with the standard deviation of the transfer limits are summarized in the table below.

Table 3-15: Impact to Grid Operations

Project ID	2014 RPP Transfer Limits		2016 RPP Transfer Limits	
	Average	Standard Deviation	Average	Standard Deviation
T006	500	316	1,440	261
T007	897	146	1,704	210
T008	1,070	89	1,796	142
T009	1,322	113	1,753	138
T011	464	370	216	529
T012	1,336	446	1,431	338
T013	1,381	231	1,482	251
T014	921	132	1,604	210
T015	442	341	1,403	275
T017	1,364	316	1,536	373

3.3.4.5 Summary of Operability Assessment

Table 3-16: Operability Summary

Project	Configuration	Dispatch Flexibility	Controllability	Impact Level during Construction	Ranking
T006	Enhance 345 kV network connectivity in Western NY	Facilitate significant amount of power transfer, and moderately sensitive to generator dispatches	none	Low	Good
T007	Enhance 345 kV and 230 kV network connectivity in Western NY	Facilitate significant amount of power transfer, and moderately sensitive to generator dispatches	none	Medium	Good
T008	Enhance 345 kV and 230 kV network connectivity in Western NY	Facilitate significant amount of power transfer, and less sensitive to generator dispatches	none	Medium	Good
T009	Enhance 345 kV and 230 kV network connectivity in Western NY	Facilitate significant amount of power transfer, and less sensitive to generator dispatches	none	Medium	Good
T011	adequate; advantageous by separating the two lines 61 and 64 on a common tower	Facilitate small amount of power transfer, and extremely sensitive to generator dispatches	none	High	Fair
T012	Enhance 230 kV network connectivity in Western NY; advantageous by separating the two lines 61 and 64 on a common tower	Facilitate significant amount of power transfer, and very sensitive to generator dispatches	none	High	Good
T013	Enhance 345 kV and 230 kV network connectivity in Western NY; advantageous Stolle substation design by separating the 345/115 kV transformers	Facilitate significant amount of power transfer, and moderately sensitive to generator dispatches	The proposed 115 kV PAR at South Perry substation can control the direction and amount of power on the 115 kV path	High	Good
T014	Enhance 345 kV network connectivity in Western NY; advantageous Dysinger substation design by connecting to Somerset 345 kV substation	Facilitate significant amount of power transfer, and moderately sensitive to generator dispatches	The proposed 345 kV PAR at Dysinger substation can control the direction and amount of power on the new 345 kV path	Low	Excellent
T015	Enhance 345 kV network connectivity in Western NY; advantageous Dysinger substation design by connecting to Somerset 345 kV substation	Facilitate significant amount of power transfer, and moderately sensitive to generator dispatches	none	Low	Good
T017	Enhance 345 kV network connectivity in Western NY; less advantageous straight bus design at Stolle Road 345 kV substation	Facilitate significant amount of power transfer, and very sensitive to generator dispatches	none	Medium	Fair

3.3.5 Performance

For the Western NY Need, the performance metric is primarily concerned with Niagara at full output and maximizing import capability from Ontario. Table 3-17 lists the annual flows across the Niagara tie lines plus Niagara generation for each of the projects. The year 2025 was chosen as the evaluation year as all projects would be online at this time. Table 3-17 presents the result of this metric.

Table 3-17: Niagara Gen + Niagara Ties flow in 2025

Project ID	Niagara Gen + Niagara Ties (GWh)
T006	24,165
T007	24,191
T008	24,208
T009	24,368
T011	23,089
T012	23,654
T013	24,198
T014	24,309
T015	24,251
T017	24,224

3.3.6 Production Cost

Presented in this section are the production cost results for the Western New York Public Policy Transmission Projects. Each entry in the following tables represents the differences between the pre-project and post-project over the duration of a project's study period. The study period begins with the proposed in-service date by the developers and goes out 20 years. Entries with a dollar value are listed as 2017 millions of dollars. Scenarios were used to distinguish projects and measure the performance robustness, and blank entries mean that a certain scenario was not a distinguishing factor for that particular project. In general, a negative value (listed in red) is a more positive outcome for the various metrics (*i.e.* reduction in production cost, lower LBMPs, reduced emissions).

Table 3-18 contains the production cost saving in 2017 millions of dollars. Tables 3-19 through 3-22 list the percentage change in zonal LBMP based on the baseline or scenario presented. Tables 3-23 through 3-26 show the load payment change in 2017 millions of dollars. Table 3-28 has the NYCA demand congestion change in 2017 millions of dollars. Lastly, Table 3-28 demonstrates the change in CO_2 emission for the system.

Table 3-18: NYCA Production Cost Saving in 2017 M$

Project ID	Baseline	2017 Baseline	SR on 77/78 In-service	Historical IESO-MISO Flow Modeled	High Fuel	Low Fuel	High Load	Low Load	National CO2 Removed and SR on 77/78 In-service
			Based off 2017 Baseline						
T006	(100)	(101)	(209)	(116)					(106)
T007	(139)	(149)	(231)	(193)	(203)	(139)	(159)	(136)	
T008	(175)	(195)	(230)	(261)					
T009	(216)	(241)	(269)	(322)					
T011	3	1	1	(5)					
T012	(55)	(75)	(75)	(172)					
T013	(205)	(229)	(229)	(308)	(296)	(210)	(277)	(185)	(138)
T014	(201)	(207)	(274)	(243)	(239)	(181)	(219)	(192)	(210)
T015	(101)	(99)	(225)	(98)					(108)
T017	(168)	(207)	(207)	(335)	(288)	(172)	(278)	(147)	(127)

Table 3-19: Baseline LBMP Change in %

Project	West	Genesee	Central	North	Mohawk Valley	Capital	Hudson Valley	Millwood	Dunwoodie	NY City	Long Island
T006	(1.59)%	0.73%	0.36%	0.44%	0.38%	0.02%	0.05%	0.04%	0.04%	0.07%	0.01%
T007	(2.20)%	0.84%	0.43%	0.55%	0.48%	0.11%	0.13%	0.13%	0.13%	0.11%	0.03%
T008	(2.23)%	1.15%	0.68%	0.80%	0.73%	0.35%	0.36%	0.35%	0.35%	0.21%	0.10%
T009	(1.84)%	1.41%	0.97%	1.14%	1.03%	0.71%	0.69%	0.68%	0.68%	0.38%	0.23%
T011	(0.21)%	0.07%	0.03%	0.02%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.02%
T012	(2.42)%	0.89%	0.47%	0.48%	0.47%	0.34%	0.32%	0.33%	0.32%	0.16%	0.10%
T013	(2.11)%	1.31%	0.87%	0.93%	0.89%	0.53%	0.53%	0.52%	0.51%	0.27%	0.17%
T014	(1.21)%	0.53%	0.44%	0.70%	0.55%	0.34%	0.39%	0.40%	0.40%	0.21%	0.13%
T015	(0.96)%	0.25%	0.12%	0.30%	0.17%	(0.06)%	(0.02)%	(0.03)%	(0.02)%	0.02%	0.00%
T017	(1.76)%	1.77%	1.11%	1.14%	1.10%	0.89%	0.81%	0.80%	0.79%	0.38%	0.26%

Table 3-20: Scenario 1 (2017 Baseline) LBMP Change in %

Project	West	Genesee	Central	North	Mohawk Valley	Capital	Hudson Valley	Millwood	Dunwoodie	NY City	Long Island
T006	(1.83)%	0.66%	0.31%	0.38%	0.31%	(0.08)%	(0.05)%	(0.06)%	(0.07)%	(0.01)%	(0.02)%
T007	(2.71)%	0.73%	0.30%	0.41%	0.34%	(0.07)%	(0.05)%	(0.06)%	(0.06)%	0.00%	(0.03)%
T008	(3.02)%	0.91%	0.40%	0.51%	0.45%	0.08%	0.08%	0.07%	0.06%	0.05%	0.03%
T009	(2.79)%	1.07%	0.57%	0.74%	0.64%	0.33%	0.31%	0.31%	0.30%	0.17%	0.15%
T011	(0.21)%	0.08%	0.03%	0.02%	0.02%	0.02%	0.01%	0.01%	0.00%	0.02%	0.02%
T012	(3.14)%	0.70%	0.23%	0.23%	0.23%	0.13%	0.08%	0.09%	0.08%	0.04%	0.06%
T013	(2.91)%	1.05%	0.57%	0.63%	0.59%	0.25%	0.24%	0.23%	0.23%	0.10%	0.11%
T014	(1.61)%	0.37%	0.29%	0.53%	0.39%	0.17%	0.21%	0.21%	0.22%	0.12%	0.11%
T015	(1.13)%	0.18%	0.08%	0.23%	0.11%	(0.14)%	(0.10)%	(0.11)%	(0.11)%	(0.03)%	(0.02)%
T017	(2.91)%	1.42%	0.70%	0.71%	0.69%	0.52%	0.42%	0.41%	0.41%	0.18%	0.20%

Table 3-21: Scenario 2 (SR on 77/78 in for all projects) LBMP Change in %

Project	West	Genesee	Central	North	Mohawk Valley	Capital	Hudson Valley	Millwood	Dunwoodie	NY City	Long Island
T006	(3.02)%	1.17%	0.52%	0.62%	0.56%	0.24%	0.23%	0.23%	0.22%	0.10%	0.09%
T007	(2.94)%	1.18%	0.64%	0.75%	0.69%	0.34%	0.32%	0.32%	0.31%	0.16%	0.15%
T008	(2.97)%	1.21%	0.67%	0.77%	0.71%	0.36%	0.35%	0.34%	0.33%	0.17%	0.14%
T009	(2.71)%	1.19%	0.69%	0.85%	0.76%	0.46%	0.44%	0.43%	0.43%	0.22%	0.20%
T011	(0.21)%	0.08%	0.03%	0.02%	0.02%	0.02%	0.01%	0.01%	0.00%	0.02%	0.02%
T012	(3.14)%	0.70%	0.23%	0.23%	0.23%	0.13%	0.08%	0.09%	0.08%	0.04%	0.06%
T013	(2.91)%	1.05%	0.57%	0.63%	0.59%	0.25%	0.24%	0.23%	0.23%	0.10%	0.11%
T014	(2.50)%	0.54%	0.23%	0.45%	0.33%	0.17%	0.17%	0.18%	0.18%	0.09%	0.09%
T015	(2.74)%	0.67%	0.24%	0.44%	0.33%	0.14%	0.12%	0.13%	0.12%	0.03%	0.05%
T017	(2.91)%	1.42%	0.70%	0.71%	0.69%	0.52%	0.42%	0.41%	0.41%	0.18%	0.20%

Table 3-22: Scenario 7 (no National CO_2 and SR on 77/78 in for all projects) LBMP Change in %

Project	West	Genesee	Central	North	Mohawk Valley	Capital	Hudson Valley	Millwood	Dunwoodie	NY City	Long Island
T006	(2.41)%	0.81%	0.23%	0.57%	0.38%	(0.56)%	(0.39)%	(0.40)%	(0.40)%	(0.16)%	(0.17)%
T007											
T008											
T009											
T011											
T012											
T013	(2.13)%	0.58%	0.21%	0.48%	0.32%	(0.54)%	(0.39)%	(0.40)%	(0.40)%	(0.17)%	(0.16)%
T014	(1.67)%	0.06%	(0.09)%	0.36%	0.13%	(0.51)%	(0.34)%	(0.33)%	(0.33)%	(0.08)%	(0.09)%
T015	(2.10)%	0.28%	(0.02)%	0.40%	0.17%	(0.46)%	(0.34)%	(0.34)%	(0.35)%	(0.13)%	(0.10)%
T017	(1.53)%	0.84%	0.15%	0.36%	0.22%	(0.54)%	(0.42)%	(0.43)%	(0.44)%	(0.20)%	(0.19)%

Table 3-23: Baseline Load Payment Change in 2017 M$

Project	West	Genesee	Central	North	Mohawk Valley	Capital	Hudson Valley	Millwood	Dunwoodie	NY City	Long Island
T006	(110)	37	39	12	21	(1)	2	1	1	30	4
T007	(175)	47	37	14	25	6	7	2	4	41	6
T008	(177)	64	57	20	34	22	20	5	12	66	17
T009	(140)	80	82	27	46	52	43	10	26	135	40
T011	(9)	4	2	0	1	2	(1)	1	(1)	7	4
T012	(219)	54	41	11	19	25	21	5	14	64	22
T013	(181)	76	69	23	40	38	32	8	19	100	36
T014	(89)	29	42	17	26	23	23	6	14	70	22
T015	(51)	11	15	8	11	(8)	(2)	(1)	(2)	11	2
T017	(137)	97	98	25	45	64	49	12	30	130	47

Table 3-24: Scenario 1(2017 Baseline) Load Payment Change in 2017 M$

Project	West	Genesee	Central	North	Mohawk Valley	Capital	Hudson Valley	Millwood	Dunwoodie	NY City	Long Island
T006	(137)	36	38	11	19	(9)	(3)	(1)	(2)	7	(2)
T007	(233)	44	26	11	20	(11)	(5)	(1)	(3)	2	(4)
T008	(260)	54	34	13	23	2	3	0	2	17	6
T009	(237)	64	49	18	31	23	19	5	12	71	26
T011	(10)	5	3	0	1	2	(1)	1	(1)	9	4
T012	(299)	46	18	5	9	8	4	1	4	15	14
T013	(266)	65	43	16	29	17	14	4	9	47	23
T014	(131)	21	29	13	19	9	11	3	7	42	15
T015	(69)	9	13	7	9	(15)	(6)	(2)	(5)	(1)	(3)
T017	(249)	84	65	16	29	40	26	7	17	72	36

Table 3-25: Scenario 2 (SR on 77/78 in for all projects) Load Payment Change in 2017 M$

Project	West	Genesee	Central	North	Mohawk Valley	Capital	Hudson Valley	Millwood	Dunwoodie	NY City	Long Island
T006	(275)	69	52	15	28	17	14	4	9	50	20
T007	(268)	73	56	19	33	24	21	5	13	72	30
T008	(261)	73	58	19	34	26	22	5	14	74	28
T009	(230)	72	60	21	35	35	29	7	18	92	38
T011	(10)	5	3	0	1	2	(1)	1	(1)	9	4
T012	(299)	46	18	5	9	8	4	1	4	15	14
T013	(266)	65	43	16	29	17	14	4	9	47	23
T014	(229)	33	20	11	15	9	9	2	7	39	15
T015	(252)	42	23	11	16	8	6	2	6	18	13
T017	(249)	84	65	16	29	40	26	7	17	72	36

Table 3-26: Scenario 7 (no National CO_2 and SR in for all projects) Load Payment Change in 2017 M$

Project	West	Genesee	Central	North	Mohawk Valley	Capital	Hudson Valley	Millwood	Dunwoodie	NY City	Long Island
T006	(181)	42	24	14	20	(53)	(27)	(8)	(18)	(38)	(20)
T007											
T008											
T009											
T011											
T012											
T013	(157)	31	9	12	18	(52)	(29)	(8)	(18)	(45)	(18)
T014	(123)	3	(9)	9	8	(50)	(26)	(7)	(15)	(23)	(13)
T015	(159)	16	0	10	11	(45)	(26)	(7)	(15)	(39)	(10)
T017	(95)	42	15	8	11	(43)	(26)	(7)	(16)	(52)	(22)

Table 3-27: NYCA Demand Congestion Change in 2017 M$

Project ID	Baseline	2017 Baseline	SR on 77/78 In-service	Historical IESO-MISO Flow Modeled	High Fuel	Low Fuel	High Load	Low Load	National CO2 Removed and SR on 77/78 In-service
			Based off 2017 Baseline						
T006	(413)	(474)	(713)	(1,367)					(827)
T007	(530)	(608)	(735)	(1,767)	(677)	(564)	(735)	(485)	
T008	(607)	(645)	(727)	(1,819)					
T009	(663)	(670)	(704)	(1,690)					
T011	(11)	(13)	(13)	(54)					
T012	(470)	(475)	(475)	(1,293)					
T013	(681)	(710)	(710)	(1,797)	(640)	(705)	(753)	(616)	(724)
T014	(457)	(479)	(582)	(1,184)	(368)	(471)	(460)	(449)	(604)
T015	(313)	(344)	(647)	(1,056)					(713)
T017	(591)	(577)	(577)	(1,662)	(436)	(657)	(636)	(528)	(468)

Table 3-28: System CO_2 Emission Change (1000 tons)

Project ID	Baseline	2017 Baseline	SR on 77/78 In-service	Historical IESO-MISO Flow Modeled	High Fuel	Low Fuel	High Load	Low Load	National CO2 Removed and SR on 77/78 In-service
			Based off 2017 Baseline						
T006	(12,802)	(11,692)	(11,390)	(12,733)					(6,871)
T007	(13,323)	(12,109)	(11,582)	(15,639)	(7,502)	(12,585)	(16,971)	(11,278)	
T008	(12,766)	(11,720)	(11,023)	(19,032)					
T009	(11,874)	(11,373)	(11,061)	(20,967)					
T011	(980)	(378)	(378)	(1,004)					
T012	(3,976)	(2,017)	(2,017)	(6,603)					
T013	(12,564)	(11,305)	(11,305)	(19,182)	(3,541)	(13,647)	(16,732)	(11,056)	(7,505)
T014	(6,059)	(6,473)	(7,362)	(12,050)	(1,202)	(6,452)	(6,049)	(4,860)	(177)
T015	(10,892)	(10,067)	(10,681)	(12,482)					(4,747)
T017	(9,982)	(11,104)	(11,104)	(19,795)	(2,312)	(14,851)	(19,068)	(10,102)	(7,625)

3.3.7 Property Rights and Routing

For each project, the NYISO reviewed whether the developer already possesses the right of way (ROW) necessary to implement the project or has specified a plan or approach for determining routing and acquiring property rights. In assessing the availability of real property rights for each proposed project, the NYISO relied on its independent consultant, SECO, along with the knowledge of the New York State Department of Public Service (DPS) and information provided by the

Transmission Owner(s) in the applicable Transmission District(s). The NYISO and SECO also reviewed, in consultation with the DPS, transmission routing studies provided by the developers that may identify routing alternatives and land-use or environmentally sensitive areas, such as wetlands, agriculture, and residential areas.

SECO reviewed the developers' property rights acquisition plans associated with the proposals using the developers' projects information submitted in the Viability & Sufficiency Assessment process and additional information provided by developers in response to a request for additional information relating to property rights and sighting.

SECO found that the following items were common among all proposals in their property rights acquisition process:

- Use existing ROW as much as practicable.
- 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.

All of the non-incumbent developers claim the following two common rights to assist in obtaining property:

- Developers cite the December 17, 2015 PSC 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. In that order, the PSC stated its expectation that incumbent transmission owners will act in a reasonable manner to negotiate access to and usage of their ROWs for the selected transmission project.
- If negotiations with private land owners are unsuccessful, developers have asserted that they believe under New York State Law they would have or obtain eminent domain authority after certification of a route by the PSC.

Concerning routing, SECO reviewed developers' proposals for routing their transmission lines and substations to identify where new property rights would need to be acquired. SECO derived estimates for property from recent comparable sales and tax assessments in the town and county where the property would be located.

A summary of SECO's review on property rights for all projects is presented in Table 3-29. Table 3-30 presents summary results for new transmission line ROW. Details on Substation property analysis can be found in Appendix E.

Table 3-29: Summary of Review of Property Rights

Project ID	Property Rights Acquisition
T006 T007 T008 T009	NAT does not yet possess all 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 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)". There are a few minor parcels that will need to be obtained for the project T012, while National Grid already owns the property required for T011. As a New York utility, National Grid has a demonstrated history of negotiating and obtaining ROW for its transmission system, and will own all assets included within its proposal.
T013	Most property rights for this proposal are already owned by the developer except for the ROW owned by National Grid, and 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. NYPA will own, operate and maintain all assets for the Dysinger Switching Station, the 345 kV Dysinger to Stolle Rd T-line, and the additions at Niagara Station. NYSEG will own, operate and maintain the remaining assets within the proposal.
T014 T015	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 Rd substations. They have provided an alternative plan to obtain all new ROW between Dysinger and Stolle Rd should they not be able to obtain rights to the incumbent utility ROW. 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 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.

Table 3-30: Summary of Review of new Transmission Lines Routing

PROPOSAL	DEVELOPER	SEGMENT	NEW RIGHT OF WAY (ROW) COMMER AREA (ACRES)	NEW RIGHT OF WAY (ROW) RESIDENTI AREA (ACRES)	NEW RIGHT OF WAY (ROW) AGRICULT AREA (ACRES)	SUB-TOTAL AREA (ACRES)	TOTAL ROW REQUIRED AREA (ACRES)	TOTAL ROW REQUIRED COST	COMMENTS
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

3.3.8 Potential Construction Delay

The NYISO evaluated developers' schedules for project completion first as part of the Viability and Sufficiency Assessment to determine whether projects were feasible. During the evaluation stage, the NYISO conducted a more in-depth analysis of the project schedules of the viable and sufficient transmission projects to determine the accuracy of schedules provided to the NYISO and the likelihood of project delay. For this purpose, the NYISO used the more detailed engineering and design information as required in Section 31.4.8.1.7 of Attachment Y to the OATT.

The NYISO contracted SECO to evaluate the schedules for each proposed Public Policy Transmission Project for potential construction delay. SECO focused on the proposed durations of the tasks in each developer's project schedule. Based on this evaluation, SECO independently determined its own time estimates for a project schedule for each project and compared it to the developer's proposed project duration. SECO conducted this evaluation based on its expertise and experience with transmission lines and substation projects in New York State and comparison to actual Article VII projects completed. Appendix E provides greater details on the evaluation of the project schedules.

Summary results of the evaluation of the project schedules are presented in Table 3-31. The independent minimum duration was 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. The independent minimum duration is the absolute best case and is shown for comparative purposes.

Table 3-31: Results of Evaluation of the Projects Schedules

Project ID	Independent Minimum Duration Estimate: months
T006	40
T007	59
T008	65
T009	71
T011	57
T012	60
T013	44
T014	40
T014_Alt	49
T015	40
T015_Alt	49
T017	66

3.4 Consequences for Other Regions

In addition to its evaluation to identify the more efficient or cost effective solution to the identified Public Policy Transmission Need, the NYISO also coordinates with neighboring regions to identify the consequences, if any, of the proposed transmission solutions on the neighboring regions using the respective planning criteria of such regions.

Through the NYISO Transmission Expansion and Interconnection Process and the associated system impact studies currently in progress, the NYISO is consulting with the IESO and PJM concerning any potential impacts due to the proposed Western NY transmission projects. Preliminary results from the system impact studies indicate minimal impacts on the neighboring systems from most of the proposed projects. If material impacts are identified for a proposed transmission project, the Transmission Expansion and Interconnection Process would identify the necessary upgrades, and the results will be incorporated into this report.

3.5 Impact on Wholesale Electricity Markets

The NYISO evaluates the impact of proposed viable and sufficient Public Policy Transmission Projects on its wholesale electricity markets, using economic metrics including change in production cost, congestion, and load payments.[18] Based on the transfer and production cost analysis results described in Sections 3.3.2 and 3.3.6, the proposed transmission projects all tend to increase the Ontario to New York transfer capability and reduce congestion. Therefore, the NYISO staff has determined that the viable and sufficient Public Policy Transmission Projects proposed to address the Western NY Need will have no adverse impact on the competitiveness of the New York wholesale electricity markets. Rather, the transmission projects all tend to improve the competitiveness of the NYISO's markets by increasing system transfer capability, allowing more resources and suppliers to compete to serve loads. The review from the NYISO's Market Monitoring Unit is included in Appendix F. [19]

3.6 Non-BPTF Upgrades Addressed by National Grid

In accordance with the PSC's October 2016 Order, National Grid identified the non-BPTF projects that it will undertake to upgrade its Niagara – Packard Line #193 and Niagara – Packard Line #194 115 kV transmission lines. National Grid reported to the NYISO that it will reconductor those lines, in addition to replacing approximately 17 towers and other hardware, and make associated substation changes. In evaluating each developer's project in relation to achieving the objectives of the Western NY Need on the BPTF, the NYISO modeled these upgrades as completed in the evaluation of each proposed transmission project. Based upon the information from National Grid on reconductoring the #193 and #194 lines, the relief of the pre-existing non-BPTF overloads

[18] *See* OATT Sections 31.4.10 and 31.4.8.1.9.

[19] See OATT Section 31.4.11.1 ("the draft report will be provided to the Market Monitoring Unit for its review and consideration").

will be undertaken in the same manner regardless of which proposed project is selected by the NYISO. In its order confirming the Western NY Need, the PSC determined that the costs of resolving the non-BPTF overloads should not be a distinguishing factor among project proposals.[20] Accordingly, the NYISO did not include the costs of reconductoring the #193 and #194 lines, or the costs of any other non-BPTF project elements that were included to address the identified non-BPTF overloads in the costs used to compare the costs of each of the developers' projects.[21]

3.7 Evaluation of Interaction with Local Transmission Owner Plans

In the NYISO's Public Policy Transmission Planning Process, the NYISO is required to review the Local Transmission Owner Plans (LTPs)[22] as they relate to the BPTF to determine whether any proposed regional Public Policy Transmission Project on the BTPF can (i) more efficiently or cost-effectively satisfy any local needs driven by a Public Policy Requirement identified in the LTPs, or (ii) might more efficiently or cost-effectively satisfy the identified regional Public Policy Transmission Need than any local transmission solutions driven by Public Policy Requirements identified in the LTPs.

The Transmission Owners' current LTPs have not identified any needs driven by a Public Policy Requirement in New York State. Accordingly, the NYISO determined that there are no proposed regional Public Policy Transmission Projects that could more efficiently or cost-effectively satisfy a need driven by a Public Policy Requirement identified in an LTP. In the absence of any public policy needs in the LTPs, it is also not necessary for the NYISO to determine whether a regional transmission project would more efficiently or cost effectively satisfy such a transmission need on the BPTF than a local transmission solution.

In the transfer analysis described in Section 3.2.1, the NYISO monitored the non-BPTF portion of the Bulk Electric System (BES) up to STE ratings and determined if the loss of the non-BPTF element would cause other facilities to be overloaded. The NYISO also performed transfer analysis monitoring the non-BPTF portion of the BES to LTE ratings. Under such conditions, some Western New York 115 kV lines are overloaded at higher Ontario to New York transfer levels. The

[20] October 2016 Order, at p 17.

[21] The NYISO readily identified and back out those elements of the developer's projects that were included to address the preexisting non-BPTF overloads.

[22] *See* Section 31.2.1.1.2.1 of the OATT.

Western New York Public Policy Transmission Projects do reduce the overloads on the 115 kV lines, but they do not necessarily eliminate the overloads at high transfer levels.

4. Conclusions and Recommendations

4.1 Summary of Project Evaluations

In determining which of the proposed Public Policy Transmission Projects is the more efficient or cost effective solution to satisfy the Public Policy Transmission Need, the NYISO considers each Public Policy Transmission Project's total performance under all of the selection metrics (described in Section 3 of this report) in making its determination. The evaluation includes scenarios which modify the assumptions to evaluate the proposed Public Policy Transmission Projects according to the selection metrics and the impact on NYISO wholesale electricity markets.

Table 4-1 provides a summary of results for each metric evaluated for the Western NY Need and is color-coded such that the best values are highlighted green, average values are highlighted in yellow, and low values are highlighted in red. This table does not comprehensively cover all evaluations documented in this report, but offers a high-level summary of the relative performance of each project for each metric using the primary study assumptions. No single metric or set of assumptions acts as a deciding factor in determining the more efficient or cost effective transmission solution.

Table 4-1: Summary of Results

Project ID	Independent Capital Cost Estimate: 2017 $M	Independent Duration Estimate: months	Ontario-NY Transfer Limit: MW	Cost per MW: $M/MW	Production Cost Savings: 2017 $M	Production Cost Savings / Cost	System CO_2 Emission Reduction: 1000 tons	Performance: Niagara Gen + Niagara Ties in 2025: GWh	Operability	Expandability	Property Rights
T006	158	40	1,440	0.11	209	1.3	11,390	24,165	Good	Good	Existing ROW
T007	276	59	1,704	0.16	231	0.8	11,582	24,191	Good	Good	Existing and new ROW
T008	348	65	1,796	0.19	230	0.7	11,023	24,208	Good	Good	Existing and new ROW
T009	479	71	1,753	0.27	269	0.6	11,061	24,368	Good	Good	Existing and new ROW
T011	182	57	216	0.84	(1)	0.0	378	23,089	Fair	Fair	Existing ROW
T012	432	60	1,431	0.30	75	0.2	2,017	23,654	Good	Fair	Existing ROW
T013	232	44	1,482	0.16	229	1.0	11,305	24,198	Good	Good	Existing ROW
T014	177	40	1,604	0.11	274	1.5	7,362	24,309	Excellent	Good	Existing ROW
T014_Alt	219	49	1,604	0.14	274	1.2	7,362	24,310	Excellent	Good	New ROW as alternative
T015	158	40	1,403	0.11	225	1.4	10,681	24,251	Good	Good	Existing ROW
T015_Alt	200	49	1,403	0.14	225	1.1	10,681	24,251	Good	Good	New ROW as alternative
T017	286	66	1,536	0.19	207	0.7	11,104	24,224	Fair	Fair	Existing and new ROW

4.2 Ranking

Based on the NYISO staff's consideration of all the evaluation metrics for efficiency or cost effectiveness, the Western New York Public Policy Transmission Projects are divided into two tiers based on their performance relative to their cost. Three metrics that significantly impacted this tiered ranking are (1) the total capital cost, (2) the production cost savings relative to the total capital cost, and (3) the cost per MW ratio for the increased Ontario to New York thermal transfer limits over the Niagara Ties. The Tier 1 projects are T006, T013, T014, and T015.

The objective of this planning process under FERC Order No. 1000 is to identify the more efficient or cost effective transmission solution to the identified need, which does not necessarily equate to the least cost solution. However, the total capital cost of the project is a highly important factor to consider independently and in considering the project's electric system performance. The four Tier 1 projects are among the five lowest cost projects. Other Tier 2 projects may be less expensive with fewer benefits, or more expensive without sufficient corresponding benefits. These observations are captured through production cost savings and transfer limit increases.

While there is no requirement for any project to exceed any specific threshold for the ratio of production cost savings over the total capital cost of the project, a ratio value greater than or equal to 1.0 indicates significant economic advantages for such a project. The four Tier 1 projects achieve significant production cost savings resulting in a ratio of 1.0 or greater, while the remaining Tier 2 projects result in a ratio lower than 1.0 due to less benefits and/or higher costs.

For the purpose of calculating cost per MW, the NYISO calculated the Ontario to New York thermal transfer limits across the Niagara ties for each project and compared that to the total capital cost, as described in section 3. NYISO staff observed a tight grouping of the same four Tier 1 projects in the range of 0.11 to 0.16 $M/MW, while other projects exhibited diminishing MW benefits for each dollar spent. These findings support assigning the top four projects to Tier 1.

Listed below are the two Tiers and the projects assigned to each category:[23]

Tier 1 projects:

- T006: North America Transmission Proposal 1
- T013: NYPA/NYSEG Western NY Energy Link
- T014: NextEra Energy Transmission New York Empire State Line Proposal 1

[23] The individual lists are in order by project number; the order is not indicative of their final ranking.

- T015: NextEra Energy Transmission New York Empire State Line Proposal 2

Tier 2 projects:

- T007: North America Transmission Proposal 2
- T008: North America Transmission Proposal 3
- T009: North America Transmission Proposal 4
- T011: National Grid Moderate Power Transfer Solution
- T012: National Grid High Power Transfer Solution
- T017: Exelon Transmission Company Niagara Area Transmission Expansion

4.3 Selection Recommendation

[THIS SECTION WILL BE COMPLETED FOLLOWING REVIEW AND DISCUSSION WITH ESPWG & TPAS]

Based on consideration of all the evaluation metrics for efficiency or cost effectiveness, and consideration of input from stakeholders, the NYISO staff recommends for selection **T### - <NAME>** as the more efficient or cost effective transmission solution to satisfy the Western New York Public Policy Transmission Need. The in-service date for the selected project shall be **MM-DD-YYYY**.

The NYISO staff determined that **T###** is the more efficient or cost effective transmission solution because… **[TO BE DETERMINED]**.

Appendices

Appendix A – Public Policy Transmission Planning Process Glossary

Appendix B – The Public Policy Transmission Planning Process

Appendix C – Western New York Public Policy Transmission Planning Need Viability and Sufficiency Assessment

Appendix D –Phase 2 Selection Assumptions

Appendix E –SECO Report

Appendix F –Market Monitoring Unit Report