Western New York Public Policy Transmission Planning Report

A Report by the
New York Independent System Operator

DRAFT for ~~Business Issues~~Management Committee
September ~~5~~20, 2017

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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. It 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. The NYISO conducted extensive evaluations of the proposed transmission projects and recommends the ranking and selection of the more efficient or cost effective transmission solution to the Western New York need as described herein.

The NYISO commenced the Public Policy Transmission Planning Process for the first time by soliciting proposed transmission needs driven by Public Policy Requirements from NYISO's stakeholders and other interested parties. The NYISO filed the proposed transmission needs for consideration by the PSC, which, upon considering various comments submitted, issued an order that found "significant environmental, economic, and reliability benefits could be achieved by relieving the transmission congestion identified in Western New York." The PSC, 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 conducted the Viability and Sufficiency Assessment for 12 projects to address the need, and identified ten viable and sufficient projects. The NYISO also 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 the 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, development 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 $157 million to $487 million, with schedules ranging from 40 months to 71 months following the NYISO's 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 0.82 $M/MW, with an average of 0.23 $M/MW. Further, the increased transfer capability and relief of 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 can 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, and the ability to remove transmission for maintenance. Certain projects afford greater expandability opportunities through substation design and transmission line configurations, while other projects offer greater operability of the system through the use of controllable devices or better integration of facilities with the overall system.

Based on consideration of all the evaluation metrics for efficiency or cost effectiveness, the NYISO first distinguished the proposed projects 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:

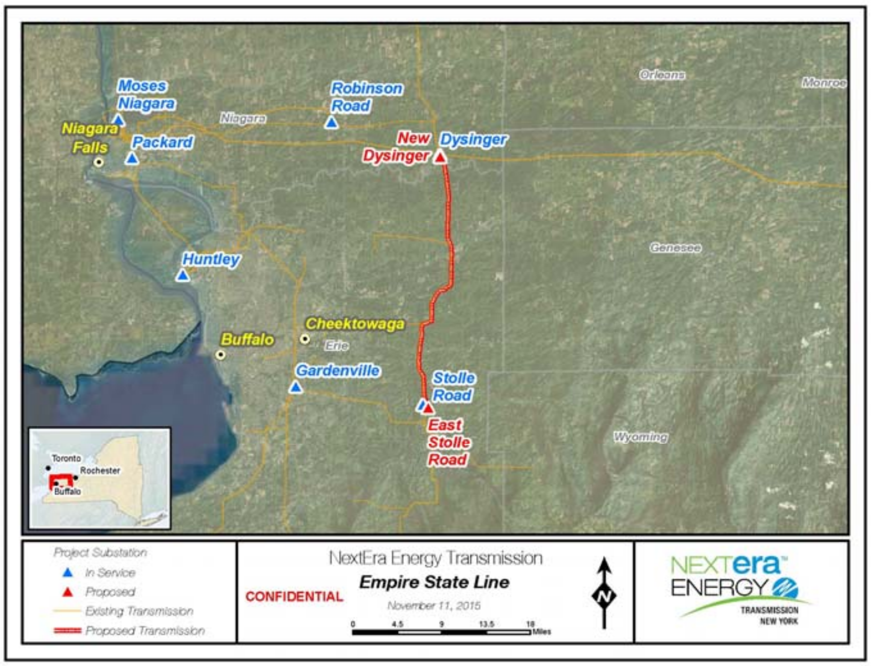
- T006: North America Transmission Proposal 1
- T013: NYPA/NYSEG Western NY Energy Link
- T014: NextEra Energy Transmission New York Empire State Line Proposal 1
- T015: NextEra Energy Transmission New York Empire State Line Proposal 2

Based on consideration of all the evaluation metrics for efficiency or cost effectiveness, together with input from stakeholders, the NYISO staff recommends that the NYISO Board selects NextEra Energy Transmission New York Empire State Line Proposal 1 (T014) as the more efficient or cost effective transmission solution to satisfy the Western New York Public Policy Transmission Need. Figure E-1 is a map showing the location of the components proposed by T014.

T014 proposed a new Dysinger 345 kV substation, a new East Stolle 345 kV switchyard, and a

345 kV line connecting Dysinger and East Stolle substations. The Dysinger substation will connect a total of seven 345 kV lines: two existing lines from Niagara, two existing lines to Rochester, two existing lines to Somerset, and the new line to East Stolle Road. The new East Stolle 345 switchyard will be built next to the existing 345 kV Stolle Road substation. In addition, a 700 MVA 345 kV phase angle regulator (PAR) is proposed at the Dysinger end of the Dysinger - East Stolle Road 345 kV line.

Figure E-1: Map of the NextEra Energy Transmission New York Empire State Line



Compared with other Tier 1 projects, T014 more efficiently utilizes both the existing and proposed transmission facilities. The proposed Dysinger substation would become the new 345 kV hub in Western New York where seven 345 kV lines are connected, and electrically reduce the distance for the existing Niagara to Rochester 345 kV transmission corridor. The proposed PAR at the Dysinger substation provides additional operational flexibility by providing a new level of controllability to power flows on the 345 kV network. Furthermore, the estimated overnight capital cost for T014 is among the lowest of the Tier 1 projects. Combining the physical design and the overnight capital cost, T014 demonstrates relatively lower cost per MW ratio among the projects and the highest production cost saving over the cost ratio across all scenarios. Even when the proposed PAR is bypassed, T014 still demonstrates significant benefits. Based on SECO's evaluation, there are no critical risks identified regarding siting, equipment procurement, real estate acquisition, construction, and scheduling. Therefore, the NYISO staff determined that T014 is both the more efficient and cost effective transmission solution to satisfy the Western NY Public Policy Transmission Need.

Based on the project schedule evaluated by SECO, the required in-service date for the selected project is June 2022. Following the approval of this report by the Board of Directors, the NYISO will tender a Development Agreement to the Developer of the selected transmission project.

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 "[i]ncreased 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 NYPA'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 at 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.[7]

2.2 Development of Solutions

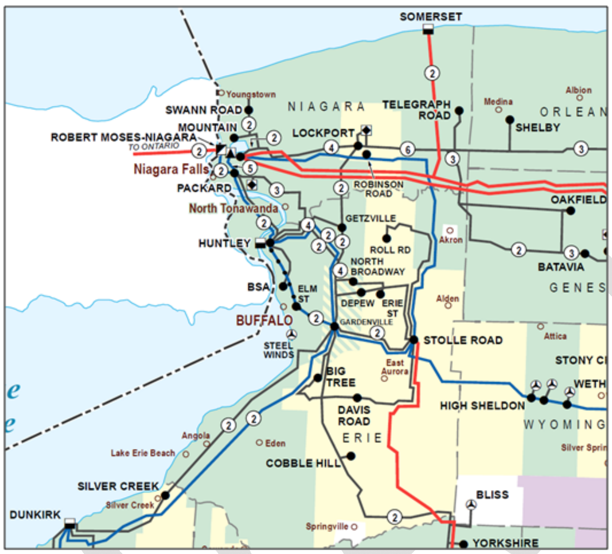
Throughout the months of August, September, and October 2015, the NYISO performed analyses to establish a baseline of constraints on the Western New York transmission system against which proposed projects would be measured. The NYISO presented these analytical baselines to stakeholders and obtained 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

[7] As described in Section 3.3, the NYISO considered the PSC's additional metrics regarding changes in production costs, location-based marginal prices, emissions, energy deliverability, Transmission Congestion Contract revenues and transmission congestion in the context of the GE MAPS analysis, which provided results for each of these metrics. As set forth in Section 3.3, capacity savings was not a distinguishing factor in selection for the Western New York Need. The NYISO considered impacts on transfer limits across the system throughout its analyses examining and comparing the relative ability and benefits of each viable and sufficient project to meet the need.

regarding the nature of the overloads.[8]

Figure 2-1: Western New York Transmission Map



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

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%

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
ST = Steam Turbine
OPPP = Other Public Policy Project
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.[9] [10] This assessment is included in this report as Appendix B.[11]

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 owners 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

[9] 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.

[10] 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 Section 31.4.1; http://www.nyiso.com/public/markets_operations/services/planning/planning_studies/index.jsp.

[11] 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.[12] 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.[13] 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

[12] 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 p 17.

[13] 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."[14] 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.[15]

2.5 Local Transmission Plan Updates and PSC-Directed Upgrades

Certain system updates were completed in Western New York outside the Public Policy Transmission Planning Process following the Viability and Sufficiency Assessment. NYSEG updated its Local Transmission System Plan to upgrade the terminals for the Gardenville – Stolle Road 230 kV Line #66, which were placed in service in October 2016. The South Perry 230/115 kV transformer was considered in the analysis based upon approval of the System Impact Study by the Operating Committee in May 2017 and its expected entry into service by 2019. The NYISO also included certain non-BPTF upgrades directed by the PSC Order issued on October 13, 2016. The PSC directed National Grid to undertake the upgrades necessary on the Gardenville-Depew 115 kV #54 line, which is expected to be in service in 2019, and the Niagara-Packard 115 kV #193 line and #194 line, which National Grid will reconductor during the construction period for the selected transmission project. The NYISO considered these updates and upgrades in the base cases for all of the projects on an equal basis. Moreover, consistent with the October 2016 Order, the NYISO did not use these updates and upgrades as a distinguishing factor between competing projects.[16]

[14] October 2016 Order, at p 17.

[15] October 2016 Order, at p 17.

[16] The NYISO identified and backed out those elements of the Developer's projects that were included to address the pre-existing non-BPTF overloads on lines #54, #193 and #194.

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

The NYISO determined that ten transmission solutions are viable and sufficient. 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.

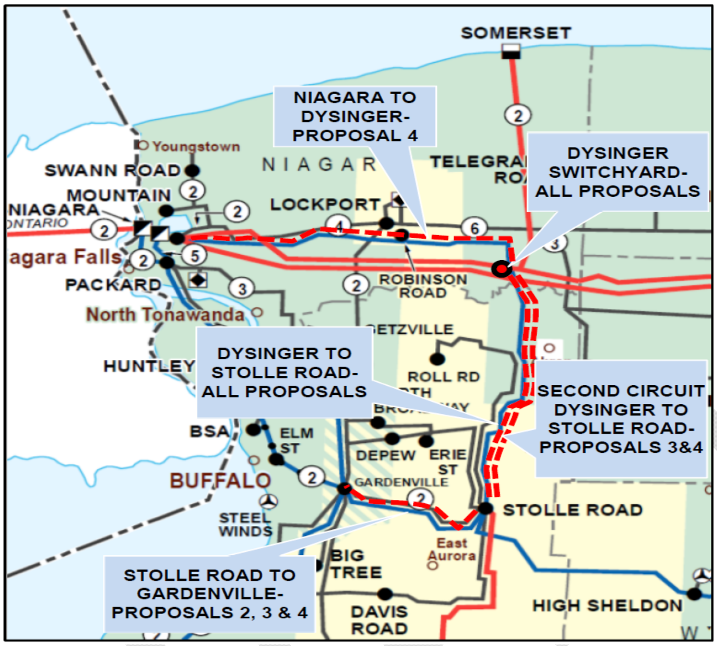
North America Transmission Proposal #1 includes the following components:

- 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 by the Developer:

- 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 by the Developer:

- 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

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 by the Developer:

- 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

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 proposed system upgrades by the Developer:

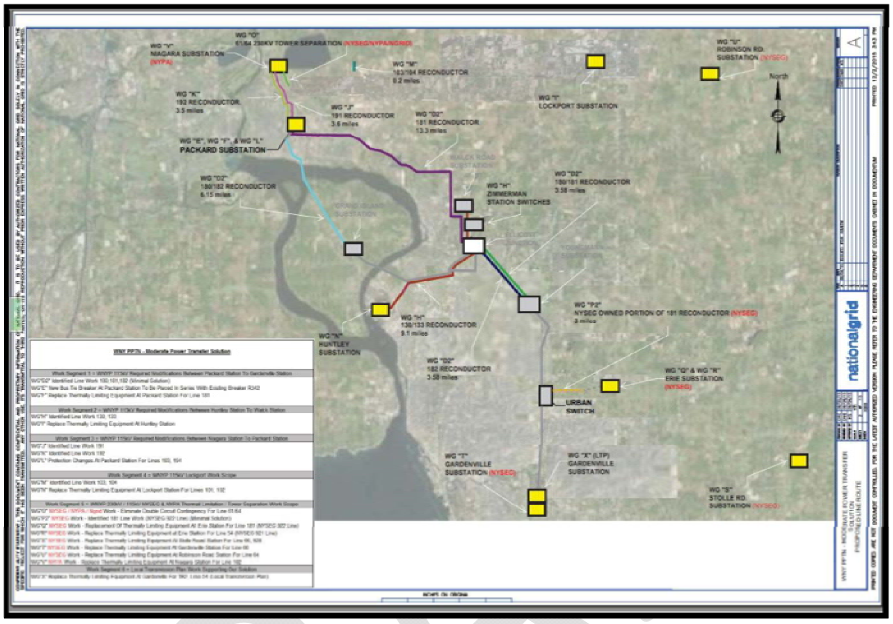
- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV line reconductoring
- Roll Road 115/34.5 kV transformer replacement
- Lockport to Shaw 115 kV terminal upgrades

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



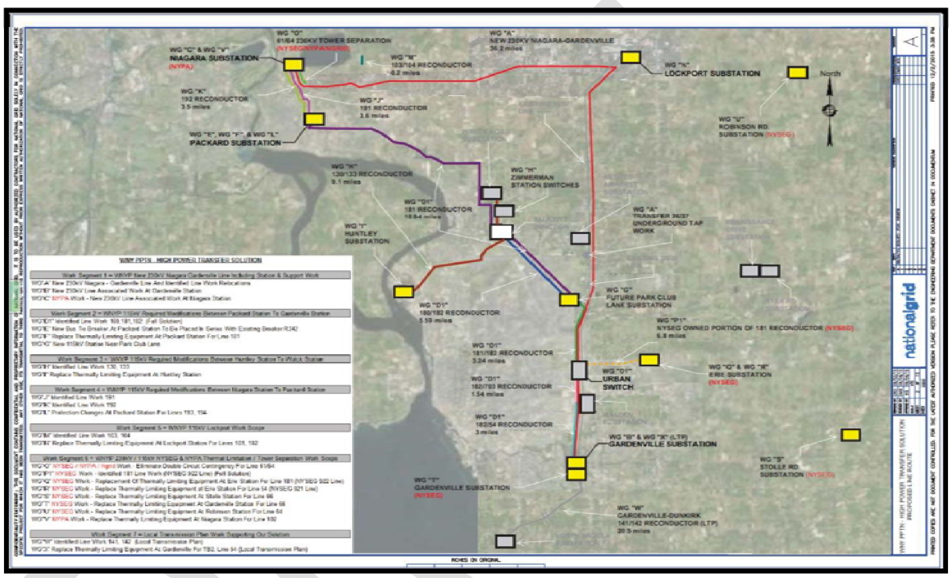
3.1.6 T012: National Grid – High Power Transfer Solution

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:
  - o Niagara/Packard-Gardenville 115 kV (180, 181, 182) reconductoring ("Full solution")
  - o Niagara-Packard (191, 192) reconductoring
  - o Packard-Huntley (130, 133) partial reconductoring
  - o Niagara-Lockport (103, 104) partial reconductoring

- o 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



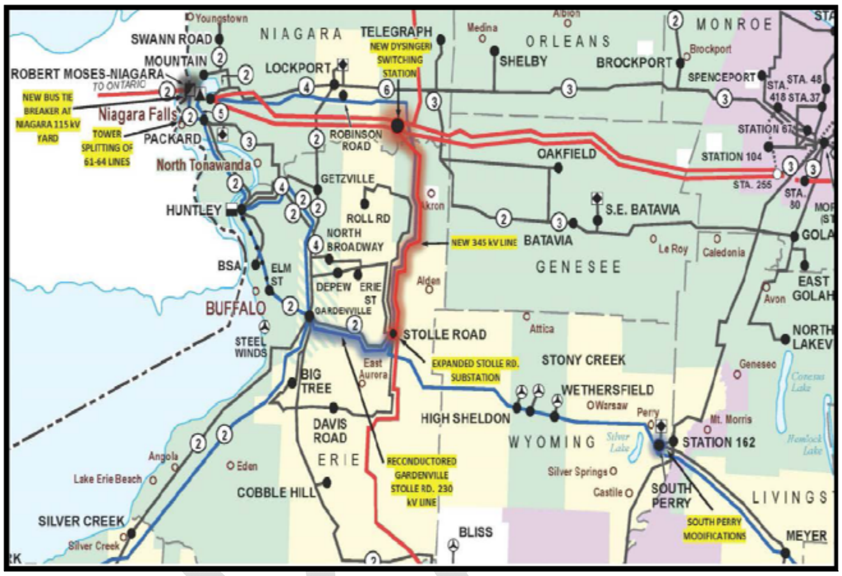
3.1.7 T013: NYPA/NYSEG – Western NY Energy Link

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
- Two new 345/230 kV transformers at Stolle Road

- Tower separation of 61/64 230 kV lines at Niagara
- 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:

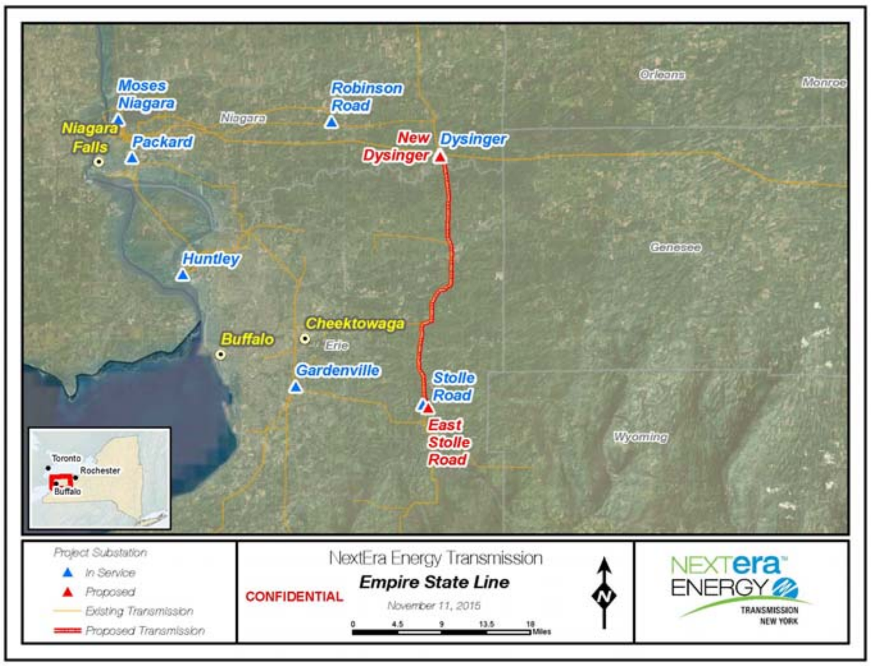
- New Dysinger 345 kV Switchyard (loops in Niagara-Somerset & Niagara-Rochester 345 kV lines, and cuts out the 345 kV line loop to Somerset 345 kV)
- New East Stolle Switchyard (near Stolle Road substation)
- New Dysinger-East Stolle 345 kV line with 700 MVA PAR on Dysinger end and a shunt reactor at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

Below are proposed system upgrades by the Developer:

- Depew to Erie 115 kV terminal upgrades

- Swann Road to Shawnee Station 115 kV (~12 miles line reconductoring)
- Stolle Road to Roll Road 115 kV terminal upgrades
- 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 system upgrades proposed by the Developer:

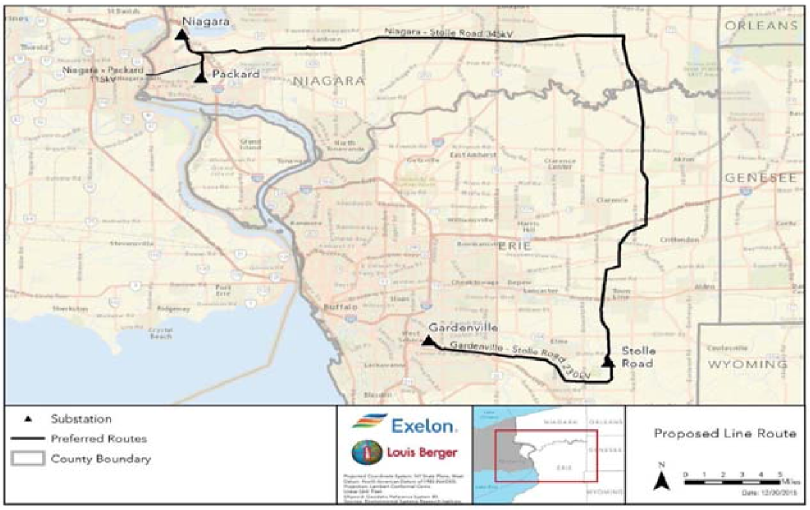
- Depew to Erie 115 kV terminal upgrades
- Swann Road to Shawnee Station 115 kV (~12 miles line reconductoring)
- Stolle Road to Roll Road 115 kV terminal upgrades
- 100 MVAR shunt reactor at Rochester

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)
- Depew to Erie 115 kV terminal upgrades

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 consideration 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.

Three major types of analysis were conducted in evaluating quantitative metrics: transfer limit analysis, resource adequacy analysis, and production cost simulation. The study method, assumptions, and the metrics evaluated by the study method are described in the following sections. The results of these analyses are described in Section 3.3.

3.2.1 Transfer Limit Analysis

Transfer limit analysis evaluates the amount of power that can be transferred across an interface while observing applicable reliability criteria. The results of transfer limit analysis were used in the evaluation of metrics such as cost per MW, operability, and expandability.

Based on the nature of 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 the BPTF were monitored while simulating design contingency events. During transfer analysis, the NYISO also 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 determined if the loss of the non-BPTF would cause other facilities to be overloaded. If the affected facility's loss caused 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 determined 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 system that was updated from the case that was used in the Western New York Public Policy Transmission Need Viability and Sufficiency Assessment with the updates and upgrades described in Section 2.5. The NYISO made specific updates to the power flow cases as used in the Viability and Sufficiency Assessment for the baseline transfer analysis. 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 B describes the detailed assumptions used in the Viability and Sufficiency Assessment.

Consistent with the Viability and Sufficiency Assessment, the baseline transfer analysis 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 considered two dispatches for wind farms on Stolle Road – Hillside 230 kV path: 0% and 100% of nameplate power.

Developers of Public Policy Transmission Project were given the option to elect whether 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 each Developer.

3.2.1.2 Scenario Transfer Analysis

The NYISO performed a transfer analysis scenario based on the latest 2016 Reliability Planning Process[17] (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 case included 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.

[17] 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.

3.2.2 Resource Adequacy Analysis

Resource adequacy is the ability of the electric systems to supply the aggregate electricity demand and energy requirements of the customers at all times, taking into account scheduled and unscheduled outages of system elements. The NYISO performed a resource adequacy evaluation of the New York power system for the Western NY Need. The 2016 RPP base cases were used as a starting point and the NYCA load forecast was extended 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 meet reliability criteria. Due to the differing nature 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's years. LOLE violations were identified starting in 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; therefore, any additional transmission in Western New York will not assist in meeting a resource adequacy need. The ICAP metric calculated in the CARIS process consists of two steps. First, the MW impact of a project is determined through the change in system LOLE before and after the 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 relaxed 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 level of capacity savings resulting from each project is not a significant distinguishing factor between the proposed transmission projects.

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. The results of production cost analysis were used in the evaluation of metrics such as cost per MW, production cost savings, production cost saving/cost ratio, system CO_2 emission reduction, LBMP, load payment, and performance.

3.2.3.1 Baseline

The Western NY Need production cost analysis baseline case is derived from the 2016 CARIS Phase 2 database.[18] 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.[19]

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 (IESO) into NYISO were modeled as dynamic rather than capped to a fixed interface limit based on historical flow.

Due to the longer study period of the Western NY baseline case, the load, fuel, and emissions forecasts were extended. While the fuel and emissions forecasts would affect the four-pool system in the Northeast (IESO, ISO-NE, NYISO, and PJM), the NYISO was able to model load forecast extensions only for the NYISO. Load forecasts for the external control areas only range from 2016 to 2024 consistent with the CARIS methodology. Therefore, after 2024, the NYISO held external control area loads 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.

[18] 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.

[19] 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, andhttp://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

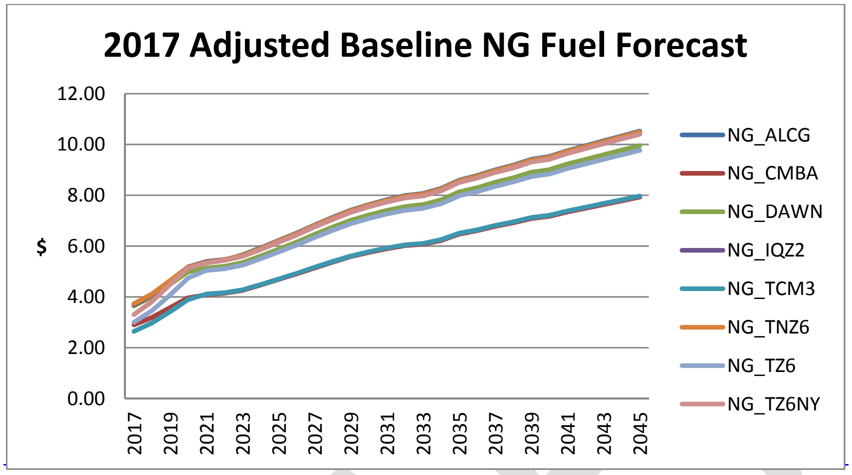
The baseline load forecast and fuel costs were updated according to the 2017 Load and Capacity Data Report and the latest natural gas forecast. Table 3-2 and Figure 3-7 show the load and fuel forecast data. Similar to the baseline, this scenario modeled the series reactors on Packard to Huntley 230 kV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

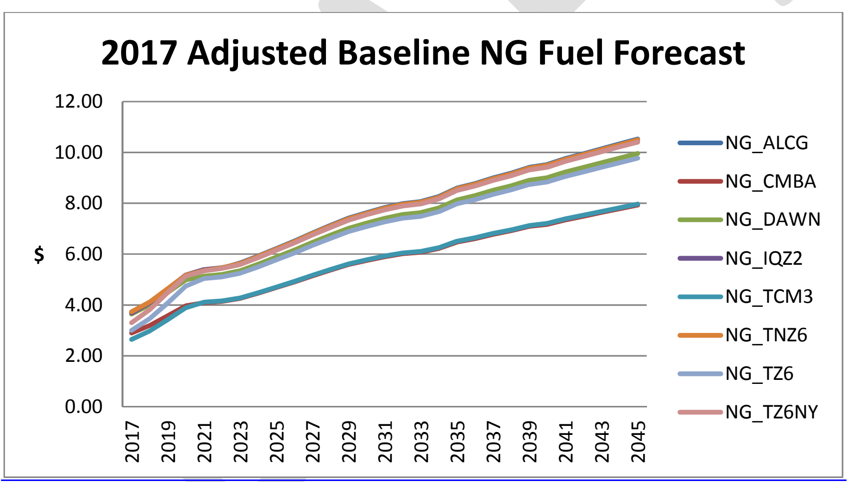
Table 3-2: NYCA Load Forecast

NYCA Energy & Peak Forecast

	2017 Adjusted Baseline	
Year	Energy (GWh)	Peak (MW)
2017	160,477	33,628
2018	160,588	33,708
2019	160,543	33,773
2020	160,375	33,831
2021	159,864	33,926
2022	159,778	34,015
2023	159,899	34,128
2024	159,963	34,229
2025	160,030	34,346
2026	160,106	34,471
2027	160,295	34,574
2028	160,758	34,862
2029	161,235	35,069
2030	161,749	35,277
2031	162,277	35,484
2032	162,876	35,702
2033	163,562	35,935
2034	164,290	36,172
2035	165,053	36,412
2036	165,791	36,641
2037	166,509	36,859
2038	167,232	37,073
2039	167,968	37,284
2040	168,787	37,509
2041	169,588	37,730
2042	170,371	37,946
2043	171,194	38,174
2044	172,030	38,405
2045	172,922	38,651

Figure 3-7: Natural Gas Forecast (Nominal $)





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. 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.

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. It also 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. Scenarios #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 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 (Nominal $)

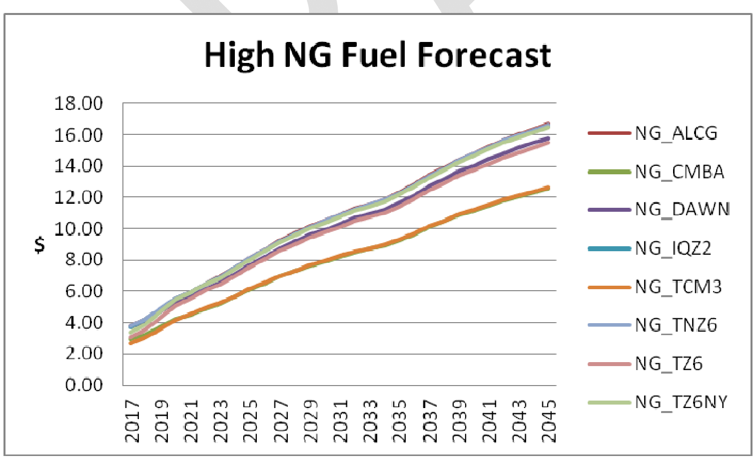
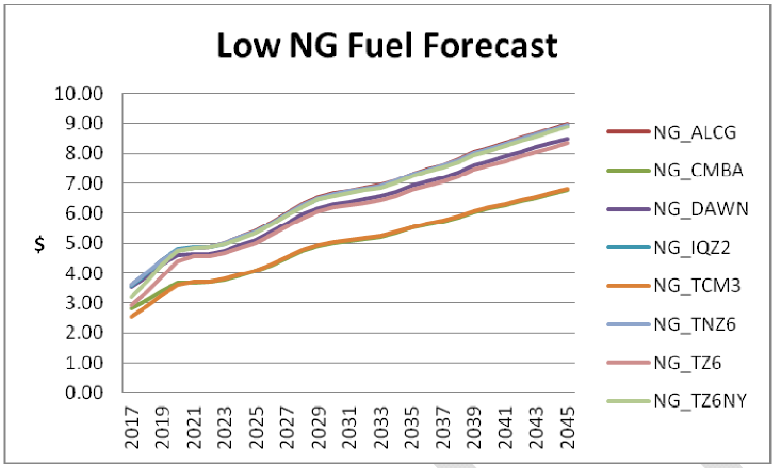


Figure 3-9: Low Natural Gas Forecast (Nominal $)



3.2.3.3.6. Scenarios #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 Forecast

	High Load Forecast		Low Load Forecast	
Year	Energy (GWh)	Peak (MW)	Energy (GWh)	Peak (MW)
2017	163,465	34,247	157,489	33,009
2018	163,489	34,472	157,687	32,944
2019	163,377	34,690	157,709	32,856
2020	163,148	34,902	157,602	32,760
2021	162,580	35,155	157,148	32,697
2022	162,589	35,452	157,232	32,615
2023	162,545	35,737	157,253	32,519
2024	162,934	35,971	156,992	32,487
2025	163,777	36,269	156,283	32,423
2026	164,698	36,571	155,514	32,371
2027	165,808	36,852	154,782	32,296
2028	167,270	37,317	154,247	32,406
2029	168,822	37,702	153,648	32,435
2030	170,486	38,089	153,013	32,465
2031	172,236	38,474	152,319	32,495
2032	174,130	38,869	151,623	32,535
2033	175,874	39,280	151,249	32,590
2034	177,704	39,695	150,877	32,649
2035	179,268	40,113	150,837	32,711
2036	181,352	40,519	150,231	32,762
2037	183,469	40,914	149,549	32,804
2038	185,835	41,304	148,630	32,842
2039	187,284	41,691	148,651	32,877
2040	188,812	42,090	148,762	32,927
2041	190,324	42,487	148,852	32,973
2042	191,815	42,878	148,926	33,014
2043	193,350	43,282	149,038	33,066
2044	194,899	43,689	149,161	33,121
2045	196,492	44,109	149,351	33,193

3.2.3.3.7. Scenario #8: 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 #8 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 D 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[20]

Project ID	Independent Cost Estimate: 2017 $M
T006	157
T007	278
T008	356
T009	487
T011	177
T012	433
T013	232
T014	181
T014_Alt	219
T015	159

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~~[20] The cost reflects the System Upgrade Facilities (SUF) identified by the System Impact Study when writing this report. A contingency SUF cost was included for any project with an ongoing System Impact Study.~~ [20] The costs reflect the System Upgrade Facilities (SUF) identified by the System Impact Study (SIS) for each of the respective projects at the time this report was written. For those projects with an ongoing SIS, the NYISO included a contingency SUF cost for each project. Prior to the release of the draft report on June 30, 2017, only T013 had a completed SIS. Since T013's SIS did not identify any SUF, the NYISO did not include a contingency SUF cost for that project. On September 15, 2017, the Operating Committee approved the SIS reports for T006, T014, and T015, which do not identify any SUF for those projects. As a result, the NYISO updated the cost estimates for T006, T014, T014_Alt, T015, and T015_Alt by removing the contingency SUF cost of 5 $M per project. These cost updates (which are not reflected in Table 3-4) are relatively small in comparison to total project costs and do not affect the relative ranking of the projects or the NYISO's recommended selection of T014 as the more efficient and cost effective solution to the Western NY Need.

T015_Alt	197
T017	299

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 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 IESO to NYISO 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

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Table 3-6: 2016 RPP IESO to NYISO 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	157	Bypassed	500	0.32	In	1,440	0.11
T007	278	Bypassed	897	0.31	In	1,704	0.16
T008	356	Bypassed	1,070	0.33	In	1,796	0.20
T009	487	Bypassed	1,322	0.37	In	1,753	0.28
T011	177	In	464	0.38	In	216	0.82
T012	433	In	1,336	0.32	In	1,431	0.30
T013	232	In	1,381	0.17	In	1,482	0.16
T014	181	Bypassed	921	0.20	In	1,604	0.11
T014_Alt	219	Bypassed	921	0.24	In	1,604	0.14
T015	159	Bypassed	442	0.36	In	1,403	0.11
T015_Alt	197	Bypassed	442	0.45	In	1,403	0.14
T017	299	In	1,364	0.22	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.

Average hourly incremental transfer capability: 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 (MWh):

$$Annual\ Niagara\ Gen\ (MWh, including\ Lewiston) + Annual\ Niagara\ Ties\ Flow\ (MWh) = Annual: Niagara\ Gen + Niagara\ Ties\ (MWh)$$

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

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

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

$$\begin{aligned}&\big(Project\ Hourly: Niagara\ Gen + Niagara\ Ties\ (MW)\big)\\ &\quad - \big(Base\ Case\ Hourly: Niagara\ Gen + Niagara\ Ties\ (MW)\big)\\ &\quad = Hourly\ Incremental: Niagara\ Gen + Niagara\ Ties\ (MW)\end{aligned}$$

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

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

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	157	Bypassed	48	3.29	In	135	1.17
T007	278	Bypassed	77	3.62	In	137	2.03
T008	356	Bypassed	107	3.33	In	140	2.54
T009	487	Bypassed	140	3.49	In	157	3.10
T011	177	In	3	53.71	In	3	53.71
T012	433	In	73	5.93	In	73	5.93
T013	232	In	136	1.70	In	136	1.70
T014	181	Bypassed	91	1.99	In	150	1.21
T014_Alt	219	Bypassed	91	2.40	In	150	1.46
T015	159	Bypassed	46	3.47	In	140	1.14
T015_Alt	197	Bypassed	46	4.29	In	140	1.41
T017	299	In	144	2.07	In	144	2.07

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. East Stolle Road Substation is a new substation and that additional area within the proposed parcel could be developed to further expand the 345kV switchyard.
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 (Niagara Dispatch 1 vs. Dispatch 2 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

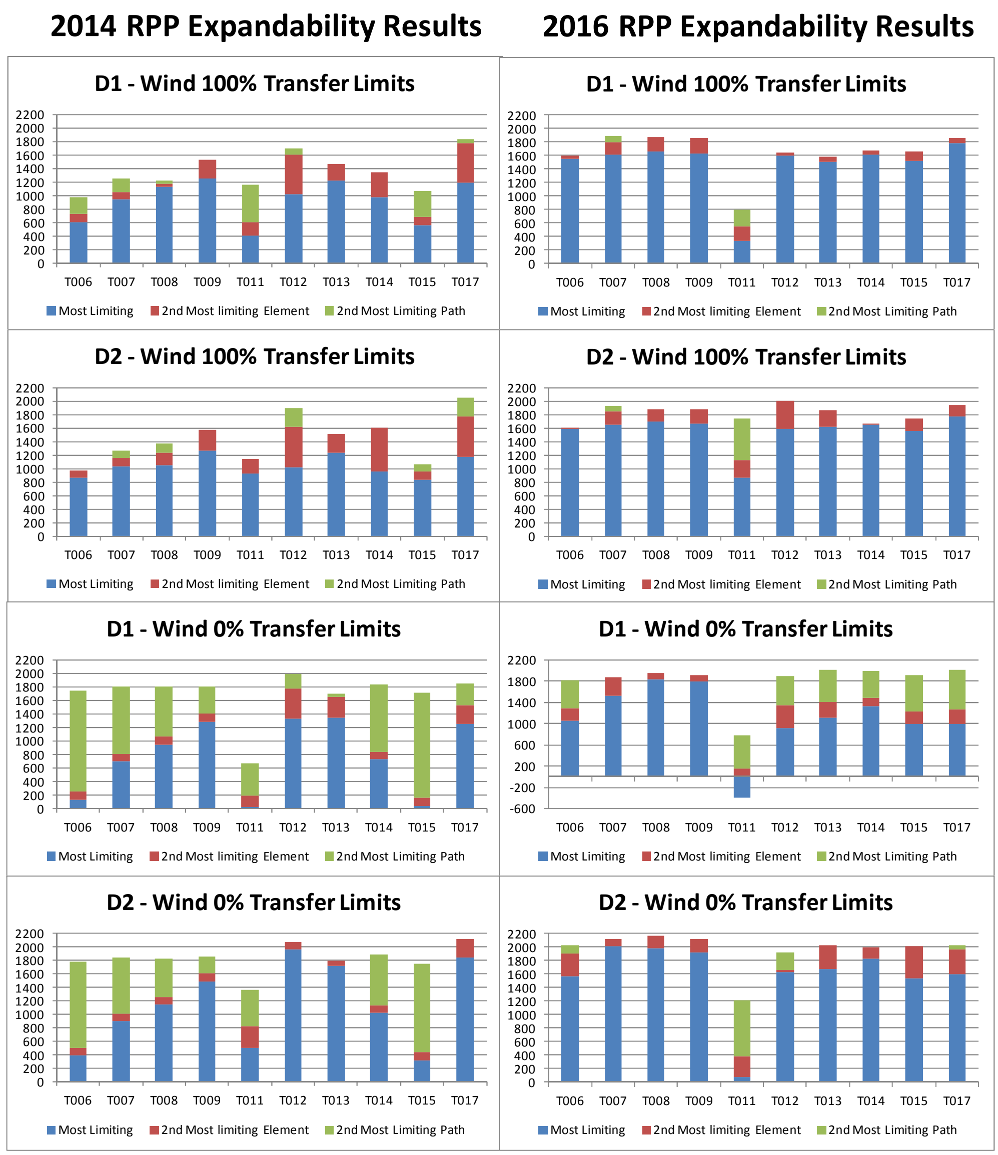

Table 3-10: Electrical Expandability Summary

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	345, 230S, ON-NY 230E	230S	230E, 230S, ON-NY	230S, 345 230E	345, 230E, 230S	345, 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 new 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 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, ON-NY	345, 230E	significantly higher transfer limits can be achieved if the proposed Dysinger 345 kV substation can be further expanded	Good
T008	345, 230S, ON-NY	345, 230E	significantly higher transfer limits can be achieved if the proposed Dysinger 345 kV substation can be further expanded	Good
T009	345, 230S, ON-NY, 230E	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, ON-NY	-	has potential for higher transfer limits, though the current design does not offer readily available options	Fair
T013	345, 230S, 230E	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	230E	significantly higher transfer limits can be achieved if the Stolle Road substation can be further expanded	Good
T015	345, 230S	230E	significantly higher transfer limits can be achieved if the Stolle Road substation can be further expanded	Good
T017	230S, 230E	345, 230E	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 the ability to remove transmission for maintenance. The NYISO considered how the proposed projects may affect the cost of operating the system, such as how they may affect the need for operating generation out of merit for reliability needs, reduce the need to cycle generation, or provide more balance in the system to respond to system conditions that are more severe than design conditions.

3.3.4.1 Controllability

Two project proposals include controllable elements: T013 and T014. T013 proposes to add a 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 Road 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 Road 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 electrical distance (also known as equivalent impedance) from Niagara to Rochester 345 kV, but it also provides 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. A small deviation also demonstrates the incremental transfer limit that the proposed project addition 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

	2014 RPP Transfer Limits		2016 RPP Transfer Limits	
Project ID	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 Benefits under Maintenance Conditions

This analysis calculates the N-1 transfer capability of Tier 1 projects under different system maintenance conditions by using optimal N-1-1 transfer limits. The N-1-1 transfer analysis optimally shifts generation from Ontario to New York while securing New York elements both pre- and post-contingency. When an overload cannot be mitigated, the optimal transfer limit is determined. Any proposed PARs were optimized to maximize the transfer limits.

Based on the 2016 RPP case (wind at 100%, Niagara Dispatch 1, and series reactors on Packard-Huntley 230 kV in-service), the below table shows the N-1-1 transfer limits. All Tier 1 projects improve system performance relative to the base case, and T014 shows better performance than other Tier 1 projects under most of the maintenance conditions.

Table 3-16: N-1-1 Transfer Capability

Maintenance Conditions	IESO-NYISO Transfer Limits									
	Base		T006		T013		T014		T015	
No maintenance outage	772	(1)	1890	(1)	1767	(1)	1861	(9)	1848	(1)
Packard - Huntley 230 kV 77	-1416	(2)	857	(6)	1090	(8)	1379	(10)	1074	(8)
Niagara - Packard 230 kV 61	-138	(3)	950	(7)	914	(7)	1335	(7)	979	(7)
Niagara - Robinson 230 kV 64	24	(4)	1141	(1)	1135	(1)	1476	(1)	1128	(1)
Stolle – Dysinger 345 kV new line	-	-	792	(1)	821	(1)	880	(1)	884	(1)
Stolle – 5 Mile 345 kV Line 29	768	(1)	1631	(1)	1594	(1)	1793	(1)	1512	(1)
Stolle – Gardenville 230 kV Line 66	-545	(5)	1139	(1)	1143	(1)	1321	(11)	1121	(1)
Stolle 345/115 XFMR(s)	768	(1)	1393	(1)	1712	(1)	1796	(1)	1369	(1)
Niagara - Dysinger 345 kV new line #1	-	-	1060	(12)	1142	(1)	1121	(12)	1107	(12)

Notes:
(1) Niagara - Packard 230 (61) at 847 MW STE rating for T:62&BP67
(2) Stolle - Gardenville 230 (66) at 574 MW LTE rating for SB:PA230_R0306
(3) Niagara - Packard 230 (62) at 847 MW Normal rating for pre 2nd contingent
(4) Niagara 230/115 Transformer 1 at 288 MW STE rating for T:77&78
(5) Packard - Sawyer 230 kV (77) at 644 MW LTE rating for SB:PA230_R0306
(6) Packard - Sawyer 230 kV (78) at 644 MW LTE rating for SB:DYS345:CB2
(7) Niagara 230/115 Transformer 1 at 288 MW STE rating for SB:PA230_R506
(8) Packard - Sawyer 230 kV (78) at 644 MW LTE rating for T:66&705
(9) Niagara - Beck 345 kV (H302) at 1132 MW LTE rating for SB:NIAG345_3008
(10) Packard - Sawyer 230 kV (78) at 644 MW LTE rating for STOLLERD 115-4
(11) Meyer 230/24.5 XFMR at 294 LTE rating for L/O:Canandaigua - Stoney Ridge 230 (68)
(12) Niagara 230/115 kV Transformer at 288 MW STE rating for L/O Niagara - Dysinger 345 line #2

3.3.4.6 Summary of Operability Assessment

Table 3-17: 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 obtaining full output from Niagara and maximizing import capability from Ontario. Table 3-18 lists the annual flows across the Niagara tie lines plus Niagara generation for each of the projects. This table also presents the annual flows across the Dysinger East interface. The Dysinger East interface only captures the flows of transmission facilities within New York State from Zone A to Zones B and C; the interface does not capture all flows out of Zone A. The flows are from the MAPS Scenario 2 (series reactors on Packard – Huntley 230 kV lines in service). The year 2025 was chosen as the evaluation year as all projects would be online at this time. The energy flow from New York to PJM West is similar for Tier 1 projects with an average increase of approximately 800 GWh in 2025.

Table 3-18: Interface flows in 2025

Project ID	Niagara Gen + Niagara Ties (GWh)	Dysinger East (GWh)
T006	24,165	5,962
T007	24,191	5,968
T008	24,208	5,852
T009	24,368	5,984
T011	23,089	6,717
T012	23,654	6,802
T013	24,198	6,006
T014	24,309	6,237
T015	24,251	6,070
T017	24,224	6,264

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 Developer and goes out 20 years. Entries with a dollar value are listed as 2017 millions of dollars. The discount rate used to calculate present value is 6.843% consistent with the 2016 CARIS Phase 2 database. Scenarios were used to distinguish projects and measure the performance robustness. 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., the system benefits from the reduction in production cost, lower LBMPs, and reduced emissions).

Tables 3-19 and 3-20 contain the production cost saving in 2017 millions of dollars. Tables 3-21 through 3-24 list the percentage change in zonal LBMP based on the baseline or scenarios presented. Tables 3-25 through 3-28 show the load payment change in 2017 millions of dollars. Table 3-29 has the NYCA demand congestion change in 2017 millions of dollars. Lastly, Table 3-30 demonstrates the change in CO_2 emission for the system.

Table 3-19: 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)

An additional scenario, which models the Series Reactors on 77/78 in-service and historical IESO-MISO flow, was performed for several projects. The results of production cost changes are shown in Table 3-20.

Table 3-20: NYCA Production Cost Saving in 2017 M$ for SR In-service and Historical IESO-MISO

Project ID	SR In-service and Historical IESO-MISO
T006	(289)
T013	(308)
T014	(338)
T015	(304)

Table 3-21: 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 3-22: 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 3-23: 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 3-24: Scenario 8 (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 3-25: 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 3-26: 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 3-27: 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 3-28: Scenario 8 (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 3-29: 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 3-30: 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 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 and Sufficiency Assessment process and responses provided by Developers to a request for additional information relating to property rights and transmission siting.

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 lines.

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 that 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 3-31. Table 3-32 presents summary results for new transmission line ROW. Details on Substation property analysis can be found in Appendix D.

Table 3-31: 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	The Developer's 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 3-32: 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 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 each project schedule 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 by comparison to actual Article VII projects completed. Appendix D provides greater details on the evaluation of the project schedules.

Summary results of the evaluation of the project schedules are presented in Table 3-33. 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 best case and is shown for comparative purposes. The independent duration estimate is calculated using the anticipated time for Article VII application preparation, Article VII approval process, ROW procurement, and construction.

Table 3-33: Results of Evaluation of the Projects Schedules

Project ID	Independent Minimum Duration Estimate: months	Independent Anticipated Duration Estimate: months
T006	40	43
T007	59	63
T008	65	69
T009	71	75
T011	57	57
T012	60	60
T013	44	55
T014	40	49
T014_Alt	49	53
T015	40	49
T015_Alt	49	53
T017	66	82

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 consulted with the IESO and PJM concerning any potential impacts due to the proposed Western New York Public Policy 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~~ System Impact Studies for Tier 1 projects were all approved by the NYISO Operating Committee with no adverse impacts identified.

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.[21] 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 E.[22]

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

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

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

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 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.[23] 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 comparing the costs of Developers' projects.[24]

3.7 Evaluation of Interaction with Local Transmission Owner Plans

In its Public Policy Transmission Planning Process, the NYISO is required to review the Local Transmission Owner Plans (LTPs)[25] 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

[23] October 2016 Order, at p 17.

[24] The NYISO readily identified and backed out those elements of the Developer's projects that were included to address the pre-existing non-BPTF overloads on lines #54, #193 and #194.

[25] *See* OATT Section 31.2.1.1.2.1.

New York 115 kV lines are overloaded at certain Ontario to New York transfer levels. The Western New York Public Policy Transmission Projects reduce the overloads on the 115 kV lines, but they do not necessarily eliminate the overloads at certain transfer levels. Therefore, Transmission Owners may identify additional 115 kV upgrades in future LTPs.

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). 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.

4.1.1 Summary of Evaluation Results

Below is a brief summary of the evaluation results for each of the ten Western NY Public Policy Transmission Projects.[26]

T006: North America Transmission Proposal 1

- Dysinger - Stolle Road 345 kV line proposed on existing ROW, and a new 345/115 kV transformer proposed at Stolle Road substation;
- The estimated cost by SECO is the lowest;
- The estimated project schedule by SECO is the shortest at 40 months;
- The cost per MW ratio is relatively lower, and the production cost saving over cost ratio is relatively higher;
- Good operability and expandability.

T007: North America Transmission Proposal 2

- Dysinger - Stolle Road and Stolle Road - Gardenville 345 kV lines proposed on existing and new ROW;
- The estimated cost by SECO is in the middle of the range;
- The estimated project schedule by SECO is 59 months;
- The cost per MW ratio is relatively lower, and the production cost saving over cost ratio is

[26] The evaluation metrics are listed in no particular order.

on the average side;

- Good operability and expandability.

T008: North America Transmission Proposal 3

- Two Dysinger - Stolle Road 345 kV lines and one Stolle Road - Gardenville 345 kV line proposed on existing and new ROW;
- The estimated cost by SECO is on the high side of the range;
- The estimated project schedule by SECO is 65 months;
- The cost per MW ratio and production cost saving over cost ratio are on the average side;
- Good operability and expandability.

T009: North America Transmission Proposal 4

- Two Dysinger - Stolle Road 345 kV lines, one Stolle Road - Gardenville 345 kV line, and one Niagara - Dysinger 345 kV line proposed on existing and new ROW;
- The estimated cost by SECO is the highest;
- The estimated project schedule by SECO is the longest at 71 months;
- The cost per MW ratio is above average, and the production cost saving over cost ratio is below average;
- Good operability and expandability.

T011: National Grid Moderate Power Transfer Solution

- 115 kV system upgrades proposed on existing ROW, and 61/64 tower separation proposed;
- The estimated cost by SECO is one of the lowest;
- The estimated project schedule by SECO is 57 months;
- The cost per MW ratio is the highest, and production cost saving over cost ratio is the lowest;
- Fair operability and expandability.

T012: National Grid High Power Transfer Solution

- Niagara - Gardenville 230 kV line proposed on existing ROW, 115 kV system upgrades proposed on existing ROW, and 61/64 tower separation proposed;
- The estimated cost by SECO is one of the highest;
- The estimated project schedule by SECO is 60 months;
- The cost per MW ratio is close to average, and the production cost saving over cost ratio is well below average;
- Good operability and fair expandability.

T013: NYPA/NYSEG Western NY Energy Link

- Dysinger–Stolle Road 345 kV line proposed on existing ROW, two 345/230 kV transformers added at Stolle Road substation, and reconductoring of Stolle Road–Gardenville 230 kV line proposed;
- The estimated cost by SECO is in the middle of the range;
- The estimated project schedule by SECO is one of the shortest at 44 months;
- The cost per MW ratio is relatively lower, and the production cost saving over cost ratio is relatively higher;
- Good operability and expandability.

T014: NextEra Energy Transmission New York Empire State Line Proposal 1

- Dysinger- East Stolle Road 345 kV line proposed on existing ROW or new ROW as an alternative;
- The estimated cost by SECO is one of the lowest;
- The estimated project schedule by SECO is the shortest at 40 months;
- The cost per MW ratio is relatively lower, and the production cost saving over the cost ratio is the highest when considering the various scenarios evaluated;
- Excellent operability and expandability.

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

- Dysinger-East Stolle Road 345 kV line proposed on existing ROW or new ROW as alternative;
- The estimated cost by SECO is one of the lowest;
- The estimated project schedule by SECO is the shortest at 40 months;
- The cost per MW ratio is relatively lower, and the production cost saving over the cost ratio is relatively higher;
- Good operability and expandability.

T017: Exelon Transmission Company Niagara Area Transmission Expansion

- Niagara - Stolle Road 345 kV line proposed on existing and new ROW;
- The estimated cost by SECO is in the middle of the range;
- The estimated project schedule by SECO is one of the longest at 66 months;
- The cost per MW ratio and production cost saving over the cost ratio are average ;
- Fair operability and expandability.

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 (1)	Cost per MW: $M/MW (1)	Production Cost Savings: 2017 $M (2)	Production Cost Savings / Cost (2)	System CO_2 Emission Reduction: 1000 tons (2)	Performance: Niagara Gen + Niagara Ties in 2025: GWh (2)	Operability	Expandability	Property Rights
T006	157	40	1,440	0.11	209	1.3	11,390	24,165	Good	Good	Existing ROW
T007	278	59	1,704	0.16	231	0.8	11,582	24,191	Good	Good	Existing and new ROW
T008	356	65	1,796	0.20	230	0.6	11,023	24,208	Good	Good	Existing and new ROW
T009	487	71	1,753	0.28	269	0.6	11,061	24,368	Good	Good	Existing and new ROW
T011	177	57	216	0.82	(1)	0.0	378	23,089	Fair	Fair	Existing ROW
T012	433	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	181	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	1.3	7,362	24,309	Excellent	Good	New ROW as alternative
T015	159	40	1,403	0.11	225	1.4	10,681	24,251	Good	Good	Existing ROW
T015_Alt	197	49	1,403	0.14	225	1.1	10,681	24,251	Good	Good	New ROW as alternative
T017	299	66	1,536	0.19	207	0.7	11,104	24,224	Fair	Fair	Existing and new ROW

Notes:
(1) Transfer scenario with series reactors on Packard-Huntley lines in-service for all projects
(2) MAPS scenario 2 with series reactors on Packard-Huntley lines in-service for all projects

4.1.2 Tiered 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 for these proposed transmission projects 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. Projects T006, T013, T014, and T015 are Tier 1 projects because they have the lowest comparative capital costs, highest production cost savings relative to their capital costs, and the lowest cost per MW of transfer capability, as well as overall superior performance on all of the metrics, as documented above.

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 but have fewer benefits or may be more expensive without having sufficient corresponding benefits. These observations are captured primarily through the projects' 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:[27]

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

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
- 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

4.2 Ranking

Based on consideration of all the evaluation metrics for efficiency or cost effectiveness, together with input from stakeholders, the NYISO staff ranked the ten projects. The relative ranking was first developed by comparing projects' performance in pairs, and then the differences were identified to distinguish projects.

Critical comparison and the resulting ranking are summarized below for the projects in Tier 1:

- T014 and T015 are identical projects except that T014 includes a PAR at Dysinger 345 kV substation. The benefits provided by tying seven 345 kV lines into a single hub and from installing the PAR far exceed the cost to procure the equipment. These benefits include increased production cost saving, increased transfer capability, and improved operability for the system. As a result, T014 was ranked higher than T015.
- T015 and T006 are comparable in project design and in many metrics. However, T015 cuts out the 345 kV loop to Somerset and results in greater production cost saving relative to cost especially in MAPS scenario 2 (series reactors on Packard – Huntley 230 kV lines in service). Therefore, T015 was ranked higher than T006.
- T006 was compared against T013. With the NYISO-controlled series reactors on Packard-

Huntley 230 kV lines in-service, T006 performs better in cost per MW and production cost saving relative to the cost. Therefore, T006 was ranked higher than T013.

- T013 was compared against T014. T014 has better operability with the 345 kV PAR and cuts out the 345 kV loop to Somerset. Moreover, the production cost savings over cost ratios among different scenarios are higher than T013. Therefore, T014 was ranked higher than T013.

Comparison among Tier 2 projects was also conducted and summarized below:

- T007, T008, and T009 were also proposed by North American Transmission with increasing network components, project costs, and project schedule. The increasing components do provide additional benefits, but the incremental benefits are not sufficient to offset the additional project cost and the risk associated with acquiring extra ROW.
- T017 was compared against T008 and T009. T017 performs better than T008 and T009 in cost per MW metric, and it also performs better in production cost saving relative to the cost. However, T008 and T009 demonstrate better operability and expandability, and thus T017 was ranked between T008 and T009.
- T012 demonstrates certain benefits in some metrics, but its performance is not great relative to its high cost. Therefore, T012 was ranked lower than all of the projects except for T011.
- While T011 strengthens the 115 kV network in Western New York, it is not very efficient or cost effective in improving the bulk system performance.

Taking all the metrics into consideration, the overall ranking of the projects is summarized in Table 4-2.

Table 4-2: Overall Ranking

Tier	Ranking	Project ID	Developer	Project Name
1	1	T014	NextEra Energy Transmission New York	Empire State Line Proposal 1
	2	T015	NextEra Energy Transmission New York	Empire State Line Proposal 2
	3	T006	North America Transmission	Proposal 1
	4	T013	NYPA/NYSEG	Western NY Energy Link
2	5	T007	North America Transmission	Proposal 2
	6	T008	North America Transmission	Proposal 3
	7	T017	Exelon Transmission Company	Niagara Area Transmission Expansion
	8	T009	North America Transmission	Proposal 4
	9	T012	National Grid	High Power Transfer Solution
	10	T011	National Grid	Moderate Power Transfer Solution

4.3 Selection Recommendation

Based on consideration of all the evaluation metrics for efficiency or cost effectiveness, together with input from stakeholders, the NYISO staff recommends for selection T014 - Empire State Line Proposal 1 as the more efficient or cost effective transmission solution to satisfy the Western New York Public Policy Transmission Need. Based on the project schedule evaluated by SECO, the in-service date for the selected project is June 2022.

Compared with other Tier 1 projects, T014 more efficiently utilizes both the existing and proposed transmission facilities. The proposed Dysinger substation would become the new 345 kV hub in Western New York where seven 345 kV lines are connected, and electrically reduce the distance for the existing Niagara to Rochester 345 kV transmission corridor. The proposed PAR at the Dysinger substation provides additional operational flexibility by providing a new level of controllability to power flows on the 345 kV network. Furthermore, the estimated overnight capital cost for T014 is among the lowest of the Tier 1 projects. Combining the physical design and the overnight capital cost, T014 demonstrates relatively lower cost per MW ratio among the projects and the highest production cost saving over the cost ratio across all scenarios. Even when the proposed PAR is bypassed, T014 still demonstrates significant benefits. Based on SECO's evaluation, there are no critical risks identified regarding siting, equipment procurement, real estate acquisition, construction, and scheduling. Therefore, the NYISO staff determined that T014 is both the more efficient and cost effective transmission solution to satisfy the Western NY Public Policy Transmission Need.

4.4 Next Steps

Following the approval of this report by the Board of Directors, the NYISO will tender a Development Agreement to the Developer of the selected transmission project that is based upon the project in service date.[28] The Development Agreement will reflect a project milestone schedule under which the Developer of the selected project will complete the interconnection process, apply for Article VII siting and other necessary permits and authorizations, enter into an Operating Agreement with the NYISO, and bring the project into service.

[28] *See* OATT Section 31.4.12.2.

Appendices

Appendix A – Public Policy Transmission Planning Process Glossary

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

Appendix C – Phase 2 Selection Assumptions

Appendix D – SECO Report

Appendix E – Market Monitoring Unit Report

Appendix F – Additional Analysis Results