Western NY Public Policy Transmission Report

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ESPWG/TPAS

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Agenda

- Public Policy Transmission Planning Process
- Western NY Public Policy Transmission Need
- Viable and Sufficient Projects
- Comparative Evaluation for Selection
- Conclusions and Recommendations
- Next Steps

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Selection Recommendation for WNY

- The draft Western NY Public Policy Transmission Planning Report was posted on June 30 as meeting material for this ESPWG/TPAS meeting.
- Based on NYISO staff's consideration of all the evaluation metrics, the Western NY solutions are divided into two tiers.
- Based upon review and discussion with ESPWG and TPAS, NYISO staff will rank the projects according to the evaluation criteria and recommend a solution as the more efficient or cost effective solution to satisfy the Western NY Public Policy Transmission Need.

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Public Policy Transmission Planning Process

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Overview

- Section 31.4 of Attachment Y of the NYISO Open Access Transmission Tariff (OATT) describes the planning process that the NYISO, and all interested parties, shall follow to consider needs for new transmission projects on the Bulk Power Transmission Facilities (BPTFs) that are driven by Public Policy Requirements.
- A Public Policy Requirement is a federal or New York State statute or regulation, including a New York State Public Service Commission (PSC) order adopting a rule or regulation subject to and in accordance with the State Administrative Procedure Act, any successor statute, or any duly enacted law or regulation passed by a local governmental entity in New York State, that may relate to transmission planning on the BPTFs.

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Public Policy Planning Process

- **Phase I: Identify Needs and Assess Solutions**
  - NYISO solicits transmission needs driven by Public Policy Requirements
  - PSC identifies transmission needs and defines additional evaluation criteria
  - NYISO solicits solutions (transmission, generation, or EE/DR)
  - NYISO performs Viability and Sufficiency Assessment (VSA)
  - PSC reviews assessment and confirms continued transmission need
- **Phase II: Transmission Evaluation and Selection**
  - NYISO staff evaluates viable and sufficient transmission solutions and recommends the more efficient or cost-effective solution
  - Stakeholder review and advisory votes at BIC and MC
  - NYISO Board may select a transmission solution for purposes of cost allocation under the NYISO Tariff

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Western NY Public Policy Transmission Need

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Western NY PPTN

- **On July 20, 2015, PSC issued an order identifying the Western NY PPTN**
- **NYISO was directed to consider projects that increase the Western NY transmission capability sufficient to:**
  - Ensure the full output from Niagara (2,700 MW including Lewiston Pumped Storage)
  - Maintain 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)
  - Maximize transfers out of Zone A to the rest of the state
  - Prevent transmission security violations (thermal, voltage or stability) that would result under normal and emergency operating conditions
  - Maintain reliability of the transmission system with fossil-fueled generation in Western NY out-of-service, as well as in-service

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Solicitation for Solutions

- The NYISO established the baseline study cases according to the PSC Order, reviewed the results at multiple ESPWG/TPAS meetings, and made the study cases available to facilitate development of the solutions
- On November 1, 2015, the NYISO issued solicitation for solutions
- On December 31, 2015, developers submitted proposed projects

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Proposed Projects

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

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

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Viability and Sufficiency Assessment

- In May 2016, the NYISO determined that the following projects are viable and sufficient
  - 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
- On October 13, 2016, PSC issued an order confirming the Western NY PPTN and requiring certain non-BPTF to be upgraded by National Grid
- The NYISO and its independent consultant (SECO) immediately commenced evaluation of each viable and sufficient project

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Viable and Sufficient Projects

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WNY System Updates

- **Major system updates in Western NY following the Viability and Sufficiency Assessment**
  - Stolle - Gardenville 230kV line #66 terminal upgrades entered into service
  - South Perry 230 kV/115 kV transformer SIS approved by OC in May 2017
  - LTP for Gardenville–Depew 115 kV line #54 per PSC Order
  - Generic upgrades for Niagara-Packard 115 kV lines #193 and #194 per PSC Order

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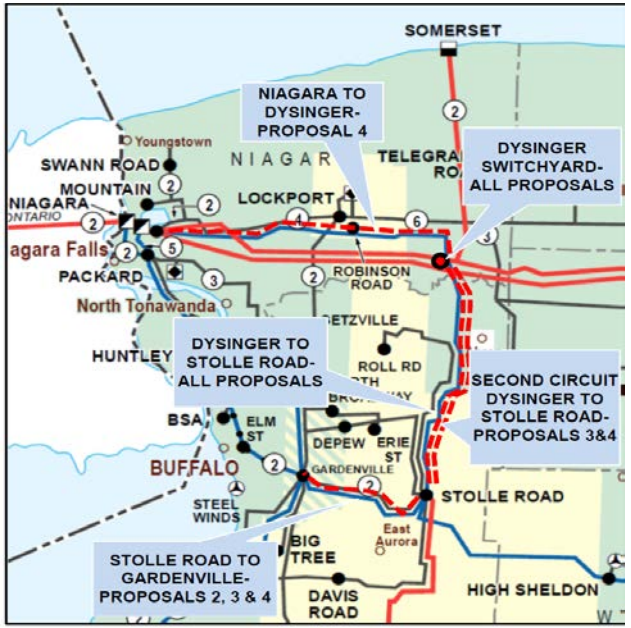
T006: North America Transmission – Proposal #1

- 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

Proposed system upgrades

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



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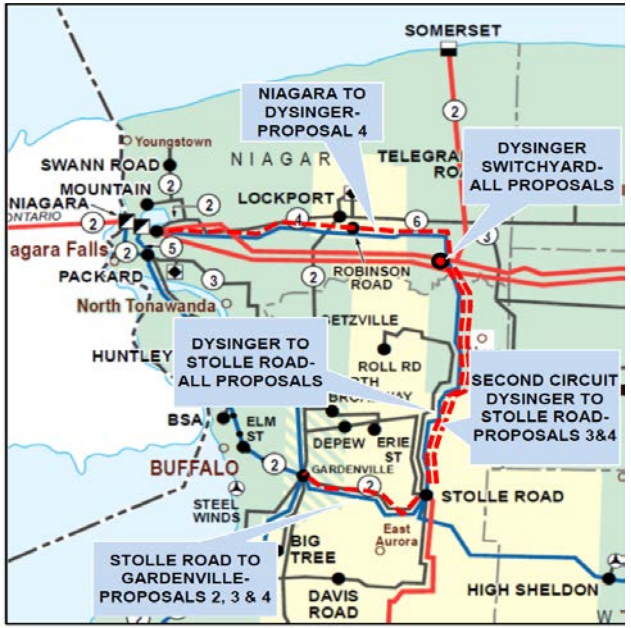
T007: North America Transmission – Proposal #2

- 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

Proposed system upgrades

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



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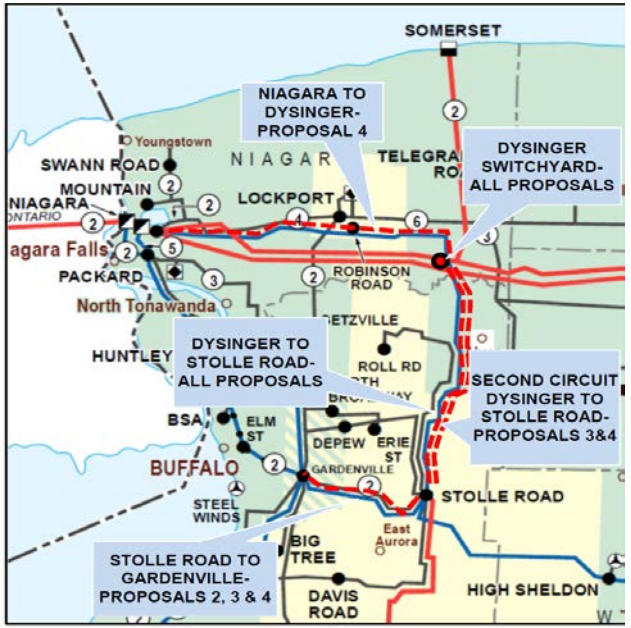
T008: North America Transmission – Proposal #3

- 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

Proposed system upgrades

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



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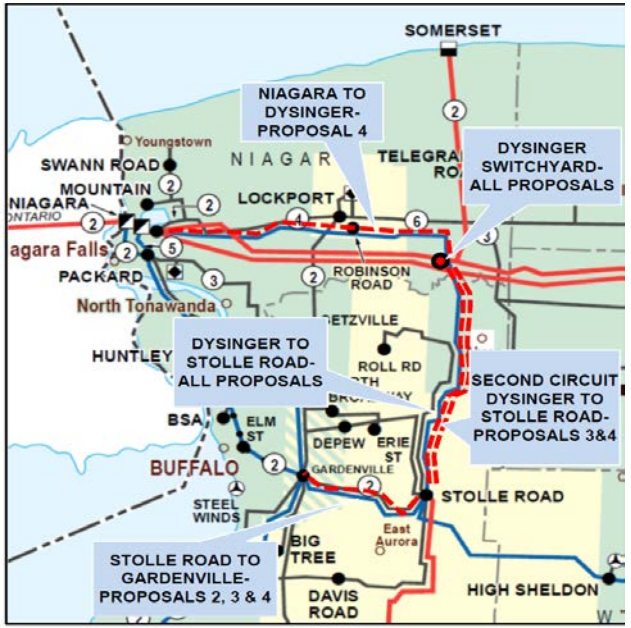
T009: North America Transmission – Proposal #4

- 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

Proposed system upgrades

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



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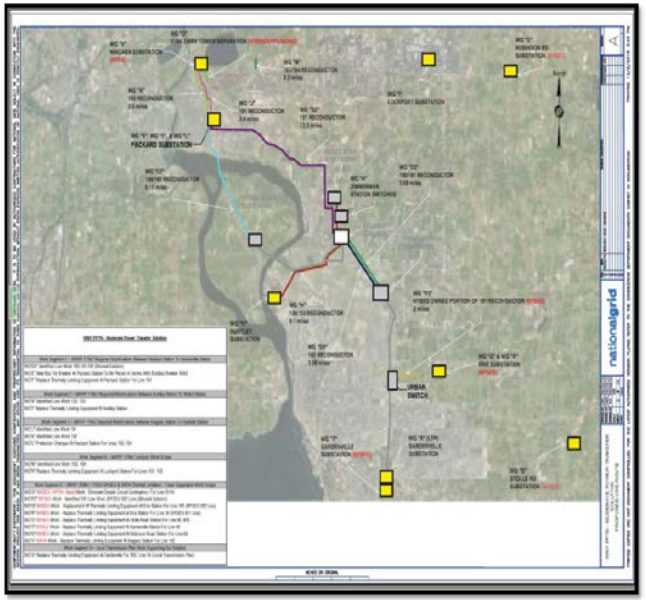
T011: National Grid – Moderate Power Transfer Solution

- 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.



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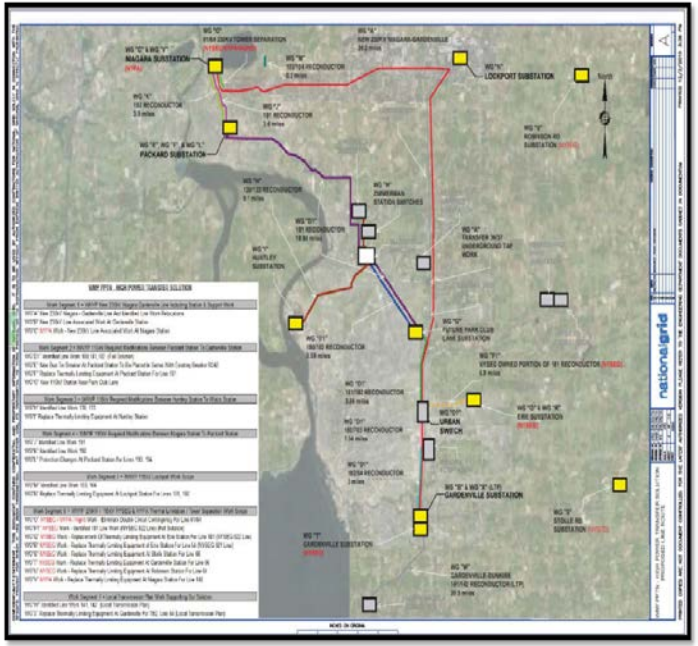
T012: National Grid – High Power Transfer Solution

- New Niagara-Gardenville 230 kV line
- New Park Club Lane 115 kV switching station (connects to Packard, Stolle Rd., Gardenville)
- Reconductoring 115 kV lines (~76 miles worth) notably:
  - Niagara/Packard-Gardenville 115 kV (180, 181, 182) reconductoring ("Full solution")
  - Niagara-Packard (191, 192) reconductoring
  - Packard-Huntley (130, 133) partial reconductoring
  - Niagara-Lockport (103, 104) partial reconductoring
  - Gardenville-Depew (54) reconductoring
- Tower separation of 61/64 230 kV lines
- Replacement of thermally limiting equipment at Packard, Huntley, Lockport, Robinson Road, Erie Street and Niagara stations.



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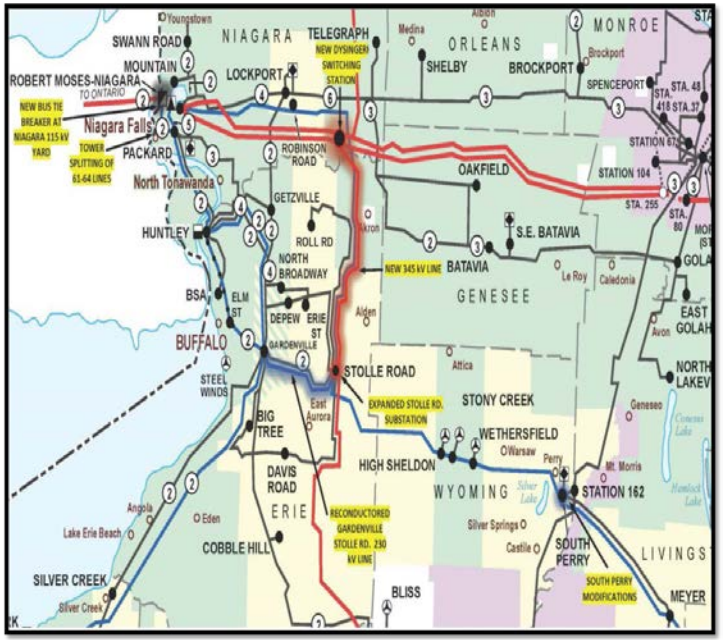
T013: NYPA/NYSEG – Western NY Energy Link

- 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, and relay upgrades
- 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)



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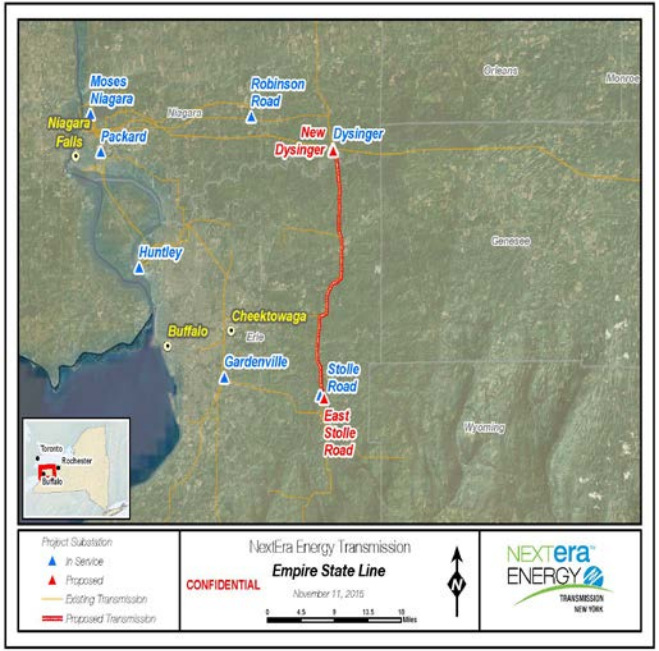
T014: NextEra Energy Transmission New York – Empire State Line #1

- 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

Proposed system upgrades

- 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

This project also proposed an alternative ROW.



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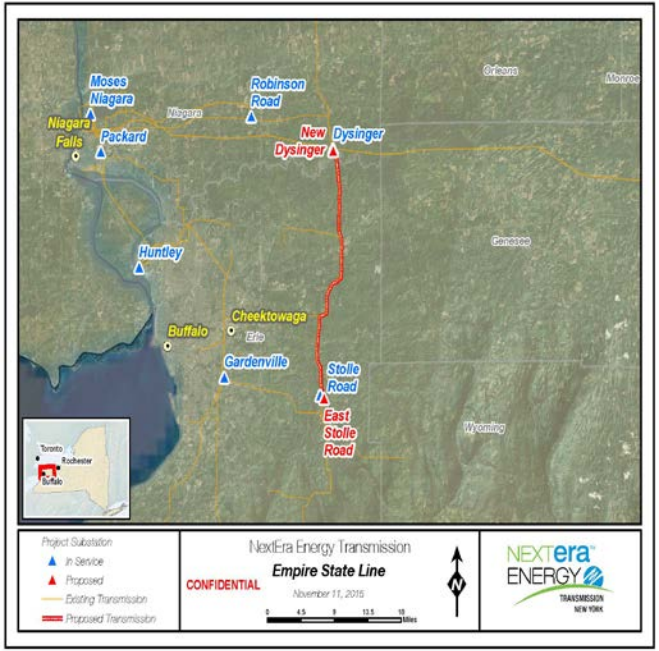
T015: NextEra Energy Transmission New York – Empire State Line #2

- 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 Road Switchyard (near Stolle Road substation)
- New Dysinger-East Stolle Road 345 kV line and a shunt reactor at East Stolle Road

Proposed system upgrades

- 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

This project also proposed an alternative ROW



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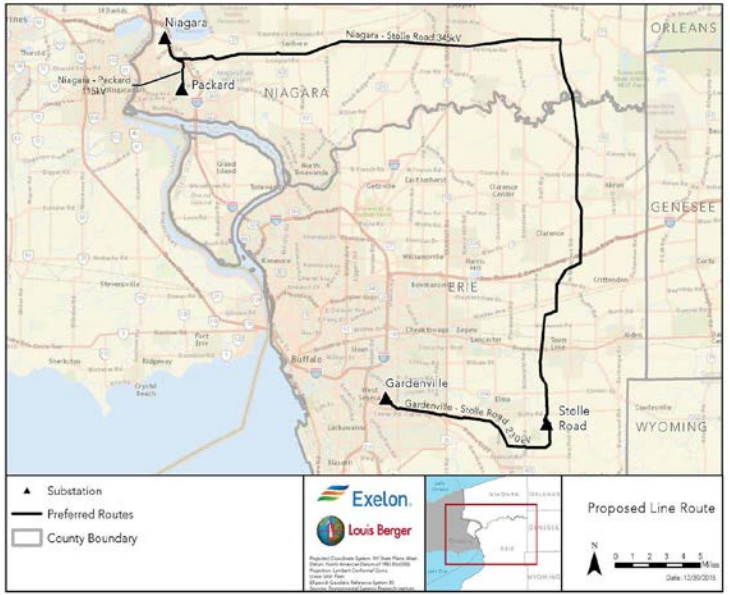
T017: Exelon Transmission Company – Niagara Area Transmission Expansion

- 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



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Comparative Evaluation for Selection

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Overview

- Evaluation metrics required by the OATT
- At the December 7, 2016 and January 24, 2017 ESPWG/TPAS meetings, the NYISO presented assumptions used for selection evaluation
- The evaluation of Public Policy Transmission Projects differs from other planning processes because it can give varying levels of consideration to the baseline and the scenarios

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Major Assumptions: Transfer Analysis

- **Baseline:**
  - Started with the VSA power flow case (based on 2014 Reliability Planning Process (RPP))
  - Updates: Stolle - Gardenville 230kV line #66 terminal upgrades, LTP for Gardenville–Depew 115 kV line #54, and generic upgrades for Niagara-Packard 115 kV lines #193 and #194
  - Two dispatches for Niagara
    - Dispatch 1: 230 kV side units maxed out
    - Dispatch 2: 115 KV side units maxed out
  - Two dispatches for wind farms on Stolle Road path: 0% and 100%
  - Series reactors on Packard-Huntley 230 kV path modeled according to developers' election (in-service or bypassed)

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Major Assumptions: Transfer Analysis

- **Scenario:**
  - Based on 2016 Reliability Planning Process base case
  - Updates: generic upgrades for Niagara-Packard 115 kV lines #193 and #194
  - The same two dispatches for Niagara
  - Two dispatches for wind farms in Zones A, B, and C: 0% and 100%
  - The 2016 RPP base case modeled the Packard – Huntley 230 kV series reactors in-service because the series reactors entered into service in 2016 with the NYISO having operational control. Therefore, the NYISO modeled the series reactors as in-service for all the projects in this scenario regardless of developers' election.

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Major Assumptions: Resource Adequacy Analysis

- Based on 2016 RPP MARS base case, and extended the load forecast out to 2045
- NYCA LOLE violations were identified starting from 2031. Compensatory MW were added in Zone K, totaling 250 MW, in different years to maintain a reliable system.
- A resource adequacy scenario with the Western NY interfaces relaxed shows no impact to the NYCA LOLE. Therefore, capacity savings is not a significant distinguishing factor between the proposed transmission projects.

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Major Assumptions: Production Cost Analysis

- Based on 2016 CARIS Phase 2 MAPS database
  - 4-pool model: NYISO, PJM, IESO, and ISO-NE
  - National CO2 program modeled starting from 2024: RGGI CO2 price applied to all 4 pools
- Updates: Stolle - Gardenville 230kV line #66 terminal upgrades
- Extensions: load, fuel, and emission price forecasts extended out to 2045
- Load forecast and resource mix for the external control areas were frozen after 2024 consistent with the CARIS methodology

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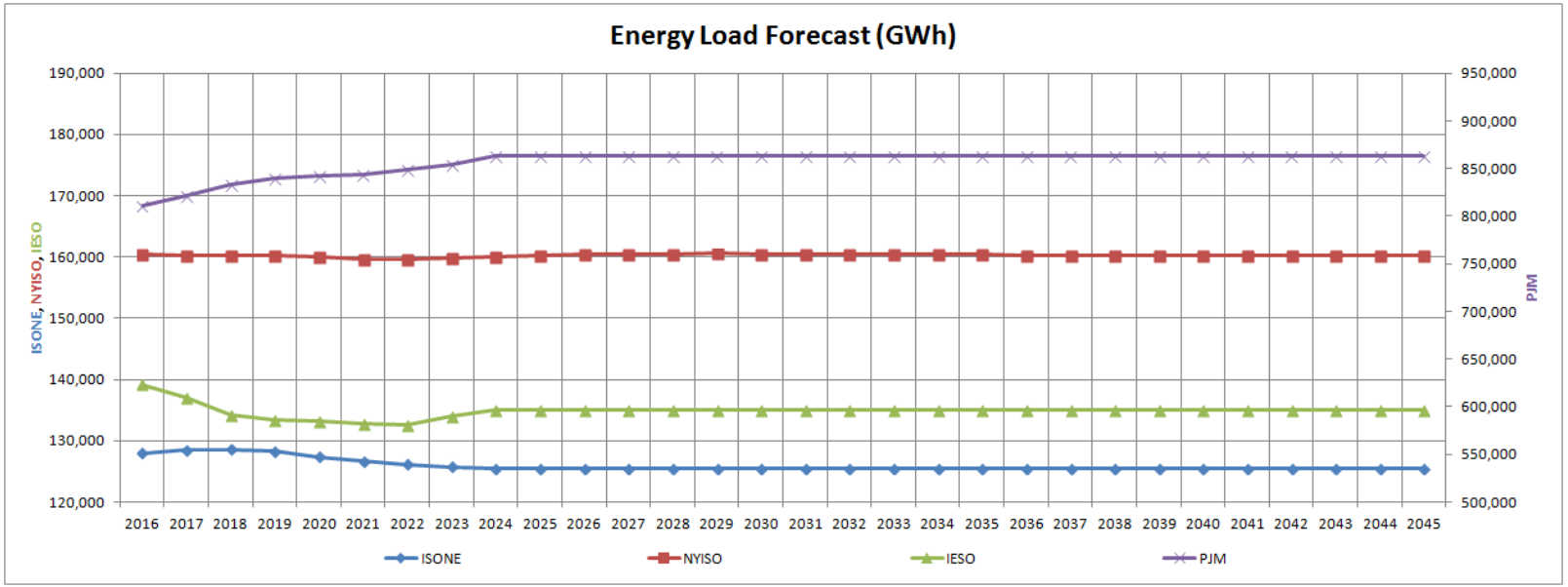
MAPS Baseline Load Forecast



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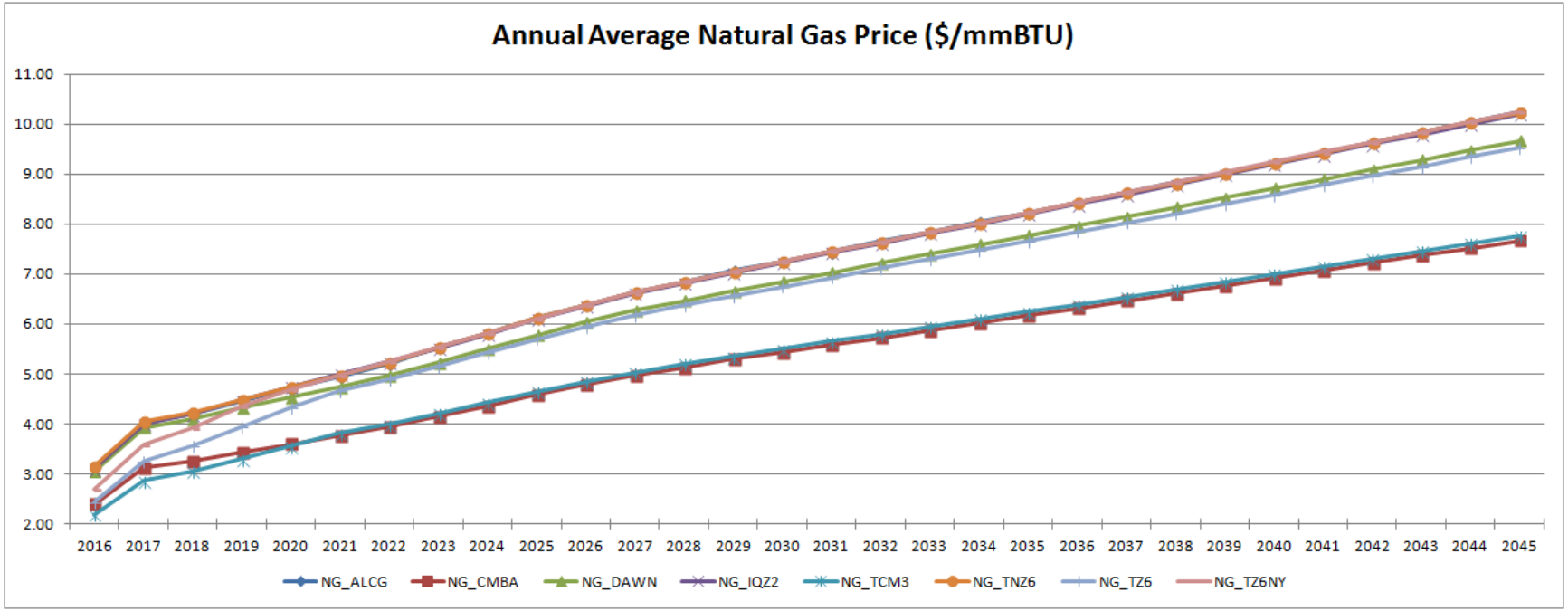
MAPS Baseline Natural Gas Forecast



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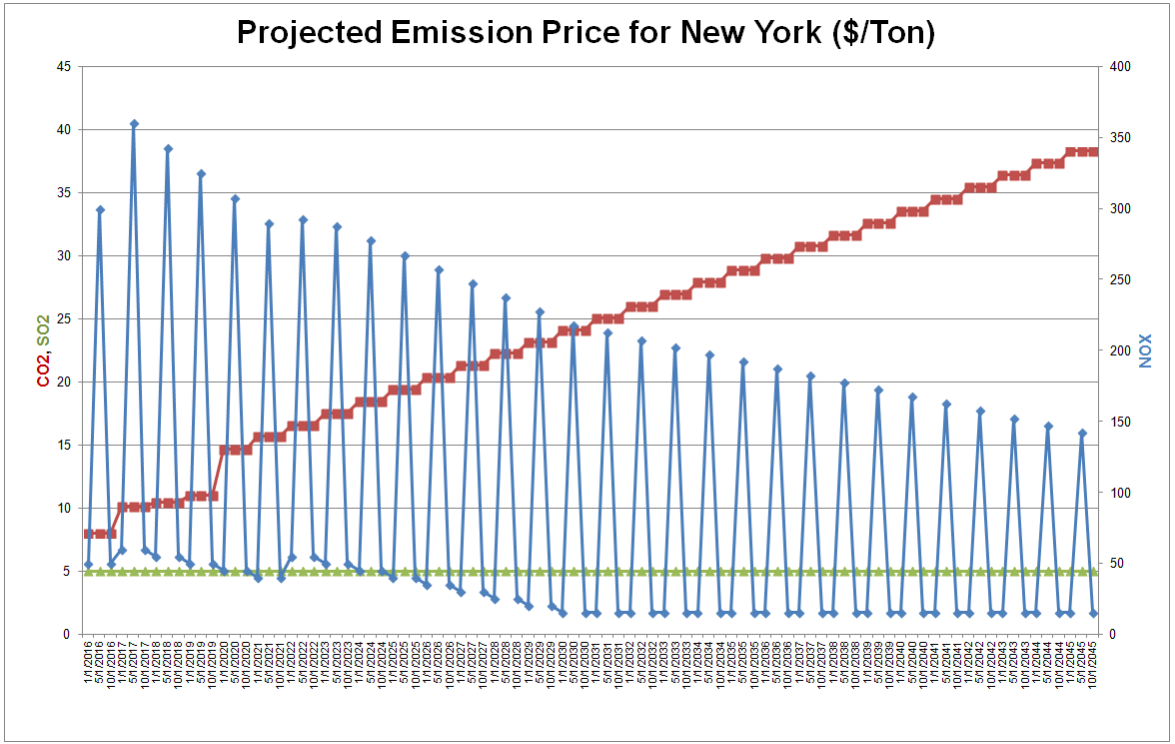
MAPS Baseline Emission Forecast



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MAPS Baseline

- Series reactors on Packard-Huntley 230 kV path modeled according to developers' election (in-service or bypassed)
- Based on 2016 Gold Book

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MAPS Scenario 1: 2017 Baseline

- Based on the MAPS Baseline
- The baseline load forecast and fuel costs were updated according to the 2017 Gold Book and the latest natural gas forecast

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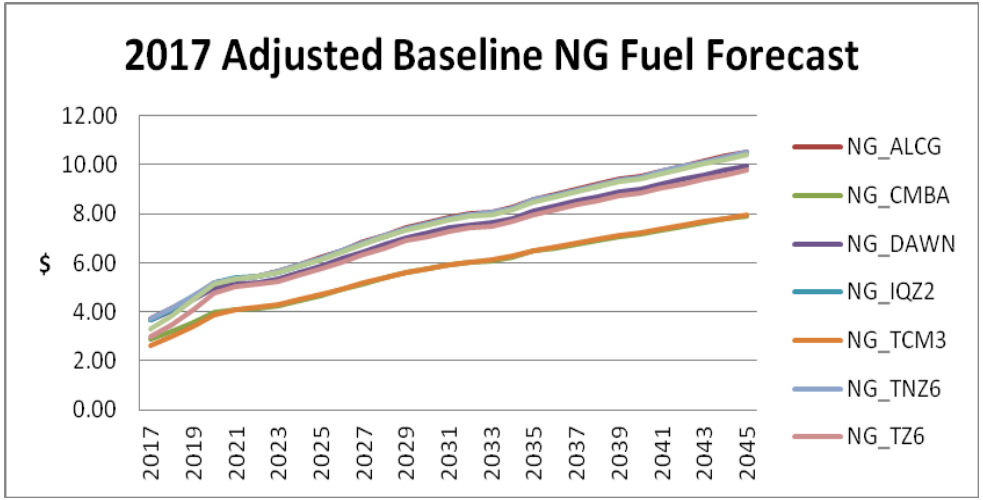
MAPS Scenario 1: 2017 Baseline

NYCA Energy, Peak & Solar Forecast

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



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MAPS Scenario 2: Series Reactor In-Service

- Based on MAPS Scenario 1
- The series reactors (SR) on Packard to Huntley 230 kV Lines 77 and 78 entered into service in 2016, with the NYISO having operational control over them. Therefore, the NYISO modeled the series reactors as in-service for all the projects in this scenario regardless of developers' election.

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MAPS Scenario 3: Historical IESO-MISO Flow Modeled

- Based on MAPS Scenario 1
- Modeled IESO-MISO flow as scheduled according to 2013 historical flows with the remainder of IESO exports flowing into the NYISO.

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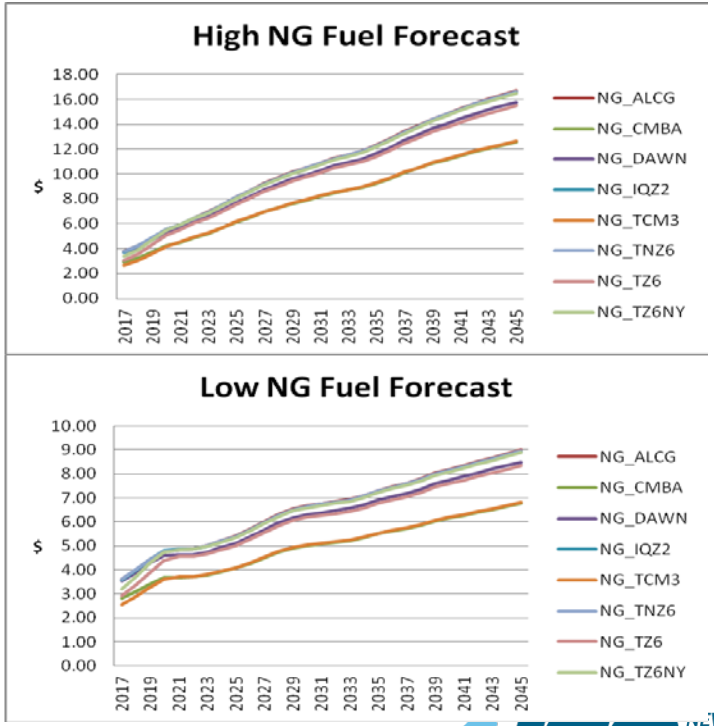
MAPS Scenarios 4 and 5: High and Low Natural Gas Forecasts

- Based on MAPS Scenario 1
- Modeled high and low natural gas costs consistent with the fuel forecast methodology used in CARIS



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MAPS Scenarios 6 and 7: High and Low NYCA Load Forecasts

- Based on MAPS Scenario 1
- Modeled high and low NYCA load forecasts

NYCA Energy, Peak, and Solar Forecast

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

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MAPS Scenario 8: National CO2 Removed and SR In-Service

- Based on MAPS Scenario 1
- Modeled the series reactors as in-service for all the projects
- National CO_2 program removed

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Independent Overnight Cost Estimates

- SECO developed the independent cost 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

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

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Cost Per MW: Transfer Limits

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

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Cost Per MW: MAPS Flow

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

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Production Cost 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	(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)

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LBMP Change in %: Scenario 1 (2017 Baseline)

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%

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

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%

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LBMP Change in %: Scenario 8 (National CO_2 Removed & SR on 77/78 in for all projects)

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)%

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Load Payment Change in 2017 M$: Scenario 1 (2017 Baseline)

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

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

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

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Load Payment Change in 2017 M$: Scenario 8 (National CO_2 Removed and SR on 77/78 in for all projects)

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)

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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)

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System CO_2 Emission Change (in 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)

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Expandability

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

ONT: Ontario – New York ties; 345: Niagara – Rochester 345 kV path;
230S: Niagara – Gardenville 230 kV path; and 230E: Niagara – Meyer 230 kV path

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Operability

Project	Configuration	Dispatch Flexibility	Controllability	Impact 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 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 design by separating the 345/115 kV transformers	Facilitate significant amount of power transfer, and moderately sensitive to generator dispatches	Proposed 115 kV PAR at South Perry	High	Good
T014	Enhance 345 kV network connectivity in WNY; advantageous Dysinger design by connecting to Somerset 345 kV substation	Facilitate significant amount of power transfer, and moderately sensitive to generator dispatches	Proposed 345 kV PAR at Dysinger	Low	Excellent
T015	Enhance 345 kV network connectivity in Western NY; advantageous Dysinger 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

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Performance

Project ID	Niagara Gen + Niagara Ties flow in 2025 (GWh)
T006	24,165
T007	24,191
T008	24,208
T009	24,368
T011	23,089
T012	23,654
T013	24,198
T014	24,309
T015	24,251
T017	24,224

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Property Rights

- The NYISO and SECO 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.
- Results considered in review of developers' project schedules and cost estimates.

Project ID	Property Rights
T006	Existing ROW
T007	Existing and new ROW
T008	Existing and new ROW
T009	Existing and new ROW
T011	Existing ROW
T012	Existing ROW
T013	Existing ROW
T014	Existing ROW
T014_Alt	New ROW as alternative
T015	Existing ROW
T015_Alt	New ROW as alternative
T017	Existing and new ROW

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Project Schedules

- The independent minimum duration was calculated using what SECO considered to be the minimum duration for Article VII application preparation, the anticipated time for the Article VII approval process, ROW procurement, and the anticipated time for construction

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

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Consequences for Other Regions

- Through the NYISO Transmission Expansion and Interconnection Process, the NYISO has been consulting with the IESO and PJM concerning any potential impacts due to the proposed 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, the Transmission Expansion and Interconnection Process will identify the necessary upgrades, and any available results will be incorporated into this report

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Impact on Wholesale Electricity Markets

- The proposed projects increase the Ontario to New York transfer capability and reduce congestion. Therefore, the NYISO staff has not determined any adverse impact on the New York wholesale electricity markets
- The draft report has been provided to Market Monitoring Unit for its review and consideration. MMU's evaluation will be provided prior to the Management Committee meeting

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Non-BPTF Upgrades

- The PSC's October 2016 Order directed National Grid to upgrade Niagara–Packard 115 kV lines #193 and #194, and determined that the costs should not be a distinguishing factor among project proposals
- National Grid reported to the NYISO that it will reconductor those lines, replace approximately 17 towers and other hardware, and make associated substation changes

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Evaluation of Interaction with Local Transmission Owner Plans

- The Tariff requires the NYISO to review the LTPs as they relate to the BPTF to determine whether any proposed regional Public Policy Transmission Project on the BPTF 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 to needs driven by Public Policy Requirements identified in the LTPs
- TOs' current LTPs have not identified any needs driven by a Public Policy Requirement. Accordingly, the NYISO determined that there is no interaction of the WNY solutions with LTPs

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Conclusions and Recommendations

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Summary of Evaluation

- High-level summary of the relative performance of each project for each metric using the primary study assumptions

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

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Ranking

- **Ranking based on the total performance of each project relative to the cost**
- **Three metrics that significantly impacted this tiered ranking**
  - Total overnight capital cost
  - Production cost savings relative to the total capital cost
  - Cost per MW ratio for the increased Ontario to New York thermal transfer limits over the Niagara Ties

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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

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Ranking & Selection

- Based upon review and discussion with ESPWG and TPAS, NYISO staff will rank the solutions and recommend a project for selection as the more efficient or cost effective solution to satisfy the Western NY Public Policy Transmission Need

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Next Steps

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Next Steps

- Please provide additional comments to PublicPolicyPlanningMailbox@nyiso.com as soon as possible, but no later than COB July 25, 2017
- July 27, 2017: ESPWG/TPAS
- August 9, 2017: Business Issue Committee
- August 10, 2017: Operating Committee (not required by Tariff)
- August 30, 2017: Management Committee
- September 19, 2017: NYISO Board Meeting

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Questions?

We are here to help. Let us know if we can add anything.

NEW YORK INDEPENDENT SYSTEM OPERATOR

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

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

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