NYISO Operating Study Summer 2019

A Report by the
New York Independent System Operator

May 2019

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Executive Summary

This study is conducted as a seasonal review of the projected thermal transfer capability for the summer 2019 capability period. The study evaluates the projected internal and external thermal transfer capabilities for the forecasted load and dispatch conditions studied. The evaluated limits are shown in Tables 1 through 5. Differences in the evaluated internal interface limits from summer 2018 to summer 2019 are shown in Figure 1 on page 10. Internal interfaces have changed due to the network alterations in the New York Control Area (NYCA) and modeling assumptions. Dysinger East limit increased to 750 MW because of the 216 MW decrease in forecasted load in the West area of NYISO. The modeling of Hudson-Farragut (B3402) 345 kV and Marion-Farragut (C3403) 345 kV lines and associated PARs out-of-service caused the redistribution of flows in the Hudson Valley area. This is the main cause for the decrease in the Total East thermal transfer limit to 4,050 MW and increase in UPNY-ConEd limit to 5175 MW. Differences in the evaluated external interface limits from summer 2018 to summer 2019 are shown in Figure 2 on page 13. External interface limits are essentially unchanged from the summer 2018.

INTRODUCTION

The following report, prepared by the Operating Studies Task Force (OSTF) at the direction and with the guidance of the System Operations Advisory Subcommittee (SOAS), highlights the thermal analysis evaluation for the summer 2019 capability period. This analysis indicates that, for the summer 2019 capability period, the New York interconnected bulk power system can be operated reliably in accordance with the "NYSRC Reliability Rules and Compliance for Planning and Operating the New York State Power System" and the NYISO System Operating Procedures.

Thermal transfer limits cited in this report are based on the forecasted load and dispatch assumptions and are intended as a guide to system operation. Changes in generation dispatch or load patterns that significantly change pre-contingency line loadings may change limiting contingencies or limiting facilities, resulting in higher or lower interface transfer capabilities.

System Operators should monitor the critical facilities noted in the included tables along with other limiting conditions while maintaining bulk power system transfers within secure operating limits.

PURPOSE

The purpose of the study is to determine:

- The total transfer capabilities (TTC) between NYISO and adjacent areas including IESO, PJM and ISO-NE for normal conditions in the summer/winter periods. The TTC is calculated based on NERC TPL-001-4 Category P1 and P2 contingencies and a set of selected Category P4, P5 and P7 contingencies.
- The TTC between NYISO and adjacent areas including IESO, PJM and ISO-NE for emergency conditions in the summer/winter periods. The TTC is calculated based on NERC TPL-001-4 Category P1 and P2 contingencies.

System Operating Limit (SOL) Methodology

The NYSRC Reliability Rules provide the documented methodology for use in developing System Operating Limits (SOLs) within the NYISO Reliability Coordinator Area. NYSRC Reliability Rules require compliance with all North American Electric Reliability Corporation (NERC) Standards and Northeast Power Coordinating Council (NPCC) Standards and Criteria. NYSRC Rule C.1, Tables C-1 and C-2 address the contingencies to be evaluated and the performance requirements to be applied. Rule C.1 also incorporates by reference Attachment H, NYISO

Transmission Planning Guideline #3-1, "Guideline for Stability Analysis and Determination of Stability-Based Transfer Limits" of the NYISO Transmission Expansion and Interconnection Manual.

STUDY PARTICIPANTS

First	Last	Company	First	Last	Company
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SYSTEM REPRESENTATION AND BASE STUDY ASSUMPTIONS

System Representation

The representation was developed from the NYISO Data Bank and assumes the forecast summer coincident peak load of 32, 383 MW. The other NPCC Balancing Areas and adjacent Regional representations were obtained from the RFC-NPCC summer 2019 Reliability Assessment power flow base case and have been updated to reflect the summer 2019 capability period. The base case model includes:

- The NYISO Transmission Operator area
- All Transmission Operator areas contiguous with NYISO
- All system elements modeled as in service
- All generation represented
- Phase shifters in the regulating mode in accordance with the NYISO Available Transfer Capability Implementation Document (ATCID)
- The NYISO Load Forecast

- Transmission Facility additions and retirements
- Generation Facility additions and retirements
- Remedial Action Scheme (RAS) models where currently existing or projected for implementation within the studied time horizon.
- Series compensation for each line at the expected operating level unless specified otherwise in the ATCID.
- Facility Ratings as provided by the Transmission Owner and Generator Owner

Generation Resource Changes

The status and dispatch level of generation represented in this analysis is a reasonable expectation based on the information available at the time of the study. Those modeling assumptions incorporate known unit outage status. The inter-Area schedules represented in the study base case are summarized in Appendix A. The following table shows generation deactivations and additions since the summer 2018 capability period:

Deactivations	
Cayuga II (IIFO)	-155 MW
Total Retirements	**-155 MW**
Additions	
Arkwright Summit Wind (Name Plate)	78 MW
Copenhagen Wind (Name Plate)	80 MW
Selkirk I&II	446 MW
Total Additions	**604 MW**

Transmission Facilities Changes

Significant facility changes since the summer 2018 capability period include:

- Modeling Hudson – Farragut (B3402) 345 kV PAR out-of-service
- Modeling Marion – Farragut (C3403) 345 kV PAR out-of-service
- Modeling St-Lawrence – Moses (L33P) 230 kV PAR out-of-service
- Modeling Moses (AT2) 230/115 Transformer out-of-service
- Modeling S.Ripley – Dunkirk (68) 230 kV line in-service
- Modeling Rainey – Corona 138 kV PAR in-service
- Addition of Cricket Valley 345 kV substation

The substation that will be used to interconnect the Cricket Valley Energy Center LLC will be constructed and in operation for Summer 2019. It is located on Consolidated Edison Company of

New York, Inc.'s ("Con Edison's") Pleasant Valley – Long Mountain 345 kV transmission line (circuit #398), approximately 14.5 miles east of Pleasant Valley 345 kV substation. The existing Line #398 will loop through a new 6-breaker ring GIS substation. In addition, a new 14.6-mile 345 kV line will be installed parallel to Line #398, using the existing Con Edison right-of-way, originating at the new Cricket Valley GIS substation and terminating at the Con Edison's Pleasant Valley 345 kV substation. The segments between Cricket Valley and Long Mountain of the existing Line #398 will be reconductored.

System Representation

The Siemens PTI PSS™MUST and PSS™E software packages were used to calculate the thermal limits based on Normal and Emergency Transfer Criteria defined in the NYSRC Reliability Rules. The thermal transfer limits presented have been determined for all transmission facilities scheduled in service during the summer 2019 period.

The schedules used in the base case power flow for this analysis assumed a net flow of 100 MW from Public Service Electric & Gas (PSE&G) to Consolidated Edison via the PAR transformers controlling the Hudson – Farragut and Linden – Goethals interconnections, and 100 MW on the South Mahwah – Waldwick circuits from Consolidated Edison to PSE&G, controlled by the PARs at Waldwick. The Hopatcong – Ramapo (5018) 500 kV circuit is scheduled in accordance with the "TCC Market PJM – NYISO Interconnection Scheduling Protocol", August 8th, 2017. For the summer 2019 base case, the schedule for the tie is 380 MW from PJM to New York. The four Ontario – Michigan PARs are modeled in-service and scheduled to a 0 MW transfer. These schedules are consistent with the scenarios developed in the RFC-NPCC Inter-Regional Reliability Assessment for summer 2019, and the MMWG summer 2018 power flow base cases. The series reactors on the Dunwoodie – Mott Haven (71 and 72), the Farragut – Gowanus (41 and 42) 345 kV, the Sprain Brook – W. 49th St. (M51 and M52) 345 kV, Packard – Sawyer (77 and 78) 230 kV and the E. 179th St. – Hell Gate (15055) 138 kV circuits are in-service in the base case. The series reactors on the Sprain Brook – East Garden City (Y49) 345 kV cable are by-passed. The series capacitors on the Marcy – Coopers Corners (UCC2-41) 345 kV, the Edic – Fraser (EF24-40) 345 kV and the Fraser – Coopers Corners (33) 345 kV circuits are in-service in the base case.

The NYISO Niagara generation was modeled using a 50-50 split on the 230 kV and 115 kV generators. The total output for the Niagara facility was modeled at 2,100 MW. The Ontario Niagara generation was modeled at an output of 1,300 MW.

DISCUSSION

Resource Assessment

Load and Capacity Assessment

The forecast peak demand for the summer 2019 capability period is 32,383 MW[1]. This forecast is approximately 520 MW (1.58%) lower than the forecast of 32,903 MW for the summer 2018 capability period, and 1,573 MW (4.63%) lower than the all-time New York Control Area (NYCA) seasonal peak of 33,956 MW, which occurred on July 19, 2013.

The Installed Capacity (ICAP) requirement for the summer period is 37,888 MW based on the NYSRC 17% Installed Reserve Margin (IRM) requirement for the 2019 Capability Year. NYCA generation capacity for summer 2019 is 39,004 MW, and net external capacity purchases of 1,625 MW have been secured for the summer period. The combined capacity resources represent a 25.4% margin above the forecast peak demand of 32,383 MW. These values were taken from the 2019 Load & Capacity Data report produced by the NYISO.

The equivalent forced outage rate is 4.78%, and includes forced outages and de-ratings based on historical performance of all generation in the NYCA. For summer 2018, the equivalent forced outage rate assumed was 4.9%.

Cross-State Interfaces

Transfer Limit Analysis

This report summarizes the results of thermal transfer limit analyses performed on power system representation modeling the forecast peak load conditions for summer 2019. Normal and emergency thermal limits were calculated according to Normal and Emergency Transfer Criteria definitions in the "NYSRC Reliability Rules for Planning and Operating the New York State Power System". For this assessment period the most severe single generation contingency is Nine Mile Point 2 at 1,310 MW. Facility ratings applied in the analysis were from the online MW ratings in the EMS, and are detailed in Appendix D.

Figure 1 presents a comparison of the summer 2019 thermal transfer limits to summer 2018 thermal transfer limits. Changes in these limits from previous years are due to changes in the base case load flow generation and load patterns that result in different pre-contingency line loadings,

[1] Forecast Coincident Peak Demand (50th percentile baseline forecast)

changes in limiting contingencies, or changes in circuit ratings, or line status. Appendix H presents a summary comparison of Cross-State thermal transfer limits between summer 2019 and 2018, with limiting element/contingency descriptions. Significant differences in these thermal transfer limits are discussed below.

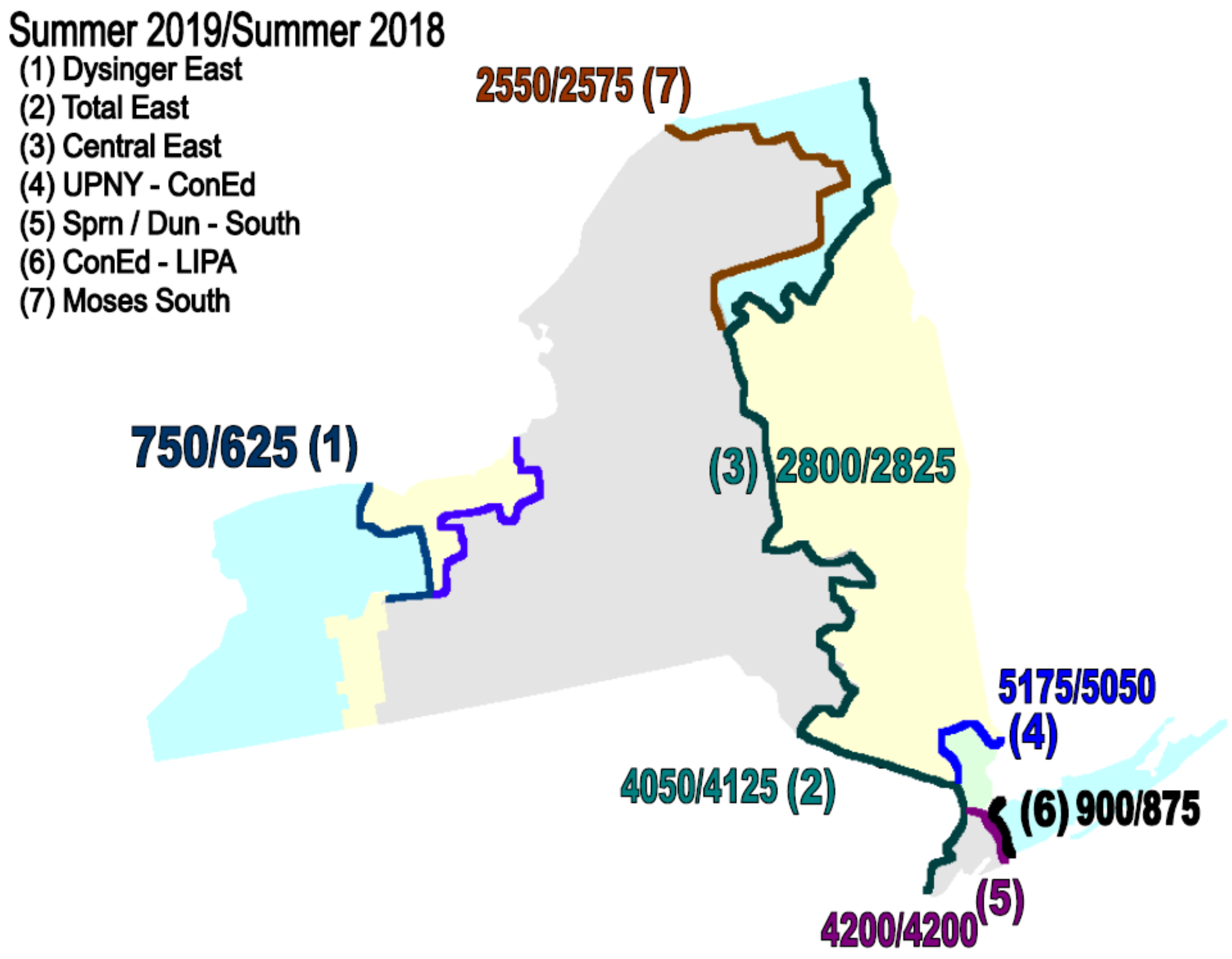

Figure 1 – Cross-State Thermal Transfer Limits

Dysinger East interface thermal transfer limit increased by 125 MW. This is mainly due to the 216 MW decrease of forecasted load in West Zone when compared to summer 2018 and modeling of S.Ripley – Dunkirk (68) 230 kV line in-service.

Total East interface thermal transfer limit decreased 75 MW. This is mainly due to the redistribution of line flows caused by the modeling of Hudson – Farragut (B3402) 345 kV and Marion – Farragut (C3403) 345 kV lines and associated PARs out-of-service.

UPNY-ConEd interface thermal transfer limit has increased 125MW. This is mainly due to the redistribution of line flows caused by the modeling of Hudson – Farragut (B3402) 345 kV and Marion – Farragut (C3403) 345 kV lines and associated PARs out-of-service. A comparable UPNY-SENY thermal transfer limit would be 4,375MW for the same limiting element and contingency as UPNY-ConEd.

Athens SPS

In 2008, a Special Protection System (SPS) went in-service impacting the thermal constraint on the Leeds to Pleasant Valley 345 kV transmission corridor. The SPS is designed to reject generation at the Athens combined-cycle plant if either the Leeds to Pleasant Valley 345 kV (92) circuit or the Athens to Pleasant Valley 345 kV (91) circuit are out-of-service and the flow on the remaining circuit is above the LTE rating. Generation at Athens will be tripped until the flow is below the LTE rating, the out-of-service circuit recloses, or the remaining circuit trips. This SPS is expected to be active when there is generation on-line at the Athens station, and will allow the NYCA transmission system to be secured to the STE rating of the 91 line for the loss of the 92 line, and vice-versa, for normal operating conditions. The SPS increases the normal thermal limit to match the emergency thermal limit across the UPNY-ConEd operating interface when the 91 or 92 is the limiting circuit. The Table 1 “Emergency” limit for the UPNY-ConEd interface can be interpreted as the “Normal” limit, when the Athens SPS is active.

West Woodbourne Transformer

The Total-East interface may be limited at significantly lower transfer levels for certain contingencies that result in overloading of the West Woodbourne 115/69 kV transformer. Should the West Woodbourne tie be the limiting facility, it may be removed from service to allow higher Total-East transfers. Over-current relays are installed at West Woodbourne and Honk Falls to protect for contingency overloads.

ConEd – LIPA Transfer Analysis

Normal transfer capabilities were determined using the base case generation dispatch and PAR settings as described in Appendix B. Emergency limits are dispatch dependant, and can vary based on generation and load patterns in the LIPA system.

For emergency transfer capability analysis, the PARs controlling the LIPA import were adjusted to allow for maximum transfer capability into LIPA:

ConEd – LIPA PAR Settings

	Normal	Emergency
Jamaica – Lake Success 138 kV	-200 MW	115 MW
Jamaica – Valley Stream 138 kV	-100 MW	120 MW
Sprain Brook – E. Garden City 345 kV	637 MW	637 MW

ISO-NE – LIPA PAR Settings

Norwalk Harbor – Northport 138 kV	100 MW	286 MW

The PAR schedules referenced above and the ConEd - LIPA transfer assessment assume the following loss factors and oil circulation modes in determination of the facility ratings for the 345 kV cables:

- Y49 has a 70% loss factor in slow oil circulation mode.
- Y50 has a 70% loss factor in rapid circulation mode.

Emergency Transfer via the 138 kV PAR-controlled Jamaica ties between ConEdison and LIPA

Con Edison and LIPA have determined possible emergency transfer levels via the Jamaica - Valley Stream (901) 138 kV and Jamaica - Lake Success (903) 138 kV PAR-controlled ties that could be used to transfer emergency power between the two entities during peak conditions. The emergency transfer levels were calculated in both directions, for system peak load conditions with all transmission lines in service and all generation available for full capacity.

ConEd to LIPA emergency assistance

Based on analysis of historical conditions performed by LIPA and Con Edison, Con Edison anticipates being able to supply a total flow up to 235 MW of emergency transfer from Con Edison to Long Island, if requested, via the ties.

LIPA to ConEd emergency assistance

LIPA anticipates being able to supply a total flow up to 505 MW of emergency transfer from Long Island to Con Edison, if requested, via the ties under ideal conditions (i.e. all lines and generation in-service, imports via Neptune, Norwalk Harbor to Northport Cable - NNC and Cross Sound Cable - CSC).

Transfer Limits for Outage Conditions

Transfer limits for scheduled outage conditions are determined by the NYISO Scheduling and Market Operations groups. The NYISO Real-Time Dispatch system monitors the EHV transmission continuously to maintain the secure operation of the interconnected EHV system.

Transient Stability and Voltage transfer Limits

The interface transfer limits shown in "SUMMARY OF RESULTS – THERMAL TRANSFER LIMIT ANALYSIS" section are the results of a thermal transfer limit analysis only. Transient stability and voltage interface transfer limits for all lines in-service and line outage conditions are summarized and available through the NYISO website located under "Interface Limits & Op Studies" at the following link

https://www.nyiso.com/reports-information

Thermal Transfer Capabilities with Adjacent Balancing Areas

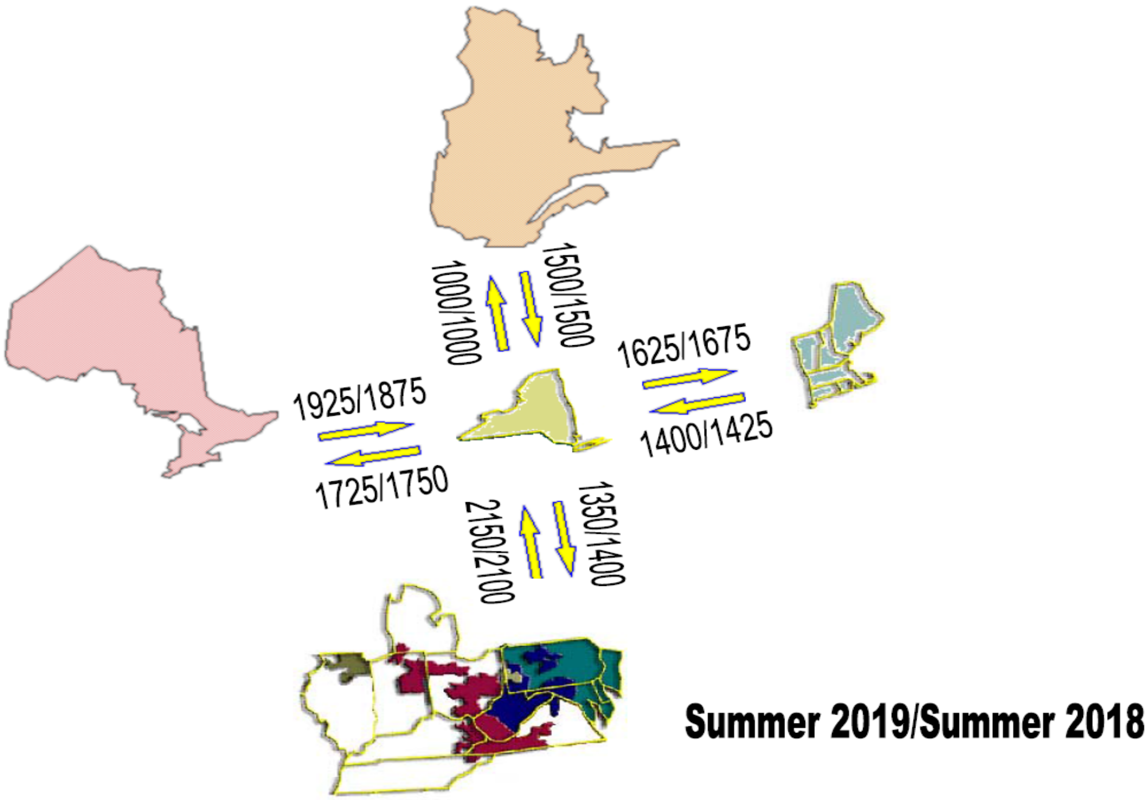

Figure 2 – Inter-Area Thermal Transfer Capabilities[2]

Thermal transfer limits between New York and adjacent Balancing Areas also are determined in this analysis. These transfer limits supplement, but do not change, existing internal operating limits. There may be facilities internal to each system that may reduce the transfer limits between Balancing Areas. Reductions due to these situations are considered to be the responsibility of the respective reliability authority. Some of these potential limitations are indicated in the summary

[2] TE-NY transfer capabilities shown in Figure 2 are not thermal transfer limits; for more information see page 20

tables by "Reliability Coordinating Facility" limits, which supplement the "Direct Tie" limits between the Balancing Areas. Transfer conditions within and between neighboring Balancing Areas can have a significant effect on inter- and intra-Area transfer limits. Coordination between Balancing Areas is necessary to provide optimal transfer while maintaining the reliability and security of the interconnected systems.

New York – New England Analysis

New England Transmission/Capacity Additions

Transmission

For the summer 2019 study period, there are no major projects coming into service that will significantly impact the New York – New England transmission capability. Notable transmission upgrades to be completed by June 2019 include re-terminating the 398 Line from Pleasant Valley into the new Cricket Valley substation in New York and reconductoring of the Eversource owned section of the 398 Line. Although the thermal ratings of the Eversource owned section of the 398 Line increased, the reconductoring has little to no impact on the New York – New England transmission capability.

Capacity

In the New England Control Area, from April through September 2019, two major generation additions are anticipated. Canal 3 (CAN3) is a simple cycle natural gas plant with an anticipated capacity of 333 MW interconnecting into the Canal 345 kV substation located in southeastern Massachusetts south of the Boston metropolitan area. Bridgeport Harbor 5 (BHR5) is a combined-cycle natural gas plant with an anticipated capacity of 485 MW interconnecting into the Singer 345 kV substation located in Bridgeport, Connecticut. Approximately 115 MW of solar photovoltaic and 48 MW of wind alternative energy resources are also anticipated to become commercial by the end of September 2019. Pilgrim Nuclear Station (PILG) is scheduled to retire in May 2019. Pilgrim Nuclear Station is comprised of one boiling water reactor with a capacity of 680 MW.

Thermal Transfer Limit Analysis

The transfer limits between the NYISO and ISO New England for normal and emergency transfer criteria are summarized in "Summary of Results – Thermal Transfer Limit Analysis " Section, Table 2.a and 2.b.

Cricket Valley Energy Center is not anticipated to enter commercial operation during Summer 2019; however, the NYISO determined transfer limits with Cricket Valley Energy Center on an advisory basis for the purpose of this study.

Cross-Sound Cable

The Cross-Sound Cable (CSC) is an HVDC merchant transmission facility connecting the New Haven Harbor 345 kV (United Illuminating, ISO-NE) station and Shoreham 138 kV (LIPA, NYISO) station. It has a design capacity of 330 MW. This facility is not metered as part of the NYISO – ISO-NE interface, and HVDC transfers are independent of transfers between the NYISO and ISO-NE.

Smithfield – Salisbury 69 kV

CHG&E and Eversource will normally operate the Smithfield - Salisbury 69 kV (FV/690) line closed. The maximum allowable flow on this line is 31 MVA based on limitations in the Eversource 69 kV system. When the ISO-NE to NYISO transfer is greater than approximately 400 MW, the line will be opened due to post contingency limits within the Eversource system. The FV/690 line has directional over-current protection that will trip the FV/690 line in the event of an overload when the flow is into ISO-NE. No protection exists to trip the FV/690 line in the event of an overload when the flow is into NYISO.

Northport – Norwalk Harbor Cable Flow

Flow on the NNC Norwalk Harbor to Northport facility is controlled by PAR transformer at Northport. As system conditions vary, the scheduled flow on the NNC may be used to optimize transfer capability between the Balancing Areas. The thermal transfer limits are presented in Table 2.a and 2.b for different PAR schedule assumptions on the Northport – Norwalk Harbor interconnection.

Whitehall – Blissville 115 kV

The PAR transformer on the K7 line at the VELCO Blissville substation will control pre-contingency flow between the respective stations. For the analyses, the pre-contingency schedule is 25 MW from Blissville (ISO-NE) to Whitehall (NYISO). The scheduled flow may be adjusted to protect the National Grid local 115 kV transmission south of Whitehall for 345 kV contingency events in southern Vermont pursuant to joint operating procedure developed by VELCO, National Grid, ISO-NE and NYISO.

Plattsburgh – Sand Bar 115 kV (i.e. PV20)

The PAR transformer on the PV20 line at the VELCO Sand Bar substation was modeled holding a pre-contingency flow of approximately 100 MW on the PV20 tie. This modeling assumption was premised upon common operating understandings between ISO-NE and the NYISO given local operating practice on the Moses – Willis – Plattsburgh 230 kV transmission corridor. ISO-NE's analysis examined and considered New England system limitations given this modeling assumption and did not examine generation dispatch or system performance on the New York side of the PV20 tie.

New York - PJM Analysis

Thermal Transfer Limit Analysis

The transfer limits for the NYISO – PJM and PJM – NYISO interfaces are summarized in Tables 3a and 3b respectively of the "SUMMARY OF RESULTS – THERMAL TRANSFER LIMIT ANALYSIS" section of this report.

Dunkirk-South Ripley (68) 230 kV Tie

Generation retirements in Southwestern NY and increased flows into PJM via the Dunkirk – South Ripley (68) 230 kV line have resulted in reliability concerns in the NY local 115kV network. Consequently the NYISO and PJM developed an operating document that guides operation of the Dunkirk-South Ripley line to maintain reliability in both the PJM and NYISO systems.

Opening of PJM - New York 115 kV Ties as Required

The normal criteria thermal transfer limits presented in "SUMMARY OF RESULTS – THERMAL TRANSFER LIMIT ANALYSIS" section were determined for an all lines in-service condition. The 115 kV interconnections between First Energy East and New York (Warren – Falconer, North Waverly – East Sayre, and Laurel Lake – Westover) may be opened in accordance with NYISO and PJM Operating Procedures provided that this action does not cause unacceptable impact on local reliability in either system. Over-current protection is installed on the Warren - Falconer and the North Waverly – East Sayre 115 kV circuits; either of these circuits would trip by relay action for an actual overload condition. There is no overload protection on the Laurel Lake - Westover circuit, but it may be opened by operator action if there is an actual or post-contingency overload condition. However, opening the Laurel Lake – Westover tie could potentially cause local thermal and pre- and post-contingency voltage violations for the 34.5 kV distribution system within First Energy East transmission zone. Sensitivity analysis performed indicated that the thermal and voltage conditions were exacerbated for conditions that modeled high simultaneous interface flows from NY to PJM and NY to Ontario.

DC Ties

Neptune DC tie is expected to be available. Hudson Transmission Project (HTP) DC tie is expected to be available.

Variable Frequency Transformer (VFT) Tie

The Variable Frequency Transformer Tie is a transmission facility connecting the Linden 230 kV (PSEG, PJM) to Linden 345 kV (ConEd, NYISO). For the summer 2019, Linden VFT will have 330 MW non-firm withdrawal right and 300 MW firm injection rights into PJM market.

Elimination of ConEdison – PJM Wheel and Implementation of 400 MW Operational Base Flow

As of May 1st, 2017 a new protocol has been implemented to set desired flow on the Hopatcong-Ramapo (5018) 500 kV, Ramapo-Waldwick K and J 345 kV, Linden – Goethals (A2253) 230 kV, Hudson – Farragut (B3402) 345 kV and Marion – Farragut (C3403) 345 kV lines, based on the scheduled PJM-NYSIO AC interchange and RECO load. The change was implemented due to the termination of non-conforming wheeling service that has been historically modeled as a fixed 1,000 MW flow from NYSIO to PJM over the JK interface and from PJM to NYSIO over the ABC interface.

Ontario – New York Analysis

Thermal Transfer Limit Analysis

The thermal transfer limits between the NYISO and Ontario's Independent Electricity System Operator (IESO) Balancing Areas for normal and emergency transfer criteria are presented in Tables 4 and 5. The thermal transfer limits from Ontario to NY were determined at all-in-service, and with line Dunkirk-South Ripley (68) 230 kV and Warren-Falconer (171) 115 kV lines out of service. The NYISO Niagara generation was modeled at an output of 2,100 MW.

The Ontario – New York ties at St. Lawrence, L33P is modelled out-of-service and L34P is controlling to 0 MW in all four scenarios. The interconnection flow limit across these ties is 300 MW, as presented in Table B3 "Interconnection Flow Limits" from the document "Reliability Outlook Tables" available at:

http://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/reliability-outlook/ReliabilityOutlookTables_2019Mar.xls?la=en

Transient Stability Limitations

Transient stability limits for the NYISO - IESO interconnection are reported in "NYPP-OH TRANSIENT STABILITY TESTING REPORT on DIRECT TIE TRANSFER CAPABILITY - OCTOBER 1993" available at:

https://www.nyiso.com/documents/20142/3694079/NYPP-OH_1993-2.pdf/2e21484a-22cf-739a-7a10-69dfd69f5d58

Ontario – Michigan PARs

All of the PARs on the four transmission lines interconnecting Ontario and Michigan are in service and regulating. For this study, the PARs were scheduled to regulate at 0 MW.

Impact of the Queenston Flow West (QFW) Interface on the New York to Ontario Transfer Limit

The QFW interface is defined as the sum of the power flows through the 230 kV circuits out of Beck. QFW is the algebraic sum of the following:

- Total generation in the Niagara zone of Ontario including the units at the Beck #1, #2 & Pump Generating Stations, Thorold and Decew Falls GS
- The total load in the zone
- The import from New York

For a given QFW limit, the import capability from New York depends on the generation dispatch and the load in the Niagara zone. The Ontario Niagara generation is set to 1,300 MW. The import capability from New York can be increased by decreasing generation in the Ontario Niagara zone, increasing demand in the Ontario Niagara zone, or both.

TransÉnergie–New York Interface

Thermal transfer limits between TransÉnergie (Hydro-Quebec) and New York are not analyzed as part of this study. Respecting the NYSRC and NYISO operating reserve requirements, the maximum allowable delivery into the NYCA from TransÉnergie on the Chateauguay – Massena (MSC-7040) 765 kV tie is 1310 MW. However in real-time the total flow is limited to 1800 MW; the additional flow is a "wheel-through" transaction to another Balancing Authority Area. Maximum delivery from NYCA to Quebec on the 7040 line is 1000 MW.

The Dennison Scheduled Line represents a 115 kV dual-circuit transmission line that interconnects the New York Control Area to the Hydro-Quebec Control Area at the Dennison Substation, near Massena, NY. The Dennison Line has a nominal north to south capacity of 190 MW in summer, into New York, and a nominal south to north capacity of 100 MW into Quebec.

SUMMARY OF RESULTS – THERMAL TRANSFER LIMIT ANALYSIS

Table 1 – NYISO CROSS STATE INTERFACE THERMAL TRANSFER LIMITS

- Table 1.a
    a. Dysinger East
    b. UPNY – ConEd
    c. Sprain Brook – Dunwoodie So.
    d. ConEd – LIPA Transfer Capability
- Table 1.b – MSC-7040 Flow Sensitivity
    a. Central East
    b. Total East
    c. Moses South

Table 2.a – NYISO to ISO-NE INTERFACE THERMAL TRANSFER LIMITS

- Northport-Norwalk Flow Sensitivity
- **Cricket Valley Energy Center I/S and O/S**

Table 2.b – ISO-NE to NYISO INTERFACE THERMAL TRANSFER LIMITS

- Northport-Norwalk Flow Sensitivity
- **Cricket Valley Energy Center I/S and O/S**

Table 3.a – NYISO to PJM INTERFACE THERMAL TRANSFER LIMITS

- 3-115 kV Ties I/S and O/S with Dunkirk-South Ripley (68) 230 kV Tie I/S and O/S
- Hudson – Farragut (B3402) 345 kV and Marion – Farragut (C3403) 345 kV lines and associated PARs I/S and O/S

Table 3.b – PJM to NYISO INTERFACE THERMAL TRANSFER LIMITS

- 3-115 kV Ties I/S and O/S with Dunkirk-South Ripley (68) 230 kV Tie I/S and O/S
- Hudson – Farragut (B3402) 345 kV and Marion – Farragut (C3403) 345 kV lines and associated PARs I/S and O/S

Table 4 – IESO to NYISO INTERFACE THERMAL TRANSFER LIMITS

Table 5 – NYISO to IESO INTERFACE THERMAL TRANSFER LIMITS

TABLE 1.a – NYISO CROSS-STATE INTERFACE THERMAL TRANSFER LIMITS - SUMMER 2019

ALL LINES I/S

	Dysinger East	UPNY - ConEd[1]	Sprain Brook Dunwoodie - So.	ConEd – LIPA Transfer Capability
NORMAL	750 (1)	5175 (3)	4200 (5)	900 (7)
EMERGENCY	1600 (2)	5900 (4)	4225 (6)	1500 (8)

	LIMITING ELEMENT	RATING			LIMITING CONTINGENCY
(1)	Niagara – Packard (61) 230 kV	@STE[4]	846 MW	L/O	Niagara – Packard (62) 230 kV Beck – Packard (BP76) 230 kV
(2)	Packard – Sawyer (77) 230 kV	@STE	746 MW	L/O	Packard – Sawyer (78) 230 kV
(3)	Leeds – Pleasant Valley (92) 345 kV	@LTE	1538 MW	L/O	Athens – Pleasant Valley (91) 345 kV
(4)	Leeds – Pleasant Valley (92) 345 kV	@STE	1724 MW	L/O	Athens – Pleasant Valley (91) 345 kV
(5)	Mott Haven – Rainey (Q11) 345 kV	@MTE[2]	1066 MW	L/O	(SB:RAIN345_4W) Mott Haven – Rainey (Q12) 345 kV Rainey 345/138 kV Transformer 3W Rainey – East 75 St. 138 kV
(6)	Dunwoodie – Mott Haven (71) 345 kV	@NORM	707 MW		Pre-Contingency Loading
(7)	Dunwoodie – Shore Rd. (Y50) 345 kV	@LTE	916 MW[3]	L/O	(SB RNS2 @ Sprain Brook 345 kV) Sprain Brook – East Garden City (Y49) 345 kV Sprain Brook – Academy (M29) 345 kV
(8)	Dunwoodie – Shore Rd. (Y50) 345 kV	@NORM	656 MW[3]		Pre-Contingency Loading

Note

1: See Cross-State Interfaces Section for discussion on Athens SPS
2: The rating used for cable circuits during SCUC reliability analysis is the average of the LTE and STE rating (MTE Rating).
3: LIPA rating for Y50 circuit is based on 70 % loss factor and rapid oil circulation.
4: Dysinger East limit used the NYSRC Rules Exception No. 13 – Post Contingency Flows on Niagara Project Facilities

TABLE 1.b – NYISO CROSS-STATE INTERFACE THERMAL TRANSFER LIMITS - SUMMER 2019

ALL LINES I/S

	MSC-7040 FLOW 800 MW	MSC-7040 FLOW 1310 MW	MSC-7040 FLOW 1600 MW
CENTRAL EAST			
NORMAL	2800 (1)	2800 (1)	2800 (1)
EMERGENCY	3050 (2)	3050 (2)	3050 (2)
TOTAL EAST			
NORMAL	4050 (3)	4050 (3)	4050 (3)
EMERGENCY	4300 (4)	4300 (4)	4300 (4)
MOSES SOUTH[1,2]			
NORMAL	2200 (5)	2550 (5)	2550 (8)
EMERGENCY	2225 (6)	2700 (7)	2650 (7)

	LIMITING ELEMENT	RATING			LIMITING CONTINGENCY
(1)	Leeds – New Scotland (93) 345 kV	@LTE	1538 MW	L/O	Leeds – New Scotland (94) 345 kV
(2)	Fraser – Coopers Corners (33) 345 kV	@STE	1793 MW	L/O	Marcy – Fraser Annex (UCC2-41) 345 kV (Series Capacitor)
(3)	Rock Tavern – Dolson Ave (DART44) 345 kV	@LTE	1852 MW	L/O	Rock Tavern–Middletown TAP (CCRT34) 345 kV Coopers Corners–Middletown TAP (CCRT34) 345 kV Middletown 345/138 kV Transformer Coopers Corners 345/115 kV Transformer
(4)	Coopers Corners – Middletown TAP (CCRT34) 345 kV	@STE	1793 MW	L/O	Rock Tavern – Dolson Ave (DART44) 345 kV
(5)	Moses – Adirondack (MA2) 230 kV	@LTE	386 MW	L/O	Chateauguay–Massena (MSC-7040) 765 kV Massena – Marcy (MSU1) 765 kV and TransÉnergie delivery
(6)	Flat Rock - Browns Falls 115 kV	@STE	135 MW	L/O	Chateauguay–Massena (MSC-7040) 765 kV Massena – Marcy (MSU1) 765 kV and TransÉnergie delivery
(7)	Marcy 765/345 kV T2 Transformer	@STE	1971 MW	L/O	Marcy 765/345 kV T1 Transformer
(8)	Marcy – Edic (UE1-7) 345 kV	@LTE	1650 MW	L/O	Marcy – Fraser Annex (UCC2-41) 345 kV (Series Capacitor) Chases Lake – Porter (11) 230 kV

Note

1: Moses South limit used the NYSRC Rules Exception No. 10 – Post Contingency Flows on Marcy AT-1 Transformer
2: Moses South limit used the NYSRC Rules Exception No. 12 – Post Contingency Flows on Marcy Transformer T2

TABLE 2.a – NYISO to ISO-NE INTERFACE THERMAL TRANSFER LIMITS - SUMMER 2019 ALL LINES I/S

	DIRECT TIE	NYISO FACILITY	ISO-NE FACILITY	DIRECT TIE	NYISO FACILITY	ISO-NE FACILITY
	Cricket Valley Energy Center Out of Service			Cricket Valley Energy Center in Service (1095 MW)		
			Northport –Norwalk 0MW			
NORMAL	2350 (1)	2525 (4)	3500 (8)	2225 (3)	2650 (4)	3600 (8)
EMERGENCY	2600 (2)	3100 (5)	3700 (9)	2350 (2)	3225 (5)	3800 (9)
			Northport –Norwalk 100MW			
NORMAL	2150 (6)	2450 (4)	3525 (8)	1900 (6)	2575 (4)	3625 (8)
EMERGENCY	2225 (7)	3025 (5)	3725 (9)	1975 (7)	3175 (5)	3825 (9)
			Northport –Norwalk 200 MW			
NORMAL	1875 (6)	2250 (4)	3525 (8)	1625 (6)	2375 (4)	3625 (8)
EMERGENCY	1925 (7)	2825 (5)	3725 (9)	1675 (7)	2975 (5)	3825 (9)

	LIMITING ELEMENT	RATING			LIMITING CONTINGENCY
(1)	Cricket Valley – Long Mountain (398) 345 kV	@LTE	1880 MW	L/O	Alps – Berkshire (393) 345 kV Berkshire – Northfield Mount (312) 345 kV Berkshire 345/115 kV Transformer Northfield G1 and G2
(2)	Cricket Valley – Long Mountain (398) 345 kV	@NORM	1323 MW		Pre-Contingency Loading
(3)	Cricket Valley – Long Mountain (398) 345 kV	@LTE	1880 MW	L/O	Milstone G3 24.0 kV
(4)	Reynolds Rd – Wyantskill (13-988) 115 kV	@STE	237 MW	L/O	Alps – Berkshire (393) 345 kV Berkshire – Northfield Mount (312) 345 kV Berkshire 345/115 kV Transformer Northfield G1 and G2
(5)	Reynolds Rd – Wyantskill (13-988) 115 kV	@STE	237 MW	L/O	Berkshire – Alps (393) 345 kV
(6)	Northport – Norwalk Harbor (NNC) 138 kV	@LTE	518 MW	L/O	Cricket Valley – Long Mountain (398) 345 kV
(7)	Northport – Norwalk Harbor (NNC) 138 kV	@STE	532 MW	L/O	Cricket Valley – Long Mountain (398) 345 kV
(8)	Berkshire – Northfield (312) 345 kV	@LTE	1697 MW	L/O	Pleasant Valley – Long Mountain (398) 345 kV
(9)	Berkshire – Northfield (312) 345 kV	@STE	2080 MW	L/O	Pleasant Valley – Long Mountain (398) 345 kV

NOTE

1: The Northport – Norwalk Harbor (NNC) flow is positive in the direction of transfer
2: The Northport – Norwalk Harbor (NNC) line is no longer part of the New York – New England Interface Definition

TABLE 2.b – ISO-NE to NYISO INTERFACE THERMAL TRANSFER LIMITS - SUMMER 2019 ALL LINES I/S

	DIRECT TIE	NYISO FACILITY	ISO-NE FACILITY	DIRECT TIE	NYISO FACILITY	ISO-NE FACILITY
	Cricket Valley Energy Center Out of Service			**Cricket Valley Energy Center in Service (1095 MW)**		
			Norwalk –Northport @ 0 MW			
NORMAL	2250 (1)		1550 (4)	2525 (1)		1650 (4)
EMERGENCY	2275 (2)		1550 (4)	2550 (2)		1650 (4)
			Norwalk –Northport @ 100 MW			
NORMAL	1850 (1)		1600 (4)	2150 (1)		1700 (4)
EMERGENCY	1925 (3)		1600 (4)	2200 (3)		1700 (4)
			Norwalk–Northport @ 200 MW			
NORMAL	1400 (1)		1650 (4)	1675 (1)		1750 (4)
EMERGENCY	1475 (3)		1650 (4)	1725 (3)		1750 (4)

	LIMITING ELEMENT	RATING			LIMITING CONTINGENCY
(1)	Northport – Norwalk Harbor (NNC) 138 kV	@LTE	518 MW	L/O	Cricket Valley – Long Mountain (398) 345 kV
(2)	Cricket Valley – Long Mountain (398) 345 kV	@NORM	1323 MW		Pre-Contingency Loading
(3)	Northport – Norwalk Harbor (NNC) 138 kV	@STE	532 MW	L/O	Cricket Valley – Long Mountain (398) 345 kV
(4)	Norwalk Junction – Archers Lane (3403D) 345 kV	@LTE	850 MW	L/O	Long Mountain – Frost Bridge (352) 345 kV

NOTE

1: The Northport – Norwalk Harbor (NNC) flow is positive in the direction of transfer
2: The Northport – Norwalk Harbor (NNC) line is no longer part of the New England – New York Interface Definition

TABLE 3.a – NYISO to PJM INTERFACE THERMAL TRANSFER LIMITS - SUMMER 2019 ALL LINES I/S

	DIRECT TIE	NYISO FACILITY	PJM FACILITY	DIRECT TIE	NYISO FACILITY	PJM FACILITY
	B&C PARs In-Service			B&C PARs Out-Of-Service		
Normal						
NORMAL	1475(1)	1350(2) [3]	1950(4)	1300(1)	1175(3) [3]	1800(4)
3-115-O/S	1400(7)	1425(2) [3]	1650(8)	1275(7)	1250(2) [3]	1475(8)
EMERGENCY	1475(1)	1950(9) [3]	1950(4)	1300(1)	1800(9) [3]	1800(4)
3-115-O/S	1475 (5)	1925(9) [3]	1650(8)	1325 (5)	1775(9) [3]	1475(8)
Dunkirk-South Ripley (68) 230 kV Out-of-service						
NORMAL	1275(11)	1250(3) [3]	1800(4)	1150(11)	1075(3) [3]	1650(4)
3-115-O/S	1900(6)	1350(2) [3]	1500 (8)	1800(6)	1225(2) [3]	1400 (8)
EMERGENCY	1275(11)	1825(9) [3]	1800(4)	1150(11)	1675(9) [3]	1650(4)
3-115-O/S	2125(10)	1775(9) [3]	1500(8)	2025(10)	1675(9) [3]	1400(8)

	LIMITING ELEMENT	RATING			LIMITING CONTINGENCY
(1)	Goudey – Laurel Lake (952) 115 kV	@NORM	108 MW		Pre-Contingency Loading
(2)	Delhi – Colliers (951) 115 kV	@STE	164 MW	L/O	Fraser – Coopers Corners (33) 345kV Fraser – Oakdale (32) 345kV
(3)	Oakdale (1) 345/115 kV	@LTE	556 MW	L/O	Oakdale – Watercure (31) 345kV Oakdale (3) 345/115/34.5 kV
(4)	Tiffany – Laurel Lake 115 kV	@NORM	127 MW		Pre-Contingency Loading
(5)	South Ripley – Dunkirk (68) 230 kV	@STE	350 MW	L/O	Warren – Glade (26) 230 kV
(6)	Hillside – East Towanda (70) 230 kV	@LTE	531 MW	L/O	Watercure – Mainesburg (30) 345kV
(7)	South Ripley – Dunkirk (68) 230 kV	@LTE	339 MW	L/O	Warren – Glade (26) 230 kV
(8)	East Towanda – North Meshoppen 115 kV	@STE	210 MW	L/O	Canyon – East Towanda 230 kV
(9)	Montor Falls – Coddington Road (982)115 kV	@STE	144 MW	L/O	Clarks Corners – Oakdale (36) 345kV
(10)	Hillside – East Towanda (70) 230 kV	@STE	630 MW	L/O	Watercure – Mainesburg (30) 345kV
(11)	Warren – Falconer (171) 115 kV	@STE	120 MW	L/O	Warren – Glade (26) 230 kV

NOTE

1: Emergency Transfer Capability Limits may have required line outages as described in New York – PJM Analysis Section.
2: PAR schedules have been adjusted in the direction of transfer.
3: Internal Non-Secured Limit: Limit to secure internal transmission elements that are not secured with pricing in the NYISO markets.

TABLE 3.b – PJM to NYISO INTERFACE THERMAL TRANSFER LIMITS - SUMMER 2019 ALL LINES I/S

	DIRECT TIE	NYISO FACILITY	PJM FACILITY	DIRECT TIE	NYISO FACILITY	PJM FACILITY
		B&C PARs In-Service			B&C PARs Out-Of-Service	
			Normal			
NORMAL	1525(1)	2125(3)[3]	2125(4)	1425(1)	2025(3)[3]	2025(4)
3-115-O/S	2150(5)	2425(3)[3]	1050(8)	2075(5)	2350(3)[3]	950(9)
EMERGENCY	1650(2)	2500(6)[3]	2425(7)	1575(2)	2400(6)[3]	2400(7)
3-115-O/S	2325(10)	2850(6)[3]	1050(11)	2250(10)	2775(6)[3]	950(9)
			Dunkirk-South Ripley (68) 230 kV Out-of-service			
NORMAL	1425(2)	2050 (3)[3]	2000(4)	1350(2)	1975 (3)[3]	1925(4)
3-115-O/S	2000(5)	2325(3)[3]	1050(12)	1925(5)	2250(3)[3]	950(9)
EMERGENCY	1425(2)	2400 (6)[3]	2300(7)	1350(2)	2325 (6)[3]	2200(7)
3-115-O/S	2250(13)	2725(6)[3]	1050(12)	2150(13)	2625(6)[3]	950(9)

	LIMITING ELEMENT	RATING			LIMITING CONTINGENCY
(1)	North Waverly – East Sayre (956) 115 kV	@STE	143 MW	L/O	Hillside – East Towanda (70) 230 kV Hillside – Watercure (69) 230 kV Hillside 230/115 kV Transformer
(2)	Falconer – Warren (171) 115 kV	@STE	140 MW	L/O	Pierce Brook – Five Mile Rd. (37) 345 kV
(3)	North Waverly – Lounsberry 115 kV	@STE	143 MW	L/O	Watercure – Oakdale (31) 345 kV Oakdale – Clarks Corner (36) 345 kV
(4)	Towanda – East Sayre 115 kV	@STE	246 MW	L/O	Hillside – East Towanda (70) 230 kV Hillside – Watercure (69) 230 kV Hillside 230/115 kV Transformer
(5)	Hillside – East Towanda (70) 230 kV	@LTE	531 MW	L/O	Watercure – Mainsburg (30) 345 kV
(6)	North Waverly – Lounsberry 115 kV	@STE	143 MW	L/O	Watercure – Oakdale (31) 345 kV
(7)	Towanda – East Sayre 115 kV	@STE	246 MW	L/O	Hillside – East Towanda (70) 230 kV
(8)	Erie East – Fourmile 230 kV	@LTE	584 MW	L/O	Pierce Brook – Five Mile Rd. (37) 345 kV
(9)	East Towanda – North Meshoppen 115 kV	@STE	210 MW	L/O	Canyon – East Towanda 230 kV
(10)	South Ripley – Dunkirk (68) 230 kV	@STE	350 MW	L/O	Pierce Brook – Five Mile Rd. (37) 345 kV
(11)	Erie East – Fourmile 230 kV	@STE	584 MW	L/O	Pierce Brook – Five Mile Rd. (37) 345 kV
(12)	Everett Dr – Mainesburg 115 kV	@STE	245 MW	L/O	Hillside – East Towanda (70) 230 kV
(13)	Hillside – East Towanda (70) 230 kV	@STE	630 MW	L/O	Watercure – Mainsburg (30) 345 kV

NOTE

1: Emergency Transfer Capability Limits may have required line outages as described in New York – PJM Analysis Section.
2: PAR schedules have been adjusted in the direction of transfer.
3: Internal Non-Secured Limit: Limit to secure internal transmission elements that are not secured with pricing in the NYISO markets.

TABLE 4 – IESO to NYISO INTERFACE THERMAL TRANSFER LIMITS - SUMMER 2019 ALL LINES

I/S

	DIRECT TIE	NYISO FACILITY	IESO FACILITY
		Normal	
NORMAL	1925 (1)	2600 (3) 2	2075 (4)
EMERGENCY	2275 (2)	2625 (5) 2	3425 (6)
Dunkirk-South Ripley (68) 230 kV & Warren-Falconer (171) 115 kV Out-of-service			
NORMAL	1925 (1)	2075 (7) 2	2075 (4)
EMERGENCY	2325 (2)	2075 (7) 2	3450 (6)

	LIMITING ELEMENT	RATING			LIMITING CONTINGENCY
(1)	Beck – Niagara (PA27) 230 kV	@LTE	460 MW	L/O	Beck – Niagara (PA 301) 345 kV Beck – Allanburg (Q28A) 220 kV
(2)	Beck – Niagara (PA27) 230 kV	@NORM	400 MW		Pre-Contingency Loading
(3)	Hinman – Harris Radiator (908) 115 kV	@STE	280 MW	L/O	Robinson Road – Stolle Road (65) 230 kV Stolle Road – High Sheldon (67) 230 kV Gardenville – Stolle Road (66) 230 kV
(4)	Cherrywood DK2 – Pickering (BP27-30) 220 kV	@LTE	950 MW	L/O	Cherrywood DK1 – Pickering (BP27-30) 220 kV
(5)	Hinman – Harris Radiator (908) 115 kV	@STE	280 MW	L/O	Robinson Road – Stolle Road (65) 230 kV
(6)	Agincrt_JC5R – Leslie_TSjc5 220 kV	@NORM	320 MW		Pre-Contingency Loading
(7)	Depew – Erie Street (54-921) 115 kV	@STE	158 MW	L/O	North Broadway – Erie Street (181-192) 115kV

Note

1: Ontario - NYISO limit used the NYSRC Rules Exception No. 13 – Post Contingency Flows on Niagara Project Facilities
2: Internal Non-Secured Limit: Limit to secure internal transmission elements that are not secured with pricing in the NYISO markets.

TABLE 5 – NYISO to IESO INTERFACE THERMAL TRANSFER LIMITS – SUMMER 2019ALL LINES I/S

	DIRECT TIE	NYISO FACILITY	IESO FACILITY1
Dunkirk-South Ripley (68) 230 kV & Warren-Falconer (171) 115 kV Out-of-Service			
NORMAL	1725(1)		1350(2)
EMERGENCY	2200(5)		1725(4)
Dunkirk-South Ripley (68) 230 kV In-Service & Warren-Falconer (171) 115 kV Out-of-Service			
NORMAL	1725(1)		1375(2)
EMERGENCY	2200(5)		1750(4)

	LIMITING ELEMENT	RATING			LIMITING CONTINGENCY
(1)	Beck – Niagara (PA27) 230 kV	@LTE	460 MW	L/O	Beck – Niagara (PA 301) 345 kV Beck GS21 13.8 kV
(2)	Beck – Hannon (Q24HM) 230 kV	@LTE	480 MW	L/O	Middleport – Beach - Carluke (Q25BM) 230 kV Beck – Middleport – Beach (Q29HM) 230 kV
(3)	Beck – Niagara (PA27) 230 kV	@STE	558 MW	L/O	Beck – Niagara (PA 302) 345 kV
(4)	Beck – Hannon (Q29HM) 230 kV	@NORM	415 MW		Pre-Contingency Loading
(5)	Beck – Niagara (PA27) 230 kV	@NORM	400 MW		Pre-Contingency Loading

Note

1: This limit can be increased by reducing generation or increasing demand in the Niagara zone of Ontario. See Ontario – New York Analysis for discussion.