# 2018 Assessment of Planning Transfer Capability for the Near Term Planning Horizon

(NERC Standard FAC-013-2)

A Report by the
New York Independent System Operator

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# Table of Contents

# 1. Introduction

## 1.1. Background

This report comprises the 2018 New York Independent System Operator ("NYISO") assessment of Planning Transfer Capability ("PTC") of the planned New York State Bulk Power Transmission Facilities ("BPTF") for the near-term (years one through five) planning horizon, assessing the planned system for year five (2022).

Consistent with the "Methodology for Assessment of Transfer Capability in the Near-Term Transmission Planning Horizon" [1] ("PTC Methodology"), and the methodology employed within the annual Area Transmission Review ("ATR") [2], the NYISO conducts the annual Assessment of Planning Transfer Capability ("PTC Assessment") of the planned New York State BPTF in accordance with applicable North American Electric Reliability Corporation ("NERC") Reliability Standards [3], Northeast Power Coordinating Council ("NPCC") Design Criteria [4], New York State Reliability Council ("NYSRC") Reliability Rules and Procedures[5], and NYISO planning and operation practices.

Transfer Capability is defined by NERC as the measure of the ability of interconnected electric systems to move or transfer power in a reliable manner from one area to another over all transmission lines (or paths) between those areas under specified system conditions.

PTC is determined by the NYISO in its role as Planning Coordinator in accordance with NERC Standard FAC-013-2, "Assessment of Transfer Capability for the Near-Term Transmission Planning Horizon" [6], and is not directly related to calculations of Total Transfer Capability ("TTC") or Available Transfer Capability ("ATC").

The PTC Assessment is not intended to determine the maximum transfer capability. The PTC may be sensitive to various factors including, but not limited to, base case load and generation conditions, Phase Angle Regulator ("PAR") schedules, and inter-area transfers. These sensitivities are not considered in determining the PTC as no attempts are made to optimize transfer limits.

The NYISO conducted simulations in accordance with the PTC Methodology [1]. For the assessed study year (2022), the assessment of PTC evaluates BPTF facilities.

## 1.2. NYCA Interfaces

The PTC Assessment monitors and evaluates eleven major interfaces between zones within the New York Control Area ("NYCA") as depicted in Figure 1: Dysinger East, West Central, Volney East, Moses South, Central East, Total East, UPNY-SENY, UPNY-ConEd, Millwood South, Sprain Brook –

Dunwoodie South, and LIPA Import. Additionally the PTC Assessment monitors and evaluates interfaces between the NYISO and all neighboring control areas: Ontario ("IESO"), Hydro-Quebec, ISO-New England, and PJM.

**Figure 1 NYCA Interfaces and Load Zones**

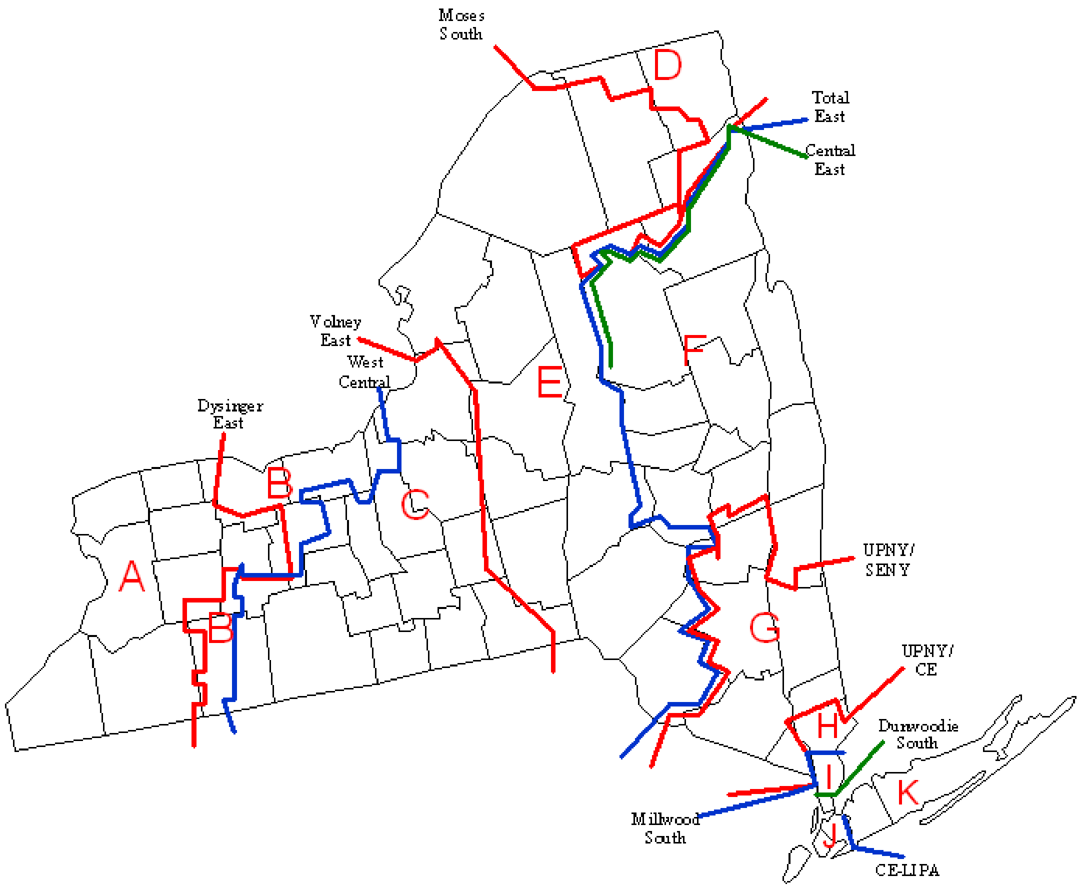


Figure 1 geographically depicts the NYCA interfaces and load zones.

## 1.3. Criteria and Assumptions

Criteria and assumptions as well as detailed descriptions of the transfers performed can be found in sections 2-4 of the PTC Methodology [1].

# 2. Thermal Transfer Analysis

## 2.1. Thermal Transfer Methodology

Thermal transfer limit analysis is performed using the PowerGEM TARA program utilizing the Proportional Scale Transfer activity by shifting generation across the interface under evaluation. The thermal transfer limit analysis is performed on the 2022 summer peak load base case in accordance with the PTC Methodology [1].

The thermal transfer analysis monitors transmission facilities above 100 kV, including all New York State BPTF elements under contingency conditions while shifting power across interfaces within NYCA and neighboring systems.

The thermal transfer analysis includes over 1,000 contingencies consistent with NERC, NPCC, and NYSRC Design Criteria [3]-[5]. Neighboring system design criteria contingencies are also included, as appropriate, to evaluate their impact on thermal transfer limits. The contingencies evaluated include the most severe impedance changes and includes the majority of possible contingencies on the BPTF system. The applied contingencies are modeled to simulate the removal of all elements that the protection system and other automatic controls would disconnect without operator intervention.

For thermal transfer analysis, tap settings of PARs and auto-transformers regulate power flow and voltage, respectively, in the pre-contingency solution, but are fixed at their corresponding pre-contingency settings in the post-contingency solution. Similarly, switched shunt capacitors and reactors are switched at pre-determined voltage levels in the pre-contingency solution, but are held at their corresponding pre-contingency position in the post-contingency solution.

Thermal transfer limits are sensitive to the base case load and generation conditions, and to the generation selection utilized to create the transfer, PAR schedules, and inter-Area power transfers. No attempts are made to optimize transfer limits; therefore, these parameters are not varied to determine an optimal dispatch.

To determine the Transfer Capability, the generation resources in the source and sink areas are adjusted uniformly to allow for equal participation of aggregated generators based on the ratio of maximum power and reserve power for each generator. Wind, nuclear, and run-of-river hydro units are excluded from generation shifts. The general direction of generation shifts is from the north and west to southeastern New York. The results are based on deterministic summer peak load power flow analysis and may not be applicable for use in probabilistic resource adequacy analysis.

## 2.2. Thermal Analysis Results

Tables 1, 2, 3, and 4 summarize the normal and emergency thermal transfer limits determined for the NYCA intra-Area and inter-Area transmission interfaces (where both open and closed interface definitions exist, the open interface limits are reported in the table). The assessment of thermal Transfer Capability demonstrates that the New York State BPTF system meets the applicable NERC, , NPCC, and NYSRC Reliability Rules [3]-[5] with respect to thermal ratings. The New York State BPTF system security is maintained by limiting power transfers according to the determined thermal constrained transfer limits. The following provides explanations for changes in transfer limits of greater than 100 MW:

- The Dysinger East and West Central Interface's normal and emergency transfer limits increased compared to the 2016 Intermediate ATR. The increase in transfer limit is the result of an increased dispatch of Somerset generation, which is very close to both the Dysinger East and West Central interfaces.
- The Volney East Interface's normal and emergency transfer limits increased compared to the 2016 intermediate ATR. This increase is due to the inclusion of the FitzPatrick Nuclear Plant, following withdrawal of the deactivation notice for that plant. The FitzPatrick plant is very close to the Volney East Interface and a portion of FitzPatrick generation flows directly over the interface.
- The Moses South Interface's normal and emergency transfer limits increased compared to the 2016 ATR. This increase is due to reduced dispatch on hydro-generation units in the north. This generation reduces flows on the 115kV transmission system coming out of area 4, on which is the historical limiting element for the Moses South Interface.
- The Total East Interface's normal and emergency limits increased compared to the 2016 Intermediate ATR. This increase is caused by a decrease in the generation down stream of the interface on the non-constraining side.
- The UPNY SENY Interface's normal limit slightly decreased when compared to the 2016 Intermediate ATR. This decrease is due to the inclusion of the FitzPatrick Nuclear Plant, which causes increased flows on the 345 kV system on the constraining side of the interface.
- The UPNY Con Edison Interface's emergency transfer limit increased when compared to the 2016 Intermediate ATR. This increase is due to a decrease in generation directly up stream of the historical limiting element.
- The LIPA Import Interface's normal and emergency transfer limits increased compared to the 2016 Intermediate ATR. This increase is the result of the inclusion of the proposed 500MW Poseidon HVDC injection into LIPA in the year 2022 study case.

When analyzing the inter-Area transfer limits, generation dispatch assumptions in neighboring areas can have a significant impact. Pre-shift generation dispatch in neighboring Control Areas dictates generation participation factors in generation-to-generation shifts. If generation close to the NYCA border participates more as a source or a sink, transmission lines in the vicinity of the source or sink may appear to be more or less limiting. The following provides explanations for changes in inter-Area transfer limits:

- The New York - New England Interface's emergency transfer limit increased slightly compared to the 2016 Intermediate ATR. This slight increase is due to a change in New England and down state New York generation dispatch.
- The New York – PJM Interface's normal and emergency limits decreased compared to the 2016 Intermediate ATR. This decrease is due to the new methodology used for New York – PJM transfers that incorporated the NYISO – PJM Joint Operating Agreement (JOA).
- The PJM – New York Interface's normal and emergency limits increased compared to the 2016 intermediate ATR. This increase is due to the inclusion of the proposed 500MW Poseidon HVDC injection into LIPA in the year 2022 study case. While the methodology changed to incorporate the JOA in the PJM – New York direction as well, these changes in methodology were less impactful to the PJM – New York direction than in the New York – PJM direction.

**Table 1: Normal Transfer Criteria Intra – Area Thermal Transfer Limits**

| Interface | 2016 Intermediate ATR | 2017 Transfers | Limiting Constraint 2016 Intermediate ATR | Limiting Constraint 2017 Transfers |
|---|---|---|---|---|
| **Dysinger East** | 875 (A) | 1,075 (A) | **Packard – Sawyer 230 (77)** at 644 MW LTE rating for L/O Huntley – Sawyer 230 (78) and Packard – Sawyer 230 (78) and Packard – Niagara 230 (62) and Packard 230/115 kV Transformer (XMFR 3) | **Niagara - Packard 230 (61)** at 847 MW STE rating for L/O Niagara - Packard 230 (62) and Packard - Beck 230 (76) |
| **West Central** | -975 (A) | -750 (A) | | |
| **Volney East** | 3,575 | 3,875 | **Fraser-Coopers Corners 345** at 1721 MW LTE rating for L/O Porter-Rotterdam 230 and Marcy-Coopers Corners 345 | |
| **Moses South** | 2,125 | 2,400 | **Browns Falls-Taylorville 115** at 134 MW STE rating for L/O Chateauguay-Massena-Marcy 765 | |
| **Central East** | 2,250 | 2,275 | **New Scotland - Leeds 345 (77)** at 1538 MW LTE rating for L/O New Scotland (99)–Leeds 345 | |
| **Total East** | 5,550 | 5,875 | **Dolson-Rock Tavern 345** at 1793 MW LTE rating for L/O Coopers Corners-Middletown Tap-Rock Tavern 345 and Rock Tavern-Roseton 345 | |
| **UPNY SENY** | 5,200 (B) | 5,075 (B) | **Leeds-Pleasant Valley 345** at 1538 MW LTE rating for L/O CPV-Rock Tavern 345 and Coopers Corners – Middletown Tap - Rock Tavern 345 | |
| **UPNY ConEdison** | 5,850 (C,D) | 5,925 (C,D) | **Buchanan – Millwood 345 (97)** at 1974 MW STE rating for Buchanan – Millwood 345 345 (98) and Buchanan – Millwood 138kV | **Roseton - East Fishkill (RFK305)** at 267 MW LTE rating for L/O Rock Tavern - Ramapo (77) and Rock Tavern - Sugarloaf - Ramapo (76) |
| **Dunwoodie South** | 5,550 (C,E) | 5575 (C,E) | **Dunwoodie-Mott Haven 345** at 926 MW LTE rating for L/O Dunwoodie-Mott Haven 345 (72) | **Dunwoodie-Mott Haven 345** at 786 MW Normal rating for pre-contingency loading |
| **LIPA Import** | 1,700 (F) | 2,100 (F) | **Dunwoodie-Shore Rd. 345** at 962 MW LTE rating for L/O Sprain Brook-E.G.C. 345 and Sprain Brook-Academy 345/138 | |

Notes:

A. Used Reliability Rules Exception Reference No. 13 – Post Contingency Flows on Niagara Project Facilities
B. Used Reliability Rules Exception Reference No. 23 – Generation Rejection at Athens
C. Ramapo PAR1 and PAR2 are scheduled at 80% of the RECO load
D. Used Reliability Rules Exception Reference No. 8 Post Contingency Flow on Buchanan-Millwood W97 or W98
E. Dunwoodie North PAR1 and PAR2 are scheduled at 115 MW each into NYC
Dunwoodie South PAR is scheduled at 235 MW into NYC
Sherman Creek PAR1 and PAR2 are scheduled at 200 MW each into NYC
Parkchester PAR1 and PAR2 are scheduled at 245 MW each into NY
F. E.G.C. PAR1 and PAR2 are scheduled at 315 MW each into Long Island
Lake Success and Valley Stream PARs are scheduled at 178 MW and 122 MW, respectively, into NYC
Neptune, CSC, and Poseidon HVdc are scheduled at 660 MW, 96 MW, and 500 MW respectively, into Long Island

**Table 2: Emergency Transfer Criteria Intra – Area Thermal Transfer Limits**

| Interface | 2016 Intermediate ATR | 2017 Transfers | Limiting Constraint 2016 Intermediate ATR | Limiting Constraint 2017 Transfers |
|---|---|---|---|---|
| **Dysinger East** | 1,550 | 1,750 | **Packard – Sawyer 230 (77)** at 746 MW STE rating for L/O Packard – Sawyer 230 (78) and Packard – Niagara 230 (61) and Packard 230/115 kV Transformer (XMFR 3) | |
| **West Central** | -300 | -50 | | |
| **Volney East** | 3,850 | 4,125 | **Fraser-Coopers Corners 345** at 1793 MW STE rating for L/O Marcy-Coopers Corners 345 | |
| **Moses South** | 2,125 | 2,400 | **Browns Falls-Taylorville 115** at 134 MW STE rating for L/O Chateauguay-Massena-Marcy 765 | |
| **Central East** | 2,550 | 2,575 | **New Scotland (77)-Leeds 345** at 1724 MW STE rating for L/O New Scotland (99)-Leeds 345 | |
| **Total East** | 5,675 | 5,925 | **Coopers Corners - Middletown Tap 345 (CCRT-34)** at 1793 MW STE rating for L/O Dolson - Rock Tavern 345 (CCRT-42) | |
| **UPNY SENY** | 5,300 (A) | 5,275 (A) | **Leeds-Pleasant Valley 345** at 1724 MW STE rating for L/O Athens-Pleasant Valley 345 | |
| **UPNY ConEdison** | 5,875 (A) | 6,600 (A) | **Buchanan – Millwood 345 (97)** at 1974 MW STE rating for Buchanan – Millwood 345 345 (98) | |
| **Dunwoodie South** | 5,650 (A,B) | 5,600 (A,B) | **Dunwoodie-Mott Haven 345** at 786 MW Normal rating for pre-contingency loading | |
| **LIPA Import** | 2,200 (C) | 2,700 (C) | **Dunwoodie-Shore Road 345** at 687 MW Normal rating for pre-contingency loading | |

Notes:

A. Ramapo PAR1 and PAR2 are scheduled at 80% of the RECO load.

B. Dunwoodie North PAR1 and PAR2 are scheduled at 115 MW each into NYC.
Dunwoodie South PAR is scheduled at 235 MW into NYC.
Sherman Creek PAR1 and PAR2 are scheduled at 200 MW each into NYC.
Parkchester PAR1 and PAR2 are scheduled at 245 MW each into NY.

C. E.G.C. PAR1 and PAR2 are scheduled at 315 MW each into Long Island.
Lake Success and Valley Stream PARs are scheduled at 87 MW and 88 MW, respectively, into Long Island.
Neptune, CSC, and Poseidon HVdc are scheduled at 660 MW, 96 MW, and 500 MW respectively, into Long Island.

**Table 3: Normal Transfer Criteria Inter-Area Thermal Transfer Limits**

| Interface | 2016 Intermediate ATR | 2017 Transfers | Limiting Constraint 2016 Intermediate ATR | Limiting Constraint 2017 Transfers |
|---|---|---|---|---|
| New York - New England | 1,475 | 1,550 | **Pleasant Valley-Long Mountain 345** at 1382 MW LTE rating for L/O Millstone Unit #3 and PV-20 OMS | **Pleasant Valley-Long Mountain 345** at 1382 MW LTE rating for Breaker Failure at Northfield Bus T2 |
| New England - New York | 1,350 | 1,425 | **Reynolds Rd. 345/115kV** at 562 MW LTE rating for L/O Alps – New Scotland 345kV | |
| New York - Ontario | 1,700 | 1,700 | **Beck – Niagara (PA27) 230 kV** at 460 MW LTE rating for L/O Niagara-Beck 345kV (PA302) | |
| Ontario - New York | 1,925 | 1,925 | **Beck – Niagara (PA27) 230 kV** at 460 MW LTE rating for L/O Niagara-Beck 345kV (PA301) | |
| New York – PJM | 1,875 (A) | 750 (A) | **Packard - Niagara 115kV (192)** at 352 MW STE rating for L/O Packard - Niagara 115kV (191) & Niagara – Lockport 115kV (101) | |
| PJM - New York | 3,175 (B) | 3,675 (B) | **N. Waverly – E. Sayre** at 108 MW Normal rating for pre-contingency loading | **Hoptacong 500kV - Ramapo 500kV** at 1052 MW Normal rating for pre-contingency loading |

Notes:

A. Ramapo PAR1 and PAR2 are scheduled at 80% of the RECO load.
Neptune, HTP, and Poseidon HVdc is scheduled at 0 MW.
Linden VFT is scheduled at 315 MW into PJM.

B. Ramapo PAR 1 and PAR 2 are scheduled at 80% of the RECO load.
Neptune, HTP, and Poseidon HVdc, are scheduled at 660 MW, 320 MW, and 500 MW respectively into NY.

**Table 4: Emergency Transfer Criteria Inter-Area Thermal Transfer Limits**

| Interface | 2016 Intermediate ATR | 2017 Transfers | Limiting Constraint 2016 Intermediate ATR | Limiting Constraint 2017 Transfers |
|---|---|---|---|---|
| New York - New England | 2,100 | 2,225 | **Pleasant Valley-Long Mountain 345kV** at 1680 MW STE rating for L/O Millstone Unit #3 | |
| New England - New York | 2,475 | 2,525 | **Reynolds Rd. 345/115kV** at 775 MW STE rating for L/O Alps – New Scotland 345kV | |
| New York – Ontario | 2,200 | 2,175 | **Beck – Niagara (PA27) 230 kV** at 558 MW STE rating for L/O Beck – Niagara (PA 301) 345 kV | **Beck – Niagara (PA27) 230 kV** at 400 MW Normal rating for pre-contingency loading |
| Ontario - New York | 2,300 | 2,300 | **Beck – Niagara (PA27) 230 kV** at 400 MW Normal rating for pre-contingency loading | **Beck – Niagara (PA27) 230 kV** at 400 MW Normal rating for pre-contingency loading |
| New York – PJM | 2,200 (A) | 1,425 (A) | **Packard - Niagara 115kV (192)** at 352 MW STE rating for L/O Packard - Niagara 115kV (191) | |
| PJM - New York | 3,175 (B) | 3,675 (B) | **N. Waverly – E. Sayre** at 108MW Normal rating for pre-contingency loading | **Hoptacong 500kV - Ramapo 500kV** at 1052 MW Normal rating for pre-contingency loading |

Notes:

A. Ramapo PAR1 and PAR2 are scheduled at 80% of the RECO load.
Neptune, HTP, and Poseidon HVdc is scheduled at 0 MW.
Linden VFT is scheduled at 315 MW into PJM.

B. Ramapo PAR 1 and PAR 2 are scheduled at 80% of the RECO load.
Neptune, HTP, and Poseidon HVdc, are scheduled at 660 MW, 320 MW, and 500 MW respectively into NY.

# 3. Voltage Transfer Analysis

## 3.1. Voltage Transfer Methodology

Voltage-constrained transfer limit analysis is performed using PowerGEM TARA software considering specific bus voltage limits (*i.e.* OP-1 buses) [7]. The OP-1 bus voltage limit criteria include specific minimum and maximum voltage limits for pre-contingency and post-contingency conditions. The required post-contingency voltage is typically within 5% of nominal.

A voltage transfer case is created from the summer 2022 peak load case. A set of power flow cases with increasing transfer levels is created for each interface from the 2022 summer peak load voltage transfer case by applying generation shifts similar to those used for thermal transfer analysis. For each interface, PowerGEM TARA evaluates the system response to the set of the most severe NERC, NPCC and NYSRC Design Criteria contingencies [3]-[5]. The applied contingencies are modeled to simulate the removal of all elements that the protection system or other automatic controls would disconnect without operator intervention. Selection of these contingencies is based on an assessment of cumulative historical power system analysis, actual system events, and planned changes to the system; additionally, all design criteria contingencies consistent with NERC, NPCC, and NYSRC criteria [3]-[5] are screened to provide that the most limiting contingencies for the modeled system are included in this analysis. The resulting contingencies evaluated include the most severe loss of reactive capability and increased impedance on the BPTF system.

For the 2017 PTC Assessment, the load is modeled as constant power in all NYCA zones except the Con Edison service territory. The Con Edison voltage-varying load model is used to model the Con Edison load in all cases.

While constructing the voltage transfer case, in order to maintain bus voltage within the applicable pre-and post-contingency limits under transfer conditions, adjustments are made to reactive power sources (*e.g.* generators, PARs, autotransformers). The reactive power of generators is regulated, within the capabilities of the units, to maintain a scheduled voltage in both the pre-contingency and post-contingency power flows. Tap settings of PARs and autotransformers regulate power flow and voltage, respectively, in the pre-contingency solution, but are fixed at their corresponding pre-contingency settings in the post-contingency solution. Similarly, switched shunt capacitors and reactors are switched at pre-determined voltage levels in the pre-contingency solution, but are held at their corresponding pre-contingency position in the post-contingency solution. In accordance with the NYISO normal (pre-contingency) operating practice, SVC and FACTS devices are held at or near zero reactive power output in the pre-contingency solution, but are allowed to regulate in the post-contingency power flow solution.

Voltage-constrained transfer limit analysis is performed to evaluate the adequacy of the system post-contingency voltage and to find the region of voltage instability. As the transfer level across an interface is increased, the voltage-constrained transfer limit is determined to be the lower of: (1) the pre-contingency power flow at which the pre/post-contingency voltage falls below the voltage limit criteria; or (2) 95% of the pre-contingency power flow at the "nose" of the post-contingency PV curve. The "nose" is the point at which the slope of the PV cure becomes infinite (i.e. vertical). Reaching the "nose" (which is the point of voltage collapse) occurs when reactive capability supporting the transfer of real power is exhausted. The region near the "nose" of the curve is generally referred to as the region of voltage instability.

Voltage-constrained transfer limit analysis is sensitive to the base case load and generation conditions, generation selection utilized to create the power transfers, PAR schedules, key generator commitment, SVC dispatch, switched shunt availability, and the scheduled inter-Area power transfers modeled in the study case. No attempts are made to optimize the voltage-constrained transfer limits; therefore, these parameters are not varied to determine an optimal dispatch.

The NYISO evaluates the voltage-constrained transfer limits for the Dysinger East, West Central, Volney East, Central East, UPNY-SENY, UPNY-Con Edison, and Sprainbrook-Dunwoodie South interfaces. The Moses-South and Long Island interfaces are historically thermally limited; therefore, given the minimal changes to these areas, the voltage-constrained transfer limits are not evaluated for these interfaces.

## 3.2. Voltage Analysis Results

Tables 5, 6, and 7 provide a summary of the voltage-constrained transfer limits. The assessment of voltage Transfer Capability demonstrates that the New York State BPTF system meets the applicable NERC [3], NPCC and NYSRC Reliability Rules [4]-[5] with respect to voltage performance. The New York State BPTF system security is maintained by limiting power transfers according to the determined voltage-constrained transfer limits. The following provides explanations for changes in transfer limits of greater than 100 MW:

- The Volney East, Central East, and UPNY-SENY voltage-constrained transfer limit increased compared to the 2016 Intermediate ATR. The difference in transfer limitation is due to the return of FitzPatrick Nuclear Plant. The FitzPatrick Nuclear Plant provides significant voltage support capability as well as increases the amount of NYCA generation available to be shifted.

**Table 5: Voltage Transfer Criteria - Voltage Collapse Limits**

| Interface | 2016 Intermediate ATR | 2017 Transfers | Limiting Constraint 2016 Intermediate ATR | Limiting Constraint 2017 Transfers |
|---|---|---|---|---|
| Dysinger East | 2,225 | 2,325 | 95% of PV Curve For L/O Sandy Pond DC | 95% of PV Curve For L/O T:77/78 |
| West Central | 475 | 600 | 95% of PV Curve For L/O Sandy Pond DC | 95% of PV Curve For L/O T:77/78 |
| Volney East | 2,925 | 4,100 | 95% of PV Curve For L/O Sandy Pond DC | 95% of PV Curve For L/O T:40&41 |
| Central East | 2,000 | 2,500 | 95% of PV Curve For L/O Sandy Pond DC | 95% of PV Curve For L/O T:40&41 |
| UPNY SENY | 5,700 | 6,000 | 95% of PV Curve For L/O T:W89&W90 | 95% of PV Curve for L/O T:34/44 |
| UPNY ConEdison | 6,425 | 6,425 | 95% of PV Curve For L/O T:W89&W90 | 95% of PV Curve for L/O T34/44 |
| Dunwoodie South | 6,250 (A) | 6,300 (A) | 95% of PV Curve For L/O T:W89&W90 | 95% of PV Curve for L/O T34/44 |

Notes:

A. Dunwoodie North PAR1 and PAR2 are scheduled at 115 MW each into NYC.
Dunwoodie South PAR is scheduled at 235 MW into NYC.
Sherman Creek PAR1 and PAR2 are scheduled at 200 MW each into NYC.
Parkchester PAR1 and PAR2 are scheduled at 245 MW each into NY.

**Table 6: Voltage Transfer Criteria - Voltage Violation Limits**

| Interface | 2016 Intermediate ATR | 2017 Transfers | Limiting Constraint 2016 Intermediate ATR | Limiting Constraint 2017 Transfers |
|---|---|---|---|---|
| Dysinger East | N/A | 2,325 | N/A | Post-Contingency Low at Gardenville 230 for L/O T:77/78 |
| West Central | N/A | 500 | N/A | Post-Contingency Low at Gardenville 230 for L/O T:77/78 |
| Volney East | N/A | 4,100 | N/A | Pre-Low at Edic |
| Central East | N/A | 2,525 | N/A | Pre-Low at Marcy 345 |
| UPNY SENY | 5,575 | 5,750 | Pre-Low at Pleasant Valley | Pre-Low at Pleasant Valley |
| UPNY ConEdison | 6,250 | 6,175 | Pre-Low at Millwood | Pre-Low at Millwood |
| Dunwoodie South | 6,025 (A) | 6,000 (A) | Pre-Low at Sprainbrook | Pre-Low at Sprainbrook |

Notes:

A. Dunwoodie North PAR1 and PAR2 are scheduled at 115 MW each into NYC.
Dunwoodie South PAR is scheduled at 235 MW into NYC.
Sherman Creek PAR1 and PAR2 are scheduled at 200 MW each into NYC.
Parkchester PAR1 and PAR2 are scheduled at 245 MW each into NY.

**Table 7: Voltage Transfer Criteria – Interface Transfer Limits**

| Interface | 2016 Intermediate ATR | 2017 Transfers | Limiting Constraint 2016 Intermediate ATR | Limiting Constraint 2017 Transfers |
|---|---|---|---|---|
| Dysinger East | 2,225 | 2,325 | 95% of PV Curve For L/O Sandy Pond DC | 95% of PV Curve For L/O T:77/78 |
| West Central | 475 | 500 | 95% of PV Curve For L/O Sandy Pond DC | Post-Contingency Low at Gardenville 230 for L/O T:77/78 |
| Volney East | 2,925 | 4,100 | 95% of PV Curve For L/O Sandy Pond DC | Pre-Low at Edic |
| Central East | 2,000 | 2,500 | 95% of PV Curve For L/O Sandy Pond DC | Pre-Low at Marcy 345 |
| UPNY SENY | 5,575 | 5,750 | Pre-Low at Pleasant Valley | Pre-Low at Pleasant Valley |
| UPNY ConEdison | 6,250 | 6,175 | Pre-Low at Millwood | Pre-Low at Millwood |
| Dunwoodie South | 6,025 (A) | 6,000 (A) | Pre-Low at Sprainbrook | Pre-Low at Sprainbrook |

Notes:

A. Dunwoodie North PAR1 and PAR2 are scheduled at 115 MW each into NYC.
Dunwoodie South PAR is scheduled at 235 MW into NYC.
Sherman Creek PAR1 and PAR2 are scheduled at 200 MW each into NYC.
Parkchester PAR1 and PAR2 are scheduled at 245 MW each into NY.

# 4. Stability Transfer Analysis

## 4.1. Stability Transfer Methodology

The dynamic data for this analysis is developed from the NPCC 2016 BCD library. This data includes generator, exciter, power system stabilizers, SVC, DC transmission controller, turbine governor, relay, and other miscellaneous models that provide dynamic control to the electrical system. The load model has significant impact on the stability performance of the New York transmission system. The primary load model in the NPCC 2016 BCD library is comprised of 100% constant impedance for both active and reactive power load for the NYCA and New England areas. The real power load models used for the other Planning Areas are: constant current (power varies with the voltage magnitude) for Hydro Quebec, New Brunswick, MRO, RFC, SERC, and SPP; 50% constant current/50% constant impedance for Ontario, Nova Scotia, and Cornwall; and 90% constant current/10% constant impedance for FRCC. The reactive load is modeled as constant impedance for FRCC, MRO, RFC, SERC, SPP, and all NPCC areas except Hydro Quebec, which uses a 13% constant current and 87% constant impedance.

Starting with the 2022 summer peak load stability base case, the NYISO created four NYCA margin cases (Central East/UPNY margin, Central East margin, West Central margin, and Moses South margin). The margin cases are used to evaluate the stability performance of the NYCA system against normal design criteria contingencies to evaluate if the interfaces are restricted by a stability constraint (*i.e.* stability transfer limit). For each margin case, the power flow on the affected interfaces are tested at a value of at least 200 MW or 10% above the more restrictive of the emergency thermal or voltage transfer limit. If there are no stability violations at this margin transfer level, this testing provides that the stability limit is higher than the emergency thermal or voltage transfer level.

The Central East/UPNY margin case (one case) has the Oswego Complex generation dispatched at an output of 5300 MW and 1,090 MW of import from Hydro Quebec (supplied by Beauharnois hydro generation) with the Chateauguay HVdc poles out-of-service to exclude the dynamic benefit of the HVdc controls. The UPNY-SENY and UPNY-Con Edison open interfaces of the Central East/UPNY margin case are loaded at 6,300and 6,800 MW, respectively. The Central East interface of the Central East/UPNY margin case is loaded at 2,750 MW. The Central East Interface limit is 2,500 MW (for voltage collapse). The UPNY-SENY emergency thermal limit is more limiting at 5,275 MW and UPNY-Con Edison is voltage limited at 6,175 MW. The Ramapo PARs are scheduled at 200 MW each into New York.

The Western margin case is loaded to the following open interface levels: Dysinger East 1,950 MW, West Central 223 MW, Ontario-to-New York 1365 MW, and HQ-to-New York 1,090 (Chateauguay

HVdc 842 MW, Beauharnois 248 MW). The Dysinger East and West Central interfaces are thermally limited at 1,750 MW and -50 MW for emergency transfer conditions, respectively.

The Moses margin case has the Moses South open interface loaded to 2,675 MW, HQ-to-New York 1,490 MW (Chateauguay HVdc 842 MW, Beauharnois 648 MW), and the St. Lawrence L33/34 PARs scheduled at 150 MW each. The Moses South interface emergency thermal limit is more limiting at 2,400 MW.

### 4.2. Stability Analysis Results

For the margin cases, there are no stability-limited interfaces in the NYCA when tested at transfer levels that are the greater of 200 MW or 10% above the more restrictive of the emergency thermal or voltage transfer limit for normal design criteria faults.

This PTC Assessment demonstrates that the New York State BPTF system meets the criteria for stability performance. The New York State BPTF system security is maintained by limiting power transfers according to the determined stability limits. The PTC Assessment performed dynamic stability simulations for those contingencies expected to produce the more severe system impacts based on examination of actual system events and assessment of changes to the planned system. This analysis did not determine actual stability transfer limits but shows that the stability limits are not more limiting than the emergency thermal or voltage-based transfer limits. All contingencies evaluated are stable, damped, and no generating unit lost synchronism other than by fault clearing action or special protection system response.

# 5. Conclusion

Table 9 provides a summary of the normal and emergency transfer limits for the open transmission interfaces used in the NYISO transmission planning studies. These results confirm that the planned system meets the applicable reliability criteria; additionally, the application of design criteria contingencies shows no loss of a major portion of the system or unintentional separation of a major portion of the system. By limiting power transfers consistent with the transfer limits reported in this review, the security of the New York State BPTF will be maintained and projected demand will be supplied in accordance with NPCC Transmission Design Criteria [4] and NYSRC Reliability Rules [5]. Subsequent annual assessments will review the continuing need for the identified Corrective Action Plans. The NYISO did not identify marginal conditions that warranted analysis beyond the five-year study period.

**Table 9: Transfer Limit Comparison**

| Interface | 2016 Intermediate ATR (Study Year 2021) | | | | 2017 Transfers (Study Year 2022) | | | |
|---|---|---|---|---|---|---|---|---|
| | Normal (MW) | | Emergency (MW) | | Normal (MW) | | Emergency (MW) | |
| **Dysinger East** | 875 | T | 1,550 | T | 1,075 | T | 1,750 | T |
| **West Central** | -975 | T | -300 | T | -750 | T | -50 | T |
| **Volney East** | 2,925 | VX | 2,925 | VX | 3,850 | T | 4,100 | V |
| **Moses South** | 2,125 | T | 2,125 | T | 2,400 | T | 2,400 | T |
| **Central East** | 2,000 | VX | 2,000 | VX | 2,275 | T | 2,500 | V |
| **Total East** | 5,550 | T | 5,675 | T | 5,875 | T | 5,925 | T |
| **UPNY-SENY** | 5,200 | T | 5,300 | T | 5,075 | T | 5,275 | T |
| **UPNY-Con Edison** | 5,900 | T | 5,900 | T | 5,925 | T | 6,175 | V |
| **Sprain Brook-Dunwoodie South** | 5,550 | T | 5,650 | T | 5,575 | T | 5,600 | T |
| **Long Island Import** | 1,700 | T | 2,200 | T | 2,100 | T | 2,700 | T |

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3. North American Electric Reliability Corporation, "Transmission System Planning Performance Requirements" TPL-001-4.
4. Northeast Power Coordinating Council, "NPCC Regional Reliability Reference Directory #1, Design and Operation of the Bulk Power System", Version 2, dated September 30, 2015.
5. New York State Reliability Council, "Reliability Rules and Compliance Manual", Version 42, dated February 9, 2018.
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7. New York Independent System Operator, "Emergency Operations Manual", Table A.2 Bus Voltage Limits and Table A.3 Bus Voltage Limits for Various Sensitivities, Version 7.3, dated March 23, 2018.
8. New York Independent System Operator, "Transmission Expansion and Interconnection Manual", Attachment H: NYISO Transmission Planning Guideline #3-1 – Guideline for Stability Analysis and Determination of Stability-Based Transfer Limits, Version 2.1, dated June 30, 2017.