2014 Intermediate Area Transmission Review

Of the New York State Bulk Power Transmission System

(Study Years 2015, 2019, 2024)

FINAL REPORT

June 3, 2015

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Executive Summary

The New York Independent System Operator (NYISO) conducts an annual Area Transmission Review (ATR) of the New York State Bulk Power Transmission Facilities (BPTF) as required by the Northeast Power Coordinating Council (NPCC) and the New York State Reliability Council (NYSRC). This ATR also includes an annual Planning Assessment of the New York State Bulk Electric System (BES), as required by the North American Electric Reliability Corporation (NERC). The BPTF, as defined in this review, includes all of the facilities designated by the NYISO to be part of the Bulk Power System (BPS) as defined by the NPCC; additional non-BPS facilities are also included in the BPTF. For the 2014 Intermediate ATR, the BES is equivalent to the BPS. The purpose of this assessment is to demonstrate conformance with the applicable NERC Reliability Standards; NPCC Transmission Design Criteria; NYSRC Reliability Rules; and NYISO guidelines and procedures.

This report comprises the second Intermediate ATR submitted by the NYISO since the 2010 Comprehensive ATR (CATR) was approved by NPCC in June 2011. In 2011 and 2012, the NYISO completed Interim reviews; an Intermediate Review was completed in 2013. This 2014 Intermediate ATR assesses the BPTF for planned years 2015, 2019, and 2024. The NPCC Transmission Design Criteria and NYSRC Reliability Rules only require an assessment of the BPS for planned year 2019. The NERC TPL Reliability Standard requires additional assessments on the BES for years 2015 and 2024. All study years are evaluated for conformance with all applicable reliability standards.

Eight assessments are made for this Intermediate ATR. Overall, the results are comparable to the 2010 CATR, which found the planned New York State BPTF and BES facilities are in conformance with the applicable NERC Reliability Standards; NPCC Transmission Design Criteria; NYSRC Reliability Rules; and NYISO guidelines and procedures.

The system representations used in this transmission review are developed based on the NPCC 2013 Base Case Development (BCD) library and the NYISO 2014 FERC 715 filing power flow models updated with the NYISO 2014 Load and Capacity Data. The updated local transmission plans are also incorporated into the Intermediate ATR study models.

Changes to the five-year case for this review (2019) compared to the five-year case for the 2010 CATR (2015) include a 1,433 MW increase in load forecast and a decrease of approximately 1,916 MW in capacity resources.

In the first and second assessments, power flow and stability analyses are conducted to evaluate the thermal, voltage, and stability performance of the New York State BPTF for normal (or design) contingencies as defined in the NPCC Transmission Design Criteria, NYSRC Reliability Rules and the steady state and stability performance planning events as defined in Table 1 of the NERC Reliability Standard (Planning Events) [3].

As part of the first assessment, power flow analyses are conducted to evaluate the performance of the New York State BPTF under N-1 and N-1-1 conditions to ensure that the system is planned to meet all applicable reliability criteria. To evaluate the impact of a single event from the normal system condition (N-1), all design criteria contingencies are evaluated including: singe element, common structure, stuck breaker, generator, bus, and HVDC facilities contingencies. An N-1 violation occurs when the power flow on the monitored facility is greater than the applicable post-contingency rating. N-1-1 analysis evaluates the ability of the system to meet design criteria after a critical element has already been lost.

For transmission security analysis considering N-1-1 conditions, to ensure compliance with NPCC Transmission Design Criteria, NYSRC Reliability Rules, and NERC Planning Events, the BPTF elements are evaluated with single element contingencies as the first contingency (N-1-0); the second contingency (N-1-1) includes all design criteria contingencies evaluated under N-1 conditions. This evaluation is conservative compared to NERC Planning Events since the planning event performance requirements only require single element contingencies be evaluated for both the first and second contingency.

The summer peak power flow analysis indicates N-1 thermal violations on the Clay-Lockheed Martin (#14) 115 kV line for all study years and the Clay-Woodard (#17) 115 kV line in 2019 and 2024. The N-1-1 evaluation shows further violations at the National Grid Clay 115 kV station including: Clay 345/115 kV 1TR, Clay-S. Oswego (#4) 115 kV, Clay-Teall (#10) 115 kV, and Clay-Dewitt (#3) 115 kV circuits. The National Grid Porter-Yahnundasis (#3) 115 kV transmission line also has violations under N-1-1 conditions. Additionally, two Pannell 345/115 kV transformers show thermal violations in 2015 under N-1-1 conditions. For these facilities, Corrective Action Plans are identified to mitigate the issues. For all other facilities, system adjustments are identified for each first contingency (N-1) such that there are no post-contingency thermal and/or voltage violations following any second contingency (N-1-1). There are no thermal or voltage violations observed under light load conditions for all applicable study years.

In the second assessment, stability analyses are conducted to evaluate the stability performance of the New York State BPTF for normal (or design) contingencies as defined in the NPCC Transmission Design Criteria, NYSRC Reliability Rules, and NERC Planning Events. The stability simulations show no stability issues for the studied peak and light load base cases under N-1 and N-1-1 conditions. Stability analysis was also evaluated against the peak load base case and high peak load sensitivity case with the dynamic load model. The stability simulations show no stability issues for these sensitivity cases under the same design contingencies evaluated with a static load model.

The third assessment evaluates the fault duty at BES buses in the short-circuit representation. The analysis indicates that three buses with BPTF facilities may experience over-dutied circuit breakers for the conditions tested. These over-dutied circuit breakers are at the Porter 230 kV, Porter 115 kV, and Astoria West 138 kV substations. The owners of these over-dutied circuit breakers have provided Corrective Action Plans.

In the fourth assessment, power flow and stability analysis are conducted to evaluate the performance of the BPTF for low probability extreme contingencies as defined in the NERC Reliability Standards, NPCC Regional Reliability Directory #1, and NYSRC Reliability Rules. The dynamic load model was tested on these same extreme contingencies and found 8 of the 55 contingencies were unable to solve due to local low voltage issues; all contingencies are stable using the static load model. The power flow analysis results indicate, in all cases, the extreme contingencies do not cause significant thermal or voltage problems over a widespread area for the system conditions tested. In a few cases, an extreme contingency may result in a loss of local load within an area due to low voltage or first-swing instability of isolated generators. In all of the evaluated cases and conditions tested, the affected area is confined to the New York Control Area (NYCA) system.

The fifth assessment evaluates extreme system conditions, which have a low probability of occurrence (e.g. loss of gas supply and high peak load conditions resulting from extreme weather). For the loss of gas supply assessment, system conditions have not changed in a manner to significantly impact the results identified in the 2013 Intermediate ATR. For compliance with NPCC Design Criteria and the NYSRC Reliability Standard, the high peak load evaluation only requires evaluation of the BPS for planned year 2019; however, for NERC criteria, the planned year 2015 is also included in the evaluation.

Under high peak load conditions (i.e., 90/10 peak load forecast), the violations identified under normal load conditions are exacerbated under high summer peak load conditions along with new overloads in the same locations (e.g. Clay 115 kV and Porter 115 kV stations). The increased load level also results in earlier occurrence of thermal violations (e.g. Porter-Yahnundasis (#3) 115 kV, Clay 345/115 kV 1TR, and Clay-S. Oswego (#4) 115 kV). The following are thermal/voltage violations not observed under baseline summer peak conditions and for which sufficient system adjustments are not available in the planned system for the year that the violation is observed: Gardenville 230/115 kV (TB3), Huntley-Gardenville (#80) 230 kV, Rochester Station 80 345/115 kV (2TR and 5TR), Pannell 345/115 kV 3TR, Oakdale 345/115 kV (2TR and 3TR), Watercure 345/230 kV (1TR), W. Haverstraw 345/138 kV (Bank 194), and Middletown 345/138 kV (Bank 114). The stability simulations show no issues for the high peak load case under N-1 and N-1-1 conditions.

The sixth assessment is a review of Special Protection Systems (SPS). New York has not added nor changed any Type 1 SPS nor planned any new Type 1 SPS since the 2010 CATR. System conditions have not changed sufficiently to impact the operation or classification of existing SPS.

The seventh assessment is a review of the Dynamic Control Systems (DCS). System conditions have not changed sufficiently to impact the operation or classification of previously reviewed DCS since the 2010 CATR.

For the eighth assessment, the NYCA has no existing exclusions to NPCC Basic Criteria and makes no requests for new exclusions.

An assessment of issues specific to the NYSRC Reliability Rules is included in Section 9 of this report. The topics covered in Section 9 include: System Restoration Assessment B-R2_R4 and Local Rules Consideration G-R1 through G-R3.

In conclusion, the 2014 Intermediate ATR presents that the New York State Bulk Power Transmission Facilities, as planned (including Corrective Action Plans), through year 2024, conform to the reliability criteria described in the NYSRC Reliability Rules, NPCC Directory #1, "Design and Operation of the Bulk Power System," and applicable NERC Reliability Standards. There are facilities that require Corrective Action Plans to meet the performance requirements. With the identified Corrective Action Plans in place, the 2014 Intermediate ATR confirms that no additional upgrades are necessary to meet the performance requirements of the NYSRC Reliability Rules, NPCC Directory #1, or NERC Reliability Standards.

1. Introduction

1.1. Background

The New York Independent System Operator (NYISO) conducts an annual Area Transmission Review (ATR) of the New York State Bulk Power Transmission Facilities (BPTF) as required by the Northeast Power Coordinating Council (NPCC) [1] and the New York State Reliability Council (NYSRC) [2]. The North American Electric Reliability Corporation (NERC) [3] also requires an annual Planning Assessment of the New York State Bulk Electric System (BES) that is included in this assessment. This study also conforms to NYISO guidelines and procedures [4]-[6]. The BPTF, as defined in this review, includes all of the facilities designated by the NYISO to be part of the Bulk Power System (BPS) as defined by the NPCC; additional non-BPS facilities are also included in the BPTF. For the 2014 Intermediate ATR, BES is equivalent to BPS.

NERC is the Electric Reliability Organization (ERO) certified by the Federal Energy Regulatory Commission (FERC) to establish and enforce Reliability Standards for the BPS. NERC develops and enforces reliability standards such as TPL-001-4 [3], which regional councils adopt to establish their regional reliability standards.

NPCC, a regional council of NERC, has established Regional Reliability Reference Directory #1 the “Design and Operation of the Bulk Power System” [1] which describes the Transmission Design Criteria that apply to each Area of Northeastern North America. These criteria are consistent with or more stringent than the NERC planning events [3] for BPS elements. As part of NPCC’s ongoing reliability compliance and enforcement program, NPCC requires each of the five NPCC Areas (New York, New England, Ontario, Quebec, and Maritimes) to conduct and present an annual ATR: an assessment of the reliability of the planned bulk power transmission system within the Planning Coordinator Area and the transmission interconnections to other Planning coordinator Areas for a study year timeframe of 4 to 6 years from the reporting date. The process for compliance with NPCC requirements for the annual ATR is outlined in NPCC Directory #1 [1], “Appendix B – Guidelines and Procedures for NPCC Area Transmission Reviews”.

The NYSRC has established rules for planning and operating the New York State BPS [2]. The NYSRC Reliability Rules [2] are consistent with and in certain cases are more specific than the NPCC Transmission Design Criteria [1] and the NERC Reliability Standards [3]. The process for compliance with the NYSRC requirements for the annual ATR is outlined in NYSRC Reliability Rules [2] Section VII, “NYSRC Procedure for New York Control Area Transmission Reviews”.

The Guidelines and Procedures for NPCC Area Transmission Reviews require each Area to conduct a Comprehensive Area Transmission Review (CATR) at least every five years and to conduct either an Interim or Intermediate ATR in each of the years between CATRs, as appropriate. This assessment is conducted in accordance with the requirements for an Intermediate Review, as described in the NPCC

Directory #1 [1]. The previous Comprehensive ATR of the New York State BPTF was performed in 2010 (approved June 1, 2011) and assessed the planned year 2015 system [8]. In 2011 and 2012 an Interim level ATR was performed by the NYISO, assessing the planned years 2016 and 2017 system respectively. In 2013, an Intermediate level ATR was performed by the NYISO, assessing the planned year 2018 system. This 2014 Intermediate ATR assesses the planned year 2015, 2019, and 2024 system. This 2014 Intermediate ATR includes the updated forecast of system conditions, including a number of proposals for new, retired, or cancelled generation and transmission facilities for each study year since the previous CATR [8]. In the Long-Term Planning Horizon, there are no planned generation additions or changes; additionally, there are no other significant changes in transmission facilities in any year of the Long-Term Planning Horizon. As such, this study evaluates the planned year 2024 system to represent the highest summer peak load condition. The scope of the 2014 Intermediate ATR is provided in Appendix A.

1.2. **Facilities Included in this Review**

The system representation for this transmission review is developed from the NPCC 2013 Base Case Development (BCD) library. The system representation for the NYCA is based on the NYISO 2014 FERC 715 filing power flow models with transmission system and load changes made to the NYCA system including existing and planned facilities. The representations reflect the conditions reported in the NYISO 2014 Load and Capacity Data report ("Gold Book") [9].

The New York State BPS, as defined by NPCC and the NYSRC Reliability Rules, primarily consists of 4,185 miles of 765, 500, 345, and 230 kV transmission. Only a few hundred miles of the 6,872 miles of 138 and 115 kV transmission is also considered to be part of the New York State BPS. Also included in the New York State BPS, per the NYSRC Reliability Rules, are a number of large generating units (generally 300 MW or larger). As part of this review, the NYISO and the New York State Transmission Owners perform simulations in accordance with the NPCC Classification of Bulk Power System Elements (Document A-10) methodology [10] to determine any change in BPS status to existing or planned transmission facilities. The results of A-10 testing and the list of BPS transmission facilities are documented in Appendix C.

The New York State BPTF defined in this review include all facilities designated by the NYISO to be part of the BPS as defined by the NYSRC and NPCC, as well as other transmission facilities that are relevant to planning the New York transmission system. The list of New York State BPTF is documented in Appendix B. The remaining sub-transmission facilities not classified as BPTF are evaluated by the local Transmission Owner and coordinated through the NYISO Local Transmission Planning Process.

The transmission plans shown on Table 1.2.1 reflect the changes since the 2010 CATR. Additional changes to transmission plans that occurred following publication of the NYISO 2014 Gold Book [9] will be captured in future reviews. Proposed major generation projects included in the base case are listed in Table 1.2.2 and Table 1.2.3.

In March of 2014, Selkirk Cogen Partners, LLC submitted intent to mothball the Selkirk I and Selkirk II facilities (approximately 348 MW in the Capital Zone) effective November 2014; however, in September 2014, Selkirk Cogen Partners, LLC withdrew their mothball notice. As such, the Selkirk generating facilities are included in the 2014 Intermediate ATR base cases.

Table 1.2.1 Changes in Bulk Power Transmission Facilities

Bulk Transmission:	2010 Comprehensive ATR:	2013 Intermediate ATR:	2014 Intermediate ATR:
	Included/IS Date	**Included/IS Date**	**Included/IS Date**
Linden VFT Goethals 345 kV Substation Upgrade (Q#125)	Y/2011	Y/2014S	Y/In-Service
Sherman Creek 345 kV Substation Upgrade (M29, Q#153)	Y/2011S	Y/In-service	Y/In-service
Patnode 230kV Substation (Q#161)	Y/2011S	Y/In-service	Y/In-service
Jordanville 230 kV Substation (Q#186)	Y/2011-Q4	N/Terminated	N/Terminated
Hudson Transmission Project HVdc (Q#206)	Y/2013	Y/In-Service	Y/In-Service
Ball Hill 230 kV Substation (Q#222)	Y/2011-Q4	Y/2014-Q1	N/Withdrawn
Bayonne Energy Center Gowanus 345 kV Substation Upgrade (Q#232)	Y/2012-Q2	Y/In-Service	Y/In-Service
CPV Valley 345kV Substation (Q#251)	Y/2012-Q4	N/2016-05	Y/2016-05
South Ripley 230 kV Substation (Q#254)	Y/2011-Q4	N/Withdrawn	N/Withdrawn
Stony Creek 230 kV Substation (Q#263)	Y/NA	Y/2013-11	Y/In-Service
Stony Ridge 230 kV Substation (Q#289)	Y/2011S	Y/In-Service	Y/In-Service
Rochester Transmission Reinforcement 345 kV Substation (Q#339)	N/NA	Y/2016W	Y/2016W
Con Edison Astoria Annex 345/138 kV Transformer	N/NA	Y/In-Service	Y/In-Service
Con Edison Rainey-Corona Transformer/Phase Shifter	N/NA	Y/2018S	Y/2018S
NYPA Moses-Willis 230 kV Tower Separation	N/NA	Y/2013W	Y/2014S
NYSEG Watercure 345/230 kV Transformer	N/NA	Y/2015W	Y/2015W
NYSEG Coopers Corners 345 kV Shunt Reactor	N/NA	Y/2014W	Y/2014W
NYSEG Oakdale 345 kV Tower Separation	N/NA	Y/In-Service	Y/In-Service
NYSEG Oakdale 345/115/34.5 kV Transformer (1)	N/NA	N/NA	Y/2018
NYSEG South Perry 230 kV (New Station)	N/NA	Y/2015S	N/2017W
NYSEG Wood St. 345/115 kV Transformer	N/NA	Y/2016S	Y2016S
NYSEG Coopers Corners 345/115 kV Transformer	N/NA	Y/2016S	Y/2018W
NYSEG Fraser 345/115 kV Transformer	N/NA	Y/2016S	Y/2019W
NYSEG Gardenville 230/115 kV Transformer	N/NA	Y/2017S	Y/2017S
NYSEG/N. Grid Five Mile Rd 345 kV (New Substation)	N/NA	Y/2015S	Y/2015S
NYSEG Mainesburg (Q#394)	N/NA	N/NA	Y/2015S
N. Grid Eastover Rd 345 kV (New Substation)	N/NA	Y/2015S	Y/2015S
O&R North Rockland 345 kV (New Substation)	N/NA	Y/2018S	N/2018S
O&R Sugarloaf 345/138 kV (New Substation)	N/NA	N/NA	Y/2016S
Con Edison Feeder 76 Ramapo to Rock Tavern (Q#368)	N/NA	N/NA	Y/2016S

Notes:

(1) This element is included in-service in the 2019 base case as it is part of the Cayuga retirement reinforcement projects

Table 1.2.2 Additions/Uprates in Generation Facilities

Additions/Uprates>20 MW	**Size**	**2010 Comprehensive ATR:**	**2013 Intermediate ATR:**	**2014 Intermediate ATR:**
		Included/IS Date	**Included/IS Date**	**Included/IS Date**
AES St. Lawrence Wind Project (Q#166)	75.9	Y/2012F	Y/2014-12	N/Withdrawn
Marble River l&ll (Q#161,Q#171)	215.2	Y/2011F	Y/In-Service	Y/In-Service
Jordanville Wind Project (Q#186)	150	Y/2011W	N/Terminated	N/Terminated
Berrians l&ll (Q#201, Q#224)	250	N/NA	N/2014-06	Y/2017-06
Cape Vincent Wind Project (Q#207)	210	Y2012W	Y/2014-12	N/Withdrawn
Noble Ellenberg ll Windfield (Q#213)	21	Y2011W	N/Withdrawn	N/Withdrawn
Nine Mile Point Uprate (Q#216)	168	Y/2012-Q2	Y/In-Service	Y/In-Service
Ball Hill Wind Park (Q#222)	90	Y/2011W	Y/2014-Q1	N/Withdrawn
Bayonne Energy Center (Q#232)	500	Y/2011S	Y/In-Service	Y/In-Service
Allegany Wind Project (Q#237)	72.5	Y/2011F	Y/2014-09	Y/2015-11
CPV Valley (Q#251)	677.6	Y/2010F	N/2016-05	Y/2016-05
South Pier Improvement (Q#261)	103.7	Y/2012S	N/Withdrawn	N/Withdrawn
Stony Creek Wind Farm (Q#263)	94.4	Y/NA	Y/2013-11	Y/In-Service
Berrians GT lll (Q#266)	250	Y/2012S	N/2016-06	N/2016-06
Astoria Energy ll (Q#308)	576	Y/2011S	Y/In-Service	Y/In-Service
Prattsburgh Wind Farm (Q#119)	78.2	N/NA	Y/2013-12	N/Withdrawn
Roaring Brook Wind (Q#197)	78	N/NA	Y/2015-12	Y/2015-12
Taylor Biomass Energy (Q#349)	19	N/NA	N/NA	Y/2015-12

Table 1.2.3 Shutdowns/Deratings in Generation Facilities[1]

Shutdowns/Deratings	Size	2010 Comprehensive ATR:	2013 Intermediate ATR:	2014 Intermediate ATR:
		Included/OS Date	Included/OS Date	Included/OS Date
Greenidge 4	106.1	Y/2011-03	N/Retired 2012	N/Retired 2012
Westover 8	83.8	Y/2011-03	N/Retired 2012	N/Retired 2012
Ravenswood GT 3-4	31.7	Y/NA	N/Mothballed 2011	N/Mothballed 2011
Barrett#7	0	Y/NA	N/Retired 2011	N/Retired 2011
Far Rockway 4	105.1	Y/NA	N/Retired 2012	N/Retired 2012
Glenwood 4&5	229.2	Y/NA	N/Retired 2012	N/Retired 2012
Beebe GT	15	Y/NA	N/Retired 2012	N/Retired 2012
Binghamton Cogen	41.3	Y/NA	N/Retired 2012	N/Retired 2012
Astoria 2	177	Y/NA	N/Mothballed 2012	N/Mothballed 2012
Astoria 4	375.6	Y/NA	N/Mothballed 2012	N/Mothballed 2012
Dunkirk 1	75	Y/NA	N/Mothballed 2013	N/Mothballed 2013
Dunkirk 2	75	Y/NA	N/2015	Y/In-Service 2016
Dunkirk 3 & 4	370	Y/NA	N/Mothballed 2012	Y/In-Service 2016
Danskammer Units 1-6	493.6	Y/NA	N/2013	Y/In-Service
Niagara Bio-Gen	51	Y/NA	N/Mothballed 2013	Y/In-Service
Kensico Units #1, #2, #3	3	Y/NA	N/Retired 2012	N/Retired 2012
Montauk Units #2, #3, #4	6	Y/NA	N/Retired 2013	N/Retired 2013
Cayuga 1 & 2	308.2	Y/NA	Y/Retired 2017	N/Retired
Astoria GT 12	17.2	Y/NA	Y/Retired 2017	N/Retired
Astoria GT 13	17.1	Y/NA	Y/Retired 2017	N/Retired
Chateaugay Power	18.2	Y/NA	N/Mothballed 2013	N/Mothballed 2013
Station 9	14.3	Y/NA	N/Retired 2014	N/Retired 2014
Syracuse Energy ST1	11	Y/NA	N/Retired 2013	N/Retired 2013
Syracuse Energy ST2	63.9	Y/NA	N/Retired 2013	N/Retired 2013
Ravenswood 07	12.7	Y/NA	N/Mothballed 2014	N/Mothballed 2014

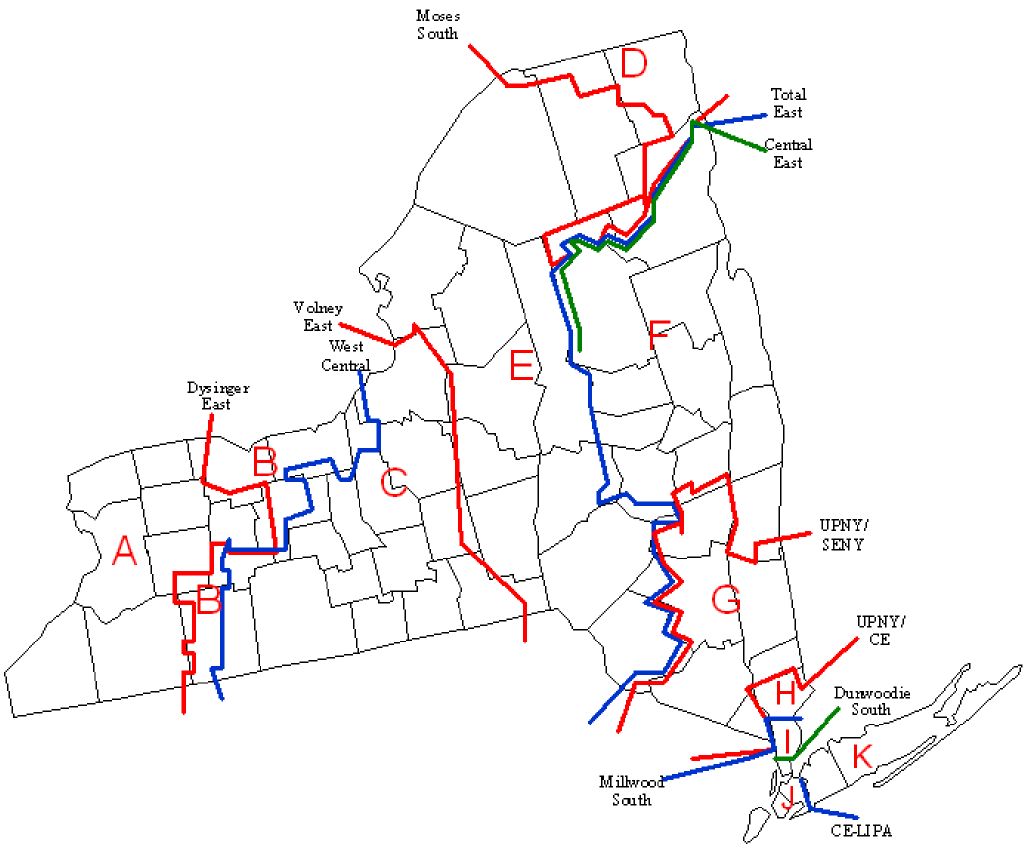
Notes:

(1) Generating Units that issued a repowering notice after the issuance of the 2014 Gold Book are not modeled in-service in this study with the exceptions noted below:
- Dunkirk Units 2, 3, and 4
- Danskammer Units 1 through 6

1.2.1. Interface Definitions

The NYISO monitors and evaluates the eleven major interfaces between the zones within the NYCA. Figure 1.2.1 geographically depicts the NYCA interfaces and Locational Based Marginal Pricing (LBMP) load zones. The NYCA planning interfaces are: Dysinger East, West Central, Volney East, Moses South, Central East, Total East, UPNY-SENY, UPNY-Con Edison, Millwood South, Sprain Brook-Dunwoodie South, and Long Island Import. The NYISO also evaluates the interfaces between the NYCA and all neighboring systems: IESO (Ontario), Hydro-Quebec, ISO-New England, and PJM. The planning interfaces are described in Appendix E.

Figure 1.2.1 NYCA Interfaces and LBMP Load Zones



1.2.2. Scheduled Transfers

Table 1.2.4 lists the NYCA scheduled inter-Area transfers modeled in the base and sensitivity cases between the NYCA and each neighboring system for 2015, 2019, and 2024. New York does not use the firm transfer concept though transfer limit analysis is performed to ensure adequate capability.

Table 1.2.4 NYCA Scheduled Inter-Area Transfers

Region		Transaction (MW)		
From	**To**	**2015**	**2019**	**2024**
NYCA	NE	88	88	88
NYCA	HQ	-1,090	-1,090	-1,090
NYCA	PJM and Others	-1,138	-1,138	-1,138
NYCA	Ontario	0	0	0

1.2.3. Load and Capacity

Table 1.2.5 provides a comparison of the load, capacity, and reserve margin between the 2010 CATR and the 2014 Intermediate ATR system forecast for 2015, 2019, and 2024. For all study years the reserve margin is greater than the required Installed Reserve Margin (IRM) of 17.0% approved by NYSRC for the 2014-2015 Capability Year [11].

Table 1.2.5 Load and Capacity Forecast

Comprehensive Review: 2010 Forecast for Summer 2015			
Peak Load (MW)	34,021 (1)		
Total Capacity (MW)	45,245 (2)		
Reserve Margin	33%		
2014 Intermediate ATR Forecast For:	**Summer 2015**	**Summer 2019**	**Summer 2024**
Existing Generating Facilities (MW)	37,978.3	37,607.4	37,607.4
Special Case Resources (MW)	1,189	1,189	1,189
Scheduled Retirements (MW)	(75)	0	0
Net Purchases and Sales (MW)	2,437.2	2,437.2	2,437.2
Completed Class Year Facilities Study (MW)	0	1,078.1	1,078.1
Other Non-Class Year Generators (MW)	28.8	51.8	51.8
Units Returned to Service (MW)(4)	494.9	939.9	939.9
Proposed Generator Re-Ratings (MW)	0	6.3	6.3
Forecast for 2015			
Peak Load (MW)	34,066		
Total Capacity (MW)	42,053 (3)		
Reserve Margin	23%		
Forecast for 2019		**Change from Previous CATR**	
Peak Load (MW)	35,454	1,433	
Total Capacity (MW)	43,309 (3)	-1,936	
Reserve Margin	22%	-11%	
Forecast for 2024			
Peak Load (MW)	36,580		
Total Capacity (MW)	43,309 (3)		
Reserve Margin	18%		

Notes:

(1) The 2015 forecast considers Alcoa and Reynolds industrial loads in-service in Zone D.

(2) This amount is derived from the NYISO 2010 Gold Book. It's the 2015 Total Resource Capability (43,581.2 MW), from Table V-2a in NYISO 2010 Gold Book, plus Proposed Resource Additions (1,663.9 MW) from Table IV-1 in NYISO 2010 Gold Book.

(3) This amount is derived from the NYISO 2014 Gold Book and represents the 2015, 2019, and 2024 Total Resource Capability from Table V-2A; net resource changes from Tables IV-1, IV-2, and IV-3 in the NYISO 2014 Gold Book; and the Danskammer and Dunkirk Units returned to service (see Table 1.2.3).

(4) Includes Danskammer and Dunkirk facilities, as appropriate.

2. Steady State and Stability Performance Planning Event Assessment

2.1. Steady State and Stability Methodology

The analysis for the 2014 Intermediate ATR is conducted in accordance with NPCC Transmission Design Criteria [1], NYSRC Reliability Rules [2], NERC Reliability Standards [3], and NYISO planning and operation practices [4]-[6], [12]-[13]. The NYISO follows specific guidelines regarding the NYISO methodology for evaluating the performance of the New York State BPTF, which conform to NPCC Directory #1, "Appendix B – Guidelines and Procedures for NPCC Area Transmission Reviews" [1] and the NYSRC Reliability Rules, "NYSRC Procedure for New York Control Area Transmission Reviews" [2]. Guidelines specific to transfer limits, voltage, and stability analysis are found in the NYISO Transmission Expansion and Interconnection Manual [4]-[6]. This Assessment of Transfer Capability respects all known planning horizon System Operating Limits (SOLs). In accordance with NERC Standard FAC-010, NPCC Directory #1 [1] defines the NYISO SOL methodology.

The procedure to evaluate the performance of the New York State BPTF consists of the following basic steps: (1) develop a mathematical model (or representation) of the NYCA and external electrical systems for the period of study (in this case, the years 2015, 2019, and 2024); (2) develop various power flow base cases to model the system conditions (load and power transfer levels, commitment and dispatch of generation and reactive power devices) to be tested; and (3) conduct steady-state power flow, voltage stability, and transient stability analysis to determine if the performance of the New York State BPTF, as modeled, meets the applicable Reliability Standards [1]-[6].

2.2. Description of Steady State and Stability Base Cases

The 2014 Intermediate ATR is performed for selected demand levels over the range of forecasted system demand representations for the years 2015, 2019, and 2024. Under these conditions, the study demonstrates system performance including critical system conditions such as stability margin transfers and high peak load as required by the NPCC.

The base cases for evaluating the New York State BPTF performance are developed from NPCC BCD libraries. Most of the relevant system representations are taken from the 2015, 2019, and 2024 cases in the 2013 NPCC BCD library. The PJM system representation is derived from the PJM Regional Transmission Expansion Plan (RTEP) planning process. For each study year, the NYISO system representation is derived from the NYISO 2014 FERC 715 filing. Changes are made to the NYCA system representation to reflect the updates included in the NYISO 2014 Gold Book [9]. There are no planned outages in the NYCA for 2015, 2019, or 2024; therefore, all facilities are assumed in-service. Generation is dispatched to match load plus system losses while respecting transmission security.

As part of the base case development process, AC contingency analysis is performed on the base case using PowerGem TARA software. If thermal or voltage limit violations on the New York State BPTF are identified, system adjustments are made to satisfy the NERC Steady State and Stability Performance Planning Events (Table 1 [3]) and NPCC and NYSRC design criteria contingencies. This analysis is confirmed through further thermal, voltage, and stability analysis performed in the following sections.

The steady state power flow evaluation cases include summer peak load, high peak load (i.e. 90/10, extreme weather) conditions, and light load. The last year of the Long-Term transmission planning horizon (year 2024) is selected for evaluation as this year has the highest forecast coincident summer peak load; additionally, there are no proposed generation additions or changes from 2019 through 2024. The high peak load cases are developed from the 2015 and 2019 summer peak load base case with the load increased to meet the high peak forecast statewide coincident peak load, reflecting weather conditions expected to occur no more than once in ten years. As a conservative planning assumption, the steady state peak load and high peak load power flow base and sensitivity cases assume wind generation is unavailable. The light load case (off-peak) load level is approximately 45% of the summer peak load. The light load base case assumes a wind generation dispatch of approximately 13%. The light load sensitivity case assumes a wind generation of approximately 100%.

The stability evaluation cases include year 2019 summer peak load, margin, high peak load, and light load conditions. The high peak load case is developed from the 2019 summer peak load base case with the load increased to meet the high peak forecast statewide coincident peak load, similar to the steady state case. The summer peak load and high peak load cases are evaluated considering the behavior of induction motor loads. In the margin cases, the transfer levels of the West Central, Moses South, Central East, and UPNY-Con Edison interfaces are at least 10% higher than the lower of either the emergency thermal or the voltage-constrained transfer limits in accordance with NYISO Transmission Planning Guideline #3-1 [6]. In the light load base case, the load level is approximately 45% of summer peak load. The light load sensitivity case assumes a wind generation dispatch of approximately 100%.

Table 2.2.1 provides a summary the power flow schedules on the inter-area controllable ties in all base cases. Diagrams and descriptions of the base cases utilized can be found in Appendix D.

Table 2.2.1 Schedules on Inter-Area Controllable Devices

Location	MW Schedule				Direction
	2010 Comprehensive ATR: Forecast for Summer 2015	2014 Intermediate ATR: Forecast for Summer 2015	2014 Intermediate ATR: Forecast for Summer 2019	2014 Intermediate ATR: Forecast for Summer 2024	
Ramapo PAR 1[1]	100	200	200	212	Toward NY
Ramapo PAR 2[1]	100	200	200	212	Toward NY
St. Lawrence PARs (L33/34)	0	0	0	0	-
Sandbar PAR (PV-20)	115	0	0	0	Toward VT
Goethals PAR (A2253)	334	334	334	334	Toward NY
Farragut PAR 1 (B3402)	333	333	333	333	Toward NY
Farragut PAR 2 (C3403)	333	333	333	333	Toward NY
Linden VFT	300	315	315	315	Toward NY
Hudson Transmission HVDC	660	320	320	320	Toward NY
Neptune HVDC	660	660	660	660	Toward NY
Cross Sound Cable HVDC	330	96	96	96	Toward NY
Northport PAR	100	0	0	0	Toward NY
Chateauguay HVDC	720	1,090	1,090	1,090	Toward NY
Blissville PAR[2]	0	25	25	25	Toward NY
Waldwick PAR 1[2]	345	345	345	345	Toward PJM
Waldwick PAR 2[2]	300	330	330	330	Toward PJM
Waldwick PAR 3[2]	355	325	325	325	Toward PJM

Notes:

(1) Ramapo PAR 1 and PAR 2 are scheduled at 80% of the RECO load.

(2) These PARS are not reported in the 2010 CATR.

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2.3. **Thermal Transfer Analysis**

2.3.1. Methodology

Thermal transfer limit analysis is performed using the Siemens PTI PSS® MUST program utilizing the linear First Contingency Incremental Transfer Capability (FCITC) Calculation activity by shifting generation across the given interface under evaluation. The thermal transfer limit analysis is performed in accordance with the NYISO methodology for Assessment of Transfer Capability in the Near-Term Transmission Planning Horizon [13] for the 2019 summer peak load base case. A listing of the NYCA intra-Area and inter-Area interface definitions used for the 2014 Intermediate ATR is provided in Appendix E.

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 approximately 1,000 contingencies including single element, common structure, stuck breaker, generator, multiple element, and DC contingencies consistent with NERC steady state Planning Events, and NPCC and NYSRC Design Criteria contingencies [1]-[3]. Neighboring system design criteria contingencies are also included, as appropriate, to evaluate their impact on the transfer limits. The contingencies evaluated include the most severe loss of reactive capability, and increased impedance on the BPTF system. 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. The list of these contingencies is provided in Appendix H.

For thermal transfer analysis, 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.

Thermal transfer limits are sensitive to the base case load and generation conditions, generation selection utilized to create the transfers, PAR schedules, and inter-area power transfers. No attempts are made to optimize transfer limits; therefore, these sensitivities are not considered during thermal transfer analysis.

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 a deterministic summer peak power flow analysis and may not be applicable for use in probabilistic resource adequacy analyses.

2.3.2. Analysis Results

Tables 2.3.1, 2.3.2, 2.3.3, and 2.3.4 provide a summary the normal and emergency thermal transfer limits determined for the NYCA intra-Area and inter-Area open transmission interfaces (where applicable). The assessment of Transfer Capability demonstrates the New York State BPTF system meets the applicable NERC, NPCC, and NYSRC reliability standards [1]-[3] 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. Explanations for changes in transfer limits of greater than 100 MW are provided below. Details regarding the thermal transfer analysis results are provided in Appendix F.

- The Dysinger East and West Central Interfaces' normal and emergency thermal transfer limits decreased compared to the 2010 CATR. The transfer limitation difference is due to increased power flows on the 230 kV transmission from Niagara through Gardenville as a result of PJM generation retirements, new PJM substations which are fed primarily from the NYCA to PJM tie-lines, and the reduced wind generation modeling assumption.

- The Volney East Interface normal and emergency thermal transfer limits decreased compared to the 2010 CATR. The difference in the measured transfer limitation is due to the Marcy South series compensation project [9], which improves the overall balance of power flow from upstate to downstate on the UPNY-SENY interface by increasing power flow to southeastern New York along the Marcy South path, which happens to limit Volney East. The Volney East interface is also reduced due to the Hydro-Quebec import and the wind generation modeling assumption.

- The Moses South Interface normal and emergency thermal transfer limits have decreased compared to the 2010 CATR. The transfer limitation difference for both normal and emergency criteria is due to the reduced Hydro-Quebec import represented in the study case.

- The Central East Interface normal and emergency thermal transfer limits decreased compared to the 2010 CATR. The transfer limitation difference is due to New England generation dispatch modeling assumptions causing increased power flow from New England to New York on the tie lines in the Capital Zone and out to New England on the tie lines in the Hudson Valley zone (New England loop flow). As the New England loop flow is in the same direction as the generation shift across the limiting element, the transfer limit is reduced.

- The Total East Interface normal and emergency thermal transfer limits decreased compared to the 2010 CATR. The difference in transfer limitation is due to decreased generation in southeast New York and the increased pre-loading on the limiting element due to the dispatch of CPV Valley combined with the reduced impedance due to the Marcy South series compensation project.

- The UPNY-SENY Interface normal and emergency thermal transfer limits decreased compared to the 2010 CATR. For this ATR, the schedule for the Ramapo PARs, which are defined as part of the UPNY-SENY interface, is approximately 400 MW (1,000 MW for the 2010 CATR). The difference in the Ramapo PAR schedule accounts for a 600 MW decrease in the transfer limit. The inclusion of CPV Valley in this ATR results in shifting the limiting constraint from the typical Leeds-Pleasant Valley corridor to CPV – Rock Tavern 345 kV when accounting for the Athens Special Protection System[1]. These changes combine to a net reduction in the measured UPNY-SENY Interface thermal transfer limits.

- The UPNY-Con Edison Interface normal thermal transfer limit decreased while the emergency thermal transfer limit increased compared to the 2010 CATR. With the addition of the Rock Tavern-Sugarloaf-Ramapo 345 kV line, the previous limiting element for normal transfers is alleviated; however, the 600 MW decrease in the Ramapo PARs schedule reduces the measured normal transfer limit. The emergency transfer limit increase is mainly due to the addition of the Rock Tavern-Sugarloaf-Ramapo line, which diverts flow from the limiting constraint.

- The Long Island Import Interface normal and emergency thermal transfer limits decreased compared to the 2010 CATR. The transfer limitation difference is due to a change in assumed flow on the Cross Sound HVDC Cable (CSC) (a difference of approximately 235 MW).

When analyzing inter-area transfer limits, generation dispatch assumptions in neighboring areas can have significant impacts. Pre-shift generation dispatch in neighboring Control Areas dictate 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 the sink may appear to be more or less limiting.

- The New York – New England Interface normal and emergency thermal transfer limits decreased compared to the 2010 CATR. New England generation dispatch modeling assumptions (increasing generation in Northern and Western New England) result in increased power flow from New England to New York on the tie lines in the Capital Zone and out to New England on the tie lines in the Hudson Valley Zone. The transfer limitation difference is due to higher pre-contingency loading on lines in the Capital and Hudson Valley Zones.

- The New England – New York Interface normal thermal transfer limit decreased compared to the 2010 CATR. The New England generation dispatch modeling assumptions (increasing generation in Northern and Western New England) increased pre-transfer loading on the limiting element resulting in a decrease in transfer limit. The emergency thermal transfer limit increased compared

[1] The Athens SPS was originally placed in operation in 2008 as a temporary solution to address the energy deliverability of Athens generation. The recently extended agreement between National Grid and Athens will maintain the Athens SPS in-service until 2023 or until the construction of a permanent physical reinforcement. For further information see FERC Docket No. ER13-822-000.

to the 2010 CATR. The increase in transfer limit is due to the increased pre-contingency loading from Pleasant Valley to Long Mountain 345 kV which counteracts the generation shift from New England – New York, thus relieving the constraint identified in the 2010 CATR.

- The Ontario – New York Interface normal and emergency thermal transfer limits increased compared to the 2010 CATR. The increase in transfer limit is due to only evaluating elements near the interface as binding on the interface. The transfer limit is dependent on the Niagara generation dispatch.

- The New York – PJM Interface normal and emergency thermal transfer limits increased compared to the 2010 CATR. This is due to in part by the change in the Linden Variable Frequency Transformer (VFT) schedule to direct 315 MW into PJM[2] when evaluating this transfer limit (zero flow in the 2010 CATR). In the 2010 CATR, the normal and emergency thermal transfer limits are identical due to base case pre-loading for the same element. The significant increase in emergency thermal transfer limit in this assessment is due to the change in the limiting facility and the difference between the normal and Short Term Emergency (STE) rating. The change in the limiting facility is affected by the cancelation of the Ripley-Westfield wind project.

- The PJM – New York Interface normal and emergency thermal transfer limits did not change significantly compared to the 2010 CATR despite changes in modeling assumptions. The HTP schedule in this ATR (320 MW in 2014; 605 MW in 2010) would decrease the PJM – New York thermal transfer limit compared to the 2010 CATR. However, for the 2014 Intermediate ATR, the additional Watercure 345/230 kV transformer relieves the previous limitation identified in the 2010 CATR, increasing the thermal transfer limit thereby offsetting the decrease associated with the HTP schedule.

[2] Since the 2010 CATR, the Linden VFT has acquired injection rights into PJM.

Table 2.3.1 Normal Transfer Criteria Intra-Area Thermal Transfer Limits

Interface	2010 Comprehensive Review (Study Year 2015)	2014 Intermediate Review (Study Year 2019)
Dysinger East	2,700 (1)	1,850 (2)(A)
West Central	1,425 (1)	450 (2)(A)
Volney East	4,600 (3)	4,225 (4)
Moses South	2,475 (5)	2,350 (5)(B)(C)
Central East	2,900 (6)	2,450 (6)
Total East	5,725 (7)	4,800 (7)
UPNY-SENY	5,250 (8)(D)	5,075 (7)(E)(F)
UPNY-Con Edison	5,375 (9)(D)	4,850 (10)(F)
Sprain Brook Dunwoodie-South	5,625 (11)(G)(H)	5,700 (12)(G)(I)
Long Island Import	1,950 (13)(J)	1,700 (14)(K)

Notes:

1. **Wethersfield-Meyer 230** at 494 MW LTE rating for L/O Niagara-Rochester 345 and Rochester-Pannell 345
2. **Huntley-Sawyer 230 (80)** at 654 MW LTE rating for L/O Huntley-Sawyer 230 (79)
3. **Fraser-Coopers Corners 345** at 1404 MW LTE rating for L/O Porter-Rotterdam 230 and Marcy-Coopers Corners 345
4. **Fraser-Coopers Corners 345** at 1721 MW LTE rating for L/O Porter-Rotterdam 230 and Marcy-Coopers Corners 345
5. **Moses-Adirondack 230** at 386 MW LTE rating for L/O Chateauguay-Massena-Marcy 765
6. **New Scotland (77)-Leeds 345** at 1538 MW LTE rating for L/O New Scotland (99)–Leeds 345
7. **CPV Valley-Rock Tavern 345** at 1733 MW LTE rating for L/O Coopers Corners-Middletown Tap-Rock Tavern 345 and Rock Tavern-Roseton 345
8. **Leeds-Pleasant Valley 345** at 1538 MW LTE rating for L/O Athens-Pleasant Valley 345
9. **Rock Tavern-Ramapo 345** at 1990 MW LTE rating for L/O Roseton-E. Fishkill 345 and E. Fishkill 345/115
10. **Roseton-East Fishkill 345** at 2677 MW LTE rating for L/O Rock Tavern-Ramapo 345 and Rock Tavern-Sugarloaf-Ramapo 345
11. **Mott Haven-Rainey 345** at 1196 MW STE rating for L/O Mott Haven-Rainey 345 Transformer 8W
12. **Dunwoodie-Mott Haven 345** at 786 MW Normal rating for pre-contingency loading
13. **Dunwoodie-Shore Rd. 345** at 877 MW LTE rating for L/O Sprain Brook-E.G.C. 345 and Sprain Brook-Academy 345/138
14. **Dunwoodie-Shore Rd. 345** at 962 MW LTE rating for L/O Sprain Brook-E.G.C. 345 and Sprain Brook-Academy 345/138

A. Used Reliability Rules Exception Reference No. 13 – Post Contingency Flows on Niagara Project Facilities
B. Used Reliability Rules Exception Reference No. 10 – Post Contingency Flow on Marcy Transformer T1
C. Used Reliability Rules Exception Reference No. 12 – Post Contingency Flow on Marcy Transformer T2
D. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into New York
E. Used Reliability Rules Exception Reference No. 23 – Generation Rejection at Athens
F. Ramapo PAR1 and PAR2 are scheduled at 80% of the RECO load (200 MW each)
G. Used Reliability Rules Exception Reference No. 20 – Post Contingency Flows on Underground Circuits
H. Dunwoodie North PAR1 and PAR2 are scheduled at 115 MW each into NYC
Dunwoodie South PAR1 and PAR2 are scheduled at 120 MW and 115 MW, respectively, 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 NYC
I. Dunwoodie North PAR1 and PAR2 are scheduled at 115 MW each into NYC
Dunwoodie South PAR 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 NYC
J. E.G.C. PAR1 and PAR2 are scheduled at 315 MW each into Long Island
Lake Success and Valley Stream PARs are scheduled at 165 MW and 123 MW, respectively, into NYC
Neptune and CSC HVdc are scheduled at 660 MW and 330 MW, respectively, into Long Island
K. E.G.C. PAR1 and PAR2 are scheduled at 315 MW each into Long Island
Lake Success and Valley Stream PARs are scheduled at 165 MW and 123 MW, respectively, into NYC
Neptune and CSC HVdc are scheduled at 660 MW and 96 MW, respectively, into Long Island

Table 2.3.2 Emergency Transfer Criteria Intra-Area Thermal Transfer Limits

Interface	2010 Comprehensive Review (Study Year 2015)	2014 Intermediate Review (Study Year 2019)
Dysinger East	2,775 (1)	2,450 (2)
West Central	1,500 (1)	1,050 (2)
Volney East	5,450 (3)	4,500 (4)
Moses South	2,675 (5)	2,575 (6)
Central East	3,200 (7)	2,750 (7)
Total East	5,975 (8)	5,175 (8)
UPNY-SENY	5,900 (9)(A)	5,300 (8)(B)
UPNY-Con Edison	5,925 (10)(A)	6,475 (10)(B)
Sprain Brook Dunwoodie-South	5,625 (11)(C)	5,700 (12)(D)
Long Island Import	2,675 (13)(E)	2,250 (14)(F)

Notes:

1. **Wethersfield-Meyer 230** at 430 MW Normal rating for pre-contingency loading
2. **Packard-Sawyer 230 (77)** at 704 MW STE rating for L/O Packard-Niagara 230, Packard-Sawyer 230 (78), and Packard 230/115
3. **Edic-Fraser 345** at 1195 MW STE rating for L/O Oakdale-Fraser 345
4. **Fraser-Coopers Corners 345** at 1793 MW STE rating for L/O Marcy-Coopers Corners 345
5. **Marcy 765/345** at 1971 MW STE rating for L/O Marcy 765/345
6. **Moses-Adirondack 230** at 440 MW STE rating for L/O Chateauguay-Massena-Marcy 765
7. **New Scotland (77)-Leeds 345** at 1724 MW STE rating for L/O New Scotland (99) – Leeds 345
8. **CPV Valley-Rock Tavern 345** at 1793 MW STE rating for L/O Coopers Corners-Middletown Tap-Rock Tavern 345
9. **Leeds-Pleasant Valley 345** at 1724 MW STE rating for L/O Athens-Pleasant Valley 345
10. **Roseton-East Fishkill 345** at 1935 MW Normal rating for pre-contingency loading
11. **Mott Haven-Rainey 345** at 1196 MW STE rating for L/O Mott Haven-Rainey 345
12. **Dunwoodie-Mott Haven 345** at 786 MW Normal rating for pre-contingency loading
13. **Dunwoodie-Shore Road 345** at 599 MW Normal rating for pre-contingency loading
14. **Dunwoodie-Shore Road 345** at 687 MW Normal rating for pre-contingency loading

A. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into New York
B. Ramapo PAR1 and PAR2 are scheduled at 80% of the RECO load (190 MW each)
C. Dunwoodie North PAR1 and PAR2 are scheduled at 115 MW each into NYC
Dunwoodie South PAR1 and PAR2 are scheduled at 120 MW and 115 MW, respectively, 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
D. Dunwoody 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
E. E.G.C. PAR1 and PAR2 are scheduled at 315 MW each into Long Island
Lake Success and Valley Stream PARs are scheduled at 85 MW and 90 MW, respectively, into Long Island
Northport PAR scheduled at 286 MW into Long Island
Neptune and CSC HVdc are scheduled at 660 MW and 330 MW, respectively, into Long Island
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 87 MW and 88 MW, respectively, into Long Island
Neptune and CSC HVdc are scheduled at 660 MW and 96 MW, respectively, into Long Island

Table 2.3.3 Normal Transfer Criteria Inter-Area Thermal Transfer Limits

Interface	2010 Comprehensive Review (Study Year 2015)	2014 Intermediate Review (Study Year 2019)
New York – New England	1,425 (1)	1,225 (2)
New England – New York	2,025 (2)	1,600 (3)
New York – Ontario	1,600 (4)	1,600 (5)
Ontario – New York	1,725 (6)	1,850(7)
New York – PJM	1,775 (8)(A)	2,225 (9)(B)
PJM – New York	3,400 (10)(C)	3,350 (11)(D)

Notes:

1. **Pleasant Valley-Long Mountain 345** at 1386 MW LTE rating for L/O Millstone Unit #3 and PV-20 OMS
2. **Pleasant Valley-Long Mountain 345** at 1382 MW LTE rating for L/O Millstone Unit #3 and PV-20 OMS
3. **Reynolds Rd. 345/115** at 562 MW LTE rating for L/O Alps – New Scotland 345
4. **Niagara-PA27 230** at 460 MW LTE rating for L/O Niagara 345-Niagara2E 230 and Niagara-Beck B 345
5. **Niagara-PA27 230** at 460 MW LTE rating for L/O Niagara-Beck 345 (PA302)
6. **Niagara-Rochester 345** at 1501 MW LTE rating for L/O Somerset-Rochester 345
7. **Niagara-PA27 230** at 460 MW LTE rating for L/O Niagara-Beck 220 (PA301)
8. **South Ripley-Erie South 230** at 499 MW Normal rating for pre-contingency loading
9. **Huntley-Sawyer 230 (80)** at 654 MW LTE rating for L/O Huntley-Gardenville 230 (Line 79)
10. **Watercure 345/230** at 520 LTE rating for L/O Watercure-Oakdale 345, Oakdale 345/115 Bank #2
11. **East Towanda-Hillside** 230 at 531 MW LTE rating for L/O Watercure-Mainesburg 345 & North Waverly-East Sayre 115 (North Waverly-East Sayre 115 tripped via overcurrent relay)

A. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into PJM
Neptune is scheduled at 0 MW
Linden VFT is scheduled at 0 MW
HTP is scheduled at 0 MW

B. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into PJM
Neptune is scheduled at 0 MW
Linden VFT is scheduled at 315 MW into PJM
HTP is scheduled at 0 MW

C. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into NY
Neptune is scheduled at 660 MW into NY
Linden VFT is scheduled at 296 MW into NY
HTP is scheduled at 605 MW into NY

D. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into NY
Neptune is scheduled at 660 MW into NY
Linden VFT is scheduled at 315 MW into NY
HTP is scheduled at 320 MW into NY

Table 2.3.4 Emergency Transfer Criteria Inter-Area Thermal Transfer Limits

Interface	2010 Comprehensive Review (Study Year 2015)	2014 Intermediate Review (Study Year 2019)
New York – New England	2,000 (1)	1,800 (2)
New England – New York	2,350 (3)	2,550 (3)
New York – Ontario	1,900 (4)	1,875 (4)
Ontario – New York	1,875 (5)	2,225 (6)
New York – PJM	1,775 (7)(A)	2,375 (8)(B)
PJM – New York	3,500 (9)(C)	3,700 (10)(D)

Notes:

1. **Pleasant Valley-Long Mountain 345** at 1685 MW STE rating for L/O Millstone Unit #3
2. **Pleasant Valley-Long Mountain 345** at 1680 MW STE rating for L/O Millstone Unit #3
3. **Pleasant Valley-Long Mountain 345** at 1195 MW Normal rating for pre-contingency loading
4. **Niagara-PA27 230** at 400 MW Normal rating for pre-contingency loading
5. **Wethersfield-Meyer 230** at 430 MW Normal rating for pre-contingency loading
6. **PA27-Niagara 230** at 558 MW STE rating for L/O Beck – Niagara 220 (PA301)
7. **South Ripley-Erie South 230** at 499 MW Normal rating for pre-contingency loading
8. **Dunkirk-South Ripley 230** at 444 MW STE rating for L/O Wayne-Handsome Lake 345
9. **Stolle Rd.-Pavement Rd. 115** at 179 MW STE rating for L/O Watercure-Homer City 345
10. **Hillside-East Towanda 230 (70)** at 636 MW STE rating for L/O North Waverly-Sayre 115 & Watercure-Mainesburg 345 (North Waverly-East Sayre 115 tripped via overcurrent relay)

A. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into PJM
Neptune is scheduled at 0 MW
Linden VFT is scheduled at 0 MW
HTP is scheduled at 0 MW

B. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into PJM
Neptune is scheduled at 0 MW
Linden VFT is scheduled at 315 MW into PJM
HTP is scheduled at 0 MW

C. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into NY
Neptune is scheduled at 660 MW into NY
Linden VFT is scheduled at 296 MW into NY
HTP is scheduled at 605 MW into NY

D. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into NY
Neptune is scheduled at 660 MW into NY
Linden VFT is scheduled at 315 MW into NY
HTP is scheduled at 320 MW into NY

2.4. Voltage Transfer Analysis

2.4.1. Methodology

Voltage-constrained transfer limit analysis is performed using the Siemens PTI PSS®E (Rev. 32) software in conjunction with the NYISO Voltage Contingency Analysis Procedure (VCAP) [5] considering the voltage limits [14]. The voltage limits specify minimum and maximum voltage limits at buses listed in the *NYISO Emergency Operations Manual Table A.2* [14] (i.e. OP-1 buses). The required post-contingency voltage is typically within 5% of nominal.

A set of power flow cases with increasing transfer levels is created for each interface from the 2019 summer peak load base case by applying generation shifts similar to those used for thermal transfer analysis. For each interface, the VCAP program evaluates the system response to the set of the most severe contingencies which are applicable to NPCC Transmission Design Criteria, NYSRC Reliability Rules, and NERC Planning Events [1]-[3]. 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 analyses, actual system events, and analysis of planned changes to the system. The contingencies evaluated include the most severe loss of reactive capability, and increased impedance on the BPTF system.

For the 2014 Intermediate ATR, load is modeled as constant power in all NYCA zones except the Con Edison service territory in both the pre-contingency and post-contingency power flows. The Con Edison voltage-varying load model is used to model the Con Edison load in all cases.

All reactive power adjustments modeled by generators, PARs, autotransformers, static VAr compensators (SVC), and FACTS devices are regulated or adjusted within their respective capabilities to maintain voltages within the applicable pre-and post-contingency limits under transfer conditions. The reactive power of generators is regulated, within the capabilities of the units, to 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 power flow 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 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 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 curve becomes infinite (i.e. vertical) reaching the point of voltage collapse and occurs when reactive capability supporting power transfers 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 transfers, PAR schedules, key generator commitment, SVC dispatch, switched shunt availability, and inter-area power transfers. 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.

2.4.2. Analysis Results

Table 2.4.1 provides a summary of the voltage-constrained transfer limits. This assessment demonstrates that the New York State BPTF system meets the applicable NERC, NPCC, and NYSRC reliability standards [1]-[3] 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. For the majority of the interfaces, the decreased reserve margin within NYCA requires an increased amount of generation from Ontario to stress the interface sufficiently, creating longer transmission paths for the source generation, thereby reducing the voltage at the interface. Explanations for changes in transfer limits of greater than 100 MW are provided below. Details regarding the voltage-constrained transfer limit analysis are provided in Appendix G.

The Volney East voltage-constrained transfer limit decreased compared to the 2010 CATR. The difference in transfer limitation is due to the generation mothball/retirements in Western and Central New York, the wind generation modeling assumption, and an increased amount of generation from Ontario to stress the interface sufficiently.

The Central East voltage-constrained transfer limits decreased compared to the 2010 CATR. The difference in transfer limitation is due to the generation mothball/retirements in Western and Central New York; reduced Hydro-Quebec import; and an increased amount of generation from Ontario to stress the interface sufficiently.

The UPNY-SENY, UPNY-Con Edison, and Sprainbrook Dunwoodie-South voltage-constrained transfer limit decreased compared to the 2010 CATR. For this ATR, the schedule for the Ramapo PARs, which are defined as part of the UPNY-SENY interface definition, is approximately 400 MW (1,000 MW for the

2010 CATR). The difference in the Ramapo PAR schedule accounts for a 600 MW decrease in transfer limit; however, the transfer limit only decreased by 300 MW due to the reduced generation capacity in southeast New York.

Table 2.4.1 Summary of Voltage Constrained Transfer Limits

Interface	2010 Comprehensive Review (Study Year 2015)	2014 Intermediate Review (Study Year 2019)
Dysinger East	2,950 (2) 2,975 (1)	2,975 (3) 3,050 (4)
West Central	1,650 (2) 1,725 (1)	1,525 (3) 1,600 (4)
Volney East	5,025 (5)	4,225 (6)
Central East	3,175 (7) 3,225 (6)	2,700 (6)
UPNY-SENY	6,150 (8)(A)	5,850 (9)(B)(C)
UPNY-Con Edison	5,475 (11)(A)	5,400 (10)(B)(C) 5,525 (11)(B)(C)
Sprainbrook Dunwoodie-South	5,350 (11)(A)(D)	5,050 (12)(B)(C) 5,075 (9)(B)(C)

Notes:

1. 95% of PV nose occurs for L/O Ginna
2. Station 80 345 kV bus voltage post-contingency low limit for breaker failure at Station 80 345 kV (L/O Kintigh-Rochester 345 kV and Rochester-Pannell 345 kV)
3. Station 80 345 kV pre-contingency low limit
4. 95% of PV nose occurs for breaker failure at N. Rochester 345 kV (L/O Somerset-N. Rochester 345 kV and N. Rochester-Rochester 345 kV)
5. 95% of PV nose occurs for a stuck breaker at Edic 345 kV (L/O Fitzpatrick-Edic 345 kV and Edic-N. Scotland 345 kV)
6. 95% of PV nose occurs for L/O northern Marcy South double ckt. (L/O Marcy-Coopers Corners 345 kV and Edic-Fraser 345 kV)
7. Edic 345 kV bus voltage post-contingency low limit for breaker failure at Marcy 345 kV (L/O Volney-Marcy 345 kV and Edic-Marcy 345 kV)
8. Pleasant Valley 345 kV bus voltage post-contingency low limit for L/O Tower 34/42 (Coopers Corners-Rock Tavern 345 kV double ckt.)
9. 95% of PV nose occurs for L/O Tower 34/42 (CPV-Rock Tavern 345 kV and Coopers Corners-Rock Tavern 345 kV)
10. Millwood 345 kV bus voltage post-contingency low limit for L/O Tower 34/42 (CPV-Rock Tavern 345 kV and Coopers Corners-Rock Tavern 345 kV)
11. 95% of PV nose occurs for L/O Tower 67/68 (Ladentown-Bowline 345 kV double ckt.)
12. Dunwoodie 345 kV pre-contingency low limit

A. Ramapo PAR1 and PAR2 are scheduled at 500 MW each into NY
B. Ramapo PAR1 and PAR 2 are scheduled at 80% of the RECO load (201 MW each into NY)
C. 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 NYC
D. Dunwoodie North PAR1 and PAR2 are scheduled at 115 MW each into NYC
   Dunwoodie South PAR1 and PAR 2 are scheduled at 120 MW and 115 MW, respectively, 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 NYC

2.5. Transmission Security Analysis

2.5.1. Methodology

The analysis for the transmission security assessment is conducted in accordance with NPCC Transmission Design Criteria [1], NYSRC Reliability Rules [2], and the NERC Reliability Standard [3]. AC contingency analysis is performed on the BPTF and other NYISO secured facilities to evaluate the thermal and voltage performance under NERC steady state Planning Events, and NPCC and NYSRC Design Criteria contingencies [1]-[3] within NYCA and neighboring systems, as appropriate, using the Siemens PTI PSS®E and PowerGEM TARA programs.

The transmission security analysis is performed for near-term transmission planning horizon (i.e. 2015, 2019) peak load, off-peak load, and sensitivity cases as well as the long-term transmission planning horizon (i.e. 2024) peak load case. For all study years, generation is dispatched to match load plus system losses while respecting transmission security. Scheduled inter-area transfers modeled in the base case between the NYCA and each neighboring system are held constant.

The transmission security analysis includes approximately 1,000 design criteria contingencies that are expected to produce a more severe system impact on the BPTF. 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. The contingencies evaluated include the most severe loss of reactive capability, and increased impedance on the BPTF system. Relay loadability limits are incorporated by the Transmission Owners into the normal, long-term emergency, and short-term emergency transmission element ratings. The list of contingencies is provided in Appendix H.

To evaluate the impact of a single event from the normal system condition (N-1), all design criteria contingencies are evaluated including: singe element, common structure, stuck breaker, generator, bus, and HVDC facilities contingencies. For transmission security analysis under N-1-1 conditions, to ensure compliance with NPCC Transmission Design Criteria [1], NYSRC Reliability Rules [2], and NERC Planning Events [3], the BPTF elements are evaluated with single element contingencies as the first contingency (N-1-0); the second contingency (N-1-1) includes all design criteria contingencies evaluated under N-1 conditions. This evaluation is conservative compared to NERC Planning Events as the TPL standard [3] only requires single element contingencies be evaluated for both the first and second contingency.

Transmission security analysis allows for system adjustments including generator redispatch, PAR adjustments, and HVDC adjustments between the first (N-1-0) and second (N-1-1) contingency. For N-1 analysis, no system adjustments are allowed post-contingency. These system adjustments prepare the system for the next contingency by reducing the flow to normal rating after the first contingency. 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 power flow solution, but are allowed to regulate in the post-contingency power flow solution.

An N-1 thermal violation occurs when the power flow on the monitored facility is greater than the applicable post-contingency rating. An N-1-0 thermal violation occurs when the power flow cannot be adjusted to below the normal rating following the first contingency. An N-1-1 thermal violation occurs when the monitored element cannot be secured to the applicable post-contingency rating for the second contingency. In the second contingency column of the N-1-1 tables below, "Base Case" corresponds to events resulting in an N-1-0 violation.

An N-1, N-1-0, or N-1-1 voltage violation occurs on an OP-1 designated bus when the voltage is outside of the listed voltage limits [14], when the analysis shows BES generator bus voltages or the high side of a BES generator step-up transformer voltages less than 0.9 per unit [18], or the voltage deviation is outside of the post-contingency voltage deviation criteria. OP-1 designated buses are elements of the NYISO Secured Transmission System monitored by the NYISO to provide adequate voltage. In instances where the transmission security analysis shows BES generator bus voltages or the high side of a BES generator step-up transformer voltages less than 0.9 per unit, the system response to the contingency condition resulting in this condition is re-evaluated to including the loss of generation. For the OP-1 designated buses, the voltage deviation criterion is to allow deviation from the pre-contingency voltage to the post-contingency voltage threshold limit.

The NYISO tests all single element transmission facility outages to determine the impact of any additional single or multiple element contingency, regardless of spare equipment strategy. As required in the NERC Reliability Standard [3], the responsible Transmission Owners have reviewed the first contingency conditions listed in Tables 2.5.2, 2.5.5, 2.5.6, and 2.7.7 and consider the required lead times to resolve the contingency conditions to be less than a year.

2.5.2. Summer Peak Load Analysis Results

Rochester

In 2015, Pannell 345/115 kV 1TR, Pannell 345/115 kV 2TR, and Pannell Rd. – Quaker 115 kV (Figure 2.5.1 [1]) are overloaded for the loss of the Ginna generating facility followed by a stuck breaker at Pannell. The transmission security violations observed on these elements are resolved after Rochester Gas and Electric (RG&E) Station 255 is in-service. RG&E Station 255, which was provided as a solution in the 2012 Comprehensive Reliability Plan (CRP) (16) is included in the 2019 base case according to the firm plans indentified in the 2014 Gold Book [9].

RG&E will use operating procedures as an interim Corrective Action Plan to maintain the security of their system until Station 255 is in-service. These operating procedures include the adjustment of phase-angle regulators, use of special case resources, and manned substations when the Ginna unit is offline to allow for expedited isolation and restoration of the affected system.

Central New York

National Grid's Clay 115 kV station (Figure 2.5.1 [2]) includes eight 115 kV transmission connections and two 345/115 kV transformers that serve the Oswego and Syracuse areas. Starting in 2015, Clay-Lockheed Martin (#14) 115 kV (Clay-Wetzel) has a flow of approximately 131% of Long Term Emergency (LTE) rating of 120 MVA for an N-1 breaker failure at the Oswego 345 kV substation. In 2019, the flow increases to 137% of LTE rating. The increase in flow between 2015 and 2019 is primarily due to modeling the Cayuga generation plant out-of-service starting in 2017 and load growth. In 2024, the flow is to 138% of LTE rating. The Wetzel-Lockheed Martin section of Clay-Lockheed Martin (#14) 115 kV shows similar increases in flow percentages among the study years. In 2019 and 2024, the Clay-Woodard (#17) (Euclid-Woodard) has a flow of approximately 102% of LTE following a breaker failure at the Lafayette 345 kV substation.

National Grid identifies in their local transmission plan [17] a Corrective Action Plan to reconductor the Clay-Lockheed Martin (#14) 115 kV line in late 2017. National Grid will use operating procedures as an interim Corrective Action Plan until the Clay-Lockheed Martin (#14) 115 kV transmission line is reconductored in late 2017. The operating procedure includes switching the Wetzel Rd. load to an alternative source (Lighthouse Hill – Clay (#7) 115 kV) and local non-consequential load shedding, as necessary. National Grid also identifies in their local transmission plan [17] a Corrective Action Plan to remove thermal restrictions associated with conductor clearance for the Clay-Woodard (#17) 115 kV transmission line. The proposed in-service date provided in the local transmission plan for Clay-Woodard (#17) 115 kV rating upgrade is late 2015.

Thermal overloads are also observed at the Clay 115 kV station for N-1-1 conditions. Starting in 2015, the N-1-1 analysis shows various overloads in the Syracuse area including: Clay-Lockheed Martin (#14) 115 kV, Clay-Woodard (#17) 115 kV, Clay-Teall (#10) 115 kV, and Clay-Dewitt (#3) 115 kV. In the 2019 base case, the N-1-1 analysis shows additional overloads in the Clay area on: Clay 345/115 kV 1TR and Clay-S. Oswego (#4) 115 kV. The overloads on the Clay-Teall (#10) 115 kV and Clay-Dewitt (#3) 115 kV are mitigated by the solutions identified in the 2012 CRP [16]. These solutions involved reconductoring the overloaded lines. The overloads in this area are primarily due to power flowing from east-to-west on the 115 kV system to serve load in Central New York after the loss of a north-to-south 345 kV path and which is exacerbated with the Cayuga mothball.

National Grid's Corrective Action Plan for the violation observed on the Clay-Lockheed Martin (#14) 115 kV transmission line is discussed above for the violations observed under N-1 conditions. The Corrective Action Plan for the violation observed on the Clay-Woodard (#17) 115 kV transmission line is also discussed above under N-1 conditions; however, under N-1-1 conditions, the Clay-Woodard (#17) 115 kV transmission line has thermal violations starting in 2015. National Grid will use operating procedures as an interim Corrective Action Plan until the Clay-Woodard (#17) 115 kV transmission line thermal restrictions associated with conductor clearance is resolved in late 2015. The operating procedure includes switching the load at Euclid to an alternative source (Clay-Teall (#11) 115 kV).

National Grid identifies in their local transmission plan [17] a project to reconductor the Clay-Dewitt (#3) 115 and Clay-Teall (#10) 115 kV transmission lines late 2017. National Grid will use operating procedures as an interim Corrective Action Plan until the Clay-Dewitt (#3) 115 kV transmission line is reconductored. The operating procedure includes switching the load at Bartell Rd. and Pine Grove to an alternative source (Clay-Teall (#10) 115 kV), Fly Rd. load to an alternative source (Teall-Dewitt (#4) 115 kV), and local non-consequential load shedding, as necessary. Operating procedures will also be used as an interim Corrective Action Plan until the Clay-Teall (#10) 115 kV transmission line is reconductored in late 2017 [17]. The operating procedure includes switching the load at Pine Grove to an alternative source (Clay-Dewitt (#3) 115 kV) and local non-consequential load shedding, as necessary.

The reconfiguration of the Clay 345 kV substation resolves the violation observed on Clay 345/115 kV 1TR. As stated in National Grid's local transmission plan, this Corrective Action Plan will be completed mid-2016 [17], which is prior to when the violation is observed. Subsequent annual assessments will review the continuing need for the Corrective Action Plans identified to resolve the violations observed on system facilities.

The Corrective Action Plan to resolve violations observed on the Clay-S. Oswego (#4) 115 transmission line is to remove thermal restrictions due to conductor clearance [17]. As stated in National Grid's local transmission plan, the thermal restriction will be resolved prior to 2019.

National Grid's Porter 115 kV station (Figure 2.5.1 [3]) includes eight 115 kV transmission connections and two 345/115 kV transformers that serve the Utica and Syracuse areas. The N-1-1 analysis shows the Porter-Yahnundasis (#3) (Porter-Kelsey) 115 kV overloaded starting in 2015 for the loss of Oswego-Elbridge-Lafayette (#17) 345 kV followed by a stuck breaker at the Clay 345 kV substation. This overload is due to power flowing from east-to-west on the 115 kV system to serve load in the Utica, Syracuse, and Finger Lakes area and is exacerbated with Cayuga mothballed.

National Grid identifies in their local transmission plan [17] a Corrective Action Plan to install reactors on the Porter-Yahnundasis (#3) transmission line by late 2017. National Grid will use operating procedures as an interim Corrective Action Plan until the reactors are installed in late 2017 [17]. The operating procedure includes opening the Oneida-Yahundasis (#6) 115 kV transmission line.

Except as noted above, system adjustments are identified for each N-1 and N-1-1 facility outage condition such that there are no post-contingency thermal or voltage violations on the New York State BPTF following any N-1 or N-1-1 design criteria contingency. These results indicate that sufficient ten-minute reserve, PAR control, HVDC control, and reactive power resources available within the NYCA to allow the projected demand to be supplied for each study year. For all Corrective Action Plans identified above, subsequent annual assessments will review the continuing need for the identified solution to resolve the violations observed on system facilities. The complete N-1 and N-1-1 summer peak load steady state results are provided in Appendix H.

Under summer peak load conditions, all study years show no voltage violations.

Table 2.5.1 provides a summary of the design criteria contingencies that result in the highest thermal overload on each overloaded BPTF element under N-1 conditions for each study year. Table 2.5.2 provides a summary of the highest thermal overload on each BPTF element under N-1-1 summer peak load conditions. For the 2014 Intermediate ATR, BES is equivalent to BPS.

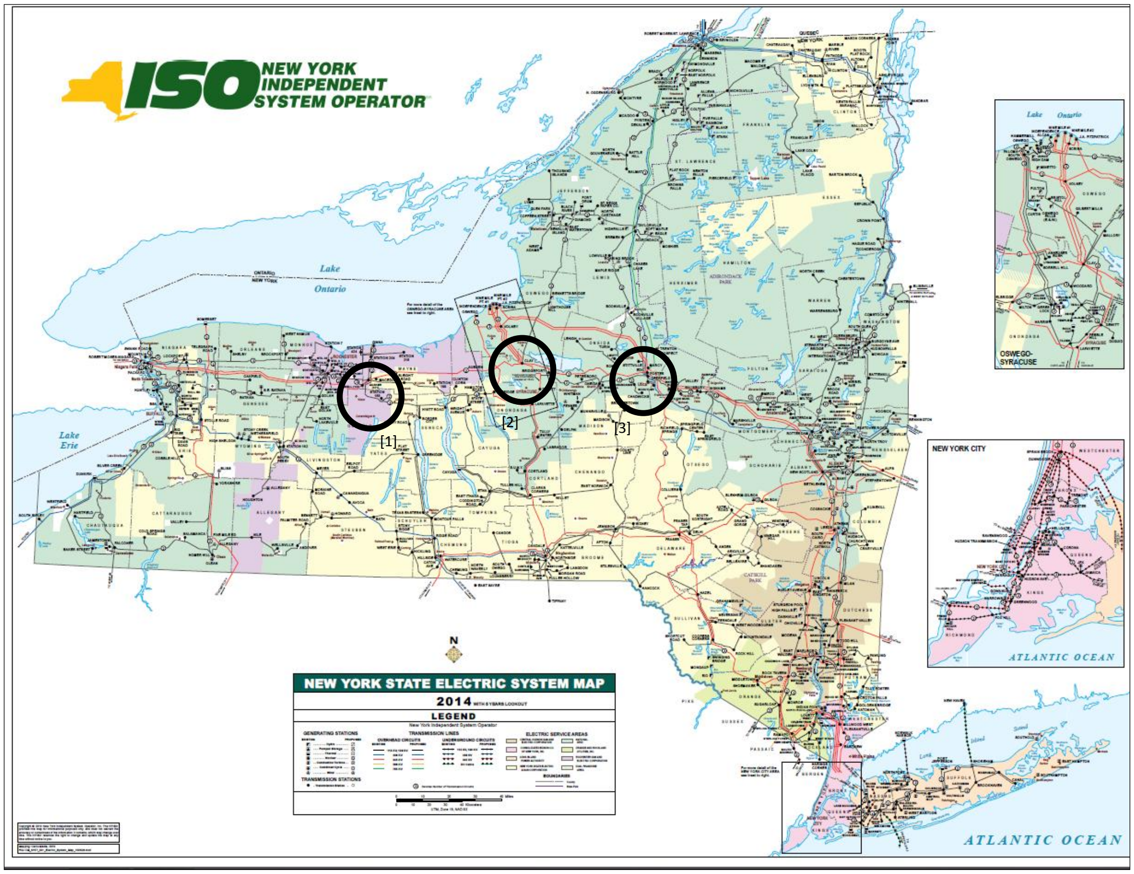
Table 2.5.1 N-1 Summer Peak Load Transmission Security Violations

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	2015 Flow (%)	2019 Flow (%)	2024 Flow (%)	Contingency (kV)
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Clay-Wetzel)	116	120	145	131	137	138	SB Oswego 345
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Wetzel-Lockheed Martin)	116	120	145	103	108	108	SB Oswego 345
C	N.Grid	Clay-Woodard (#17) 115 (Euclid-Woodard)	174	174	174	-	102	102	SB Lafayette 345

Table 2.5.2 N-1-1 Summer Peak Load Transmission Security Violations

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	2015 Flow (%)	2019 Flow (%)	2024 Flow (%)	First Contingency	Second Contingency
B	RGE	Pannell 345/115 1TR	228	282	336	131	-	-	L/O Ginna	SB Pannell 345
B	RGE	Pannell 345/115 2TR	228	282	336	131	-	-	L/O Ginna	SB Pannell 345
B	RGE	Pannell-Quaker (#914) 115	207.1	246.9	284.8	120	-	-	L/O Ginna	SB Pannell 345
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Clay-Wetzel)	116	120	145	-	111	113	Oswego-Elbridge-Lafayette (#17) 345	Base Case
						138	153	160	Clay-Woodard (#17) 115	SB Lafayette 345
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Wetzel-Lockheed Martin)	116	120	145	108	123	130	Clay-Woodard (#17) 115	SB Lafayette 345
C	N.Grid	Clay 345/115 1TR	478	637	794	-	109	112	Oswego-Elbridge-Lafayette (#17) 345	SB Clay 345
C	N.Grid	Clay-Woodard (#17) 115 (Euclid-Woodard)	174	174	174	104	106	111	Clay-Lockheed Martin (#14) 115	SB Lafayette 345
C	N.Grid	Clay-S. Oswego (#4) 115 (S. Oswego-Whitaker)	104	104	104	-	101	108	Clay 345/115 1TR	SB Clay 345
C	N.Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd.-Pine Grove)	116	120	145	108	-	-	Dewitt 345/115 2TR	Clay-Teall (#11) 115
C	N.Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116	120	145	102	-	-	Oswego-Elbridge-Lafayette (#17) 345	Clay-Dewitt (#13) 345
E	N.Grid	Porter-Yahnundasis (#3) 115 (Porter-Kelsey)	116	120	145	107	110	114	Oswego-Elbridge-Lafayette (#17) 345	SB Clay 345

Figure 2.5.1: Transmission Security Violations Under 50/50 Load Conditions



2.5.3. High Summer Peak Load Analysis Results

The high summer peak load forecast represents an extreme weather condition (e.g. hot summer day, 90/10 peak load forecast). Table 2.5.3 provides a comparison of the baseline (50/50) and high peak load forecasts (90/10) for years 2015 and 2019 [9]. With the increased load, the thermal violations observed under summer peak conditions are exacerbated along with new overloads in the same areas (e.g. Clay 115 kV and Porter 115 kV stations - Figure 2.5.2 [2],[3]). The increased load level also results in earlier occurrence of thermal violations (e.g. Porter-Yahnundasis (#3) 115 kV, Clay 345/115 kV 1TR, and Clay-S. Oswego (#4) 115 kV).

Table 2.5.4 provides a summary of the design criteria contingencies that result in the highest thermal overload on each overloaded BPTF element under N-1 conditions for years 2015 and 2019. Table 2.5.5 provides a summary of the highest thermal overload on each BPTF element under N-1-1 high summer peak load conditions when considering contingencies applicable to the NPCC Design Criteria and NYSRC Reliability Standard requirements.

Table 2.5.6 provides a summary of the highest thermal overload on each BPTF element under the same conditions considering only contingencies that are applicable to the NERC Category P3 and P6 Planning

Events [3]. The results in Table 2.5.6 differ from those in Table 2.5.5 as the NERC N-1-1 planning events only require the system to be secured for single contingency events following the loss of the first element, compared to NPCC and NYSRC which require the system to be secured to all design contingencies following the loss of the first element.

The following areas have thermal/voltage violations that are not observed under summer peak load conditions when considering contingencies applicable to the NPCC Design Criteria and NYSRC Reliability Standard requirements. For the violations observed under NERC criteria, Corrective Action Plans do not need to be developed to meet the performance requirements as they are observed under a single sensitivity case; however, all violations observed against NERC criteria are mitigated with the Corrective Action Plans identified for peak load conditions.

Rochester

In 2015, two Station 80 transformers overload for the loss of a transformer followed by a stuck breaker that results in the loss of two additional transformers (Figure 2.5.2 [1]). These contingencies also result in low voltage at Station 80 345 kV bus and the Pannell 345 kV bus. The N-1-1 thermal and voltage violations observed on the Station 80 transformers and the Pannell-Quaker (#914) 115 kV transmission line are resolved after RG&E Station 255 is in-service; however, the Pannell 345/115 transformers 1TR and 2TR have thermal violations in 2019. Solutions to these violations could include generation, transmission, and/or demand-side management in the Rochester area.

Western New York

The 230 kV system between Niagara and Gardenville includes two parallel 230 kV transmission lines from Niagara to Packard to Huntley to Gardenville, including a number of taps to serve load in the Buffalo areas (Figure 2.5.2 [4]). In 2015, the highest loading on the Huntley-Sawyer portion of Huntley-Gardenville (#80) 230 kV transmission line is approximately 102% of the Long-Term Emergency (LTE) rating under N-1-1 conditions. This overload is mitigated by the Dunkirk plant fuel conversion, which is currently scheduled for completion prior to summer 2016 [9]. In 2019, Gardenville 230/115 kV TB3 transformer loading is approximately 123% of the LTE rating under N-1-1 conditions. Solutions for this situation could include additional 230 kV or 345 kV transmission lines to serve the local area. Other solutions could include generation, transmission, and/or demand-side management in the Western New York area.

Central New York

The Oakdale 345/230/115 kV substation serves the Binghamton area (Figure 2.5.2 [5]). In 2015, the loading on both Oakdale 345/115 kV transformers have thermal violations under N-1-0 and N-1-1 conditions. The Oakdale 345 kV and Watercure 230kV bus also have low voltage for the loss of source to the local area (loss of Lafayette-Clarks Corners (#4-46) 345 kV followed by the loss of Fraser-Oakdale (#32) 345 kV and Fraser-Coopers Corners (#33) 345 kV). The thermal overloads are mitigated by the addition of a third Oakdale transformer modeled in-service starting in the 2019 case; however, these solutions do not resolve the voltage violation. Solutions to the voltage violation could include reactive support, generation, transmission, and/or demand-side management in the Binghamton area.

The Watercure 345/230 kV substation serves the Elmira area (Figure 2.5.2 [5]). In 2015, the loading on the Watercure 345/230 kV transformer overloads under N-1-1 conditions for the loss of both Oakdale 345/115 transformers is approximately 102% of LTE rating. The thermal overload is mitigated by the addition of the second Watercure transformer scheduled to be in-service winter 2015 [9] and the addition of a third Oakdale transformer modeled in-service starting in the 2019 summer case.

Lower Hudson Valley

The Middletown 345/138 kV transformer Bank 114 and W. Haverstraw 345/138 kV transformer Bank 194 serve load in the Orange and Rockland service area of the Lower Hudson Valley (Figure 2.5.2 [6]). These transformers overload under N-1-1 conditions for the loss of two Ramapo transformers that also serve the local area. This overload is mitigated by the addition of the Sugarloaf 345/138 kV substation in 2016.

Table 2.5.3 Comparison of 50/50 and High Peak Coincident Summer Peak Load for 2015 and 2019

Zone	A	B	C	D	E	F	G	H	I	J	K	NYCA
Forecast for 2015												
50/50	2,688	2,062	2,916	705	1,449	2,405	2,309	684	1,493	11,907	5,448	34,066
90/10	2,887	2,215	3,132	757	1,556	2,614	2,509	760	1,660	12,404	5,903	36,397
Delta	199	153	216	52	107	209	200	76	167	497	455	2,331
Forecast for 2019												
50/50	2,756	2,110	3,009	789	1,512	2,529	2,355	702	1,534	12,549	5,609	35,454
90/10	2,960	2,266	3,232	847	1,624	2,748	2,559	780	1,705	13,072	6,077	37,870
Delta	204	156	223	58	112	219	204	78	171	523	468	2,416

Table 2.5.4 N-1 High Summer Peak Load Transmission Security Violations

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	2015 Flow (%)	2019 Flow (%)	Contingency (kV)
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Clay-Wetzel)[1]	116	120	145	139	147	SB Oswego 345
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Wetzel-Lockheed Martin)[1]	116	120	145	108	115	SB Oswego 345
C	N.Grid	Clay-Woodard (#17) 115 (Euclid-Woodard)[1]	174	174	174	-	109	SB Lafayette 345
E	N.Grid	Porter-Yahnundasis (#3) 115 (Porter-Kelsey)	116	120	145	101	108	SB Oswego 345

Note:

(1) Overloaded element observed under summer peak load conditions

Table 2.5.5 N-1-1 High Summer Peak Load Transmission Security Violations

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	2015 Flow (%)	2019 Flow (%)	First Contingency	Second Contingency
A	N.Grid	Gardenville 230/115 TB3	141	182	250	-	123	Gardenville 230/115 2TR	SB Gardenville 230
A	N.Grid	Huntley-Gardenville (#80) 230 (Huntley-Sawyer)	566	654	755	102	-	Robinson Rd. – Stolle Rd. (#65) 230	Huntley-Gardenville (#79) 230
B	RGE	Station 80 345/115 2TR	330	415	478	109	-	Station 80 345/115 5TR	SB Rochester 345
B	RGE	Station 80 345/115 5TR	462	567	630	107	-	Station 80 345/115 2TR	SB Rochester 345
B	RGE	Pannell 345/115 1TR[1]	228	282	336	105	-	L/O Ginna	Base Case
						144	104	L/O Ginna	SB Pannell 345
B	RGE	Pannell 345/115 2TR[1]	228	282	336	105	-	L/O Ginna	Base Case
						144	104	L/O Ginna	SB Pannell 345
B	RGE	Pannell 345/115 3TR	255	319	339	101.5	-	L/O Ginna	SB Rochester 345
B	RGE	Pannell-Quaker (#914) 115[1]	207.1	246.9	284.8	127	-	L/O Ginna	Pannell 345/115 3TR
C	NYSEG	Oakdale 345/115 2TR	428	556	600	110	-	Oakdale 345/115 3TR	Base Case
						113	-	Fraser 345/115 2TR	SB Oakdale 345
C	NYSEG	Oakdale 345/115 3TR	428	556	600	109	-	Oakdale 345/115 2TR	Base Case
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Clay-Wetzel)[1]	116	120	145	116	126	Elbridge 345/115 1TR	Base Case
						163	180	Clay-Woodard (#17) 115	SB Lafayette 345
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Wetzel-Lockheed Martin)[1]	116	120	145	132	147	Clay-Woodard (#17) 115	SB Lafayette 345
C	N.Grid	Clay 345/115 1TR[1]	478	637	794	109	120	Oswego-Elbridge-Lafayette (#17) 345	SB Clay 345
C	N.Grid	Clay 345/115 2TR	478	637	794	-	107	Clay 345/115 1TR	SB Oswego 345
C.	N.Grid	Clay-Teall (#11) 115 (Euclid-Hopkins)	208	208	208	-	107	Dewitt 345/115 2TR	T:3&10
C	N.Grid	Clay-Woodard (#17) 115 (Euclid-Woodard)[1]	174	174	174	119	125	Clay-Lockheed Martin (#14) 115	SB Lafayette 345
C	N.Grid	Clay-Woodard (#17) 115 (Clay-Euclid)	220	226	226	-	107	Dewitt 345/115 2TR	T:3&10
C	N.Grid	Clay-S. Oswego (#4) 115 (S. Oswego-Whitaker)[1]	104	104	104	110	114	Clay 345/115 1TR	SB Clay 345
C	N.Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd.-Pine Grove)[1]	116	120	145	120	-	Clay-Teall (#11) 115	SB Dewitt 345
C	N.Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)[1]	116	120	145	118	-	Clay-Dewitt (#13) 345	SB Oswego 345
C	N.Grid	Clay-Dewitt (#3) 115 (Bartell Rd-Pine Grove)	116	120	145	107	-	Clay-Dewitt (#13) 345	SB Oswego 345
C	N.Grid	Clay-Lighthouse Hill (#7) 115 (Lighthouse Hill-Mallory)	108	108	108	-	102	Clay 345/115 1TR	SB Clay 345
C	NYSEG	Watercure 345/230 1TR	440	540	600	102	-	Oakdale 345/115 2TR	Oakdale 345/115 3TR
E	N.Grid	Porter-Yahnundasis (#3) 115 (Porter-Kelsey)[1]	116	120	145	-	103	Clay-Independence (#26) 345	Base Case
						121	126	Oswego-Elbridge-Lafayette (#17) 345	SB Clay 345
E	N.Grid	Porter-Oneida (#7) 115 (Porter-W. Utica)	116	120	145	108	-	Clay-Dewitt (#13) 345	SB Oswego 345
						-	110	Oswego-Elbridge-Lafayette (#17) 345	SB Clay 345
G	O&R	W. Haverstraw 345/138 Bank 194	501	607	688	128	-	Ramapo 345/115 1300TR	SB Ramapo
G	O&R	Middletown 345/138 Bank 114	562	652	746	114	-	Ramapo 345/115 1300TR	SB Ramapo

Note:

(1) Overloaded element observed under summer peak load conditions

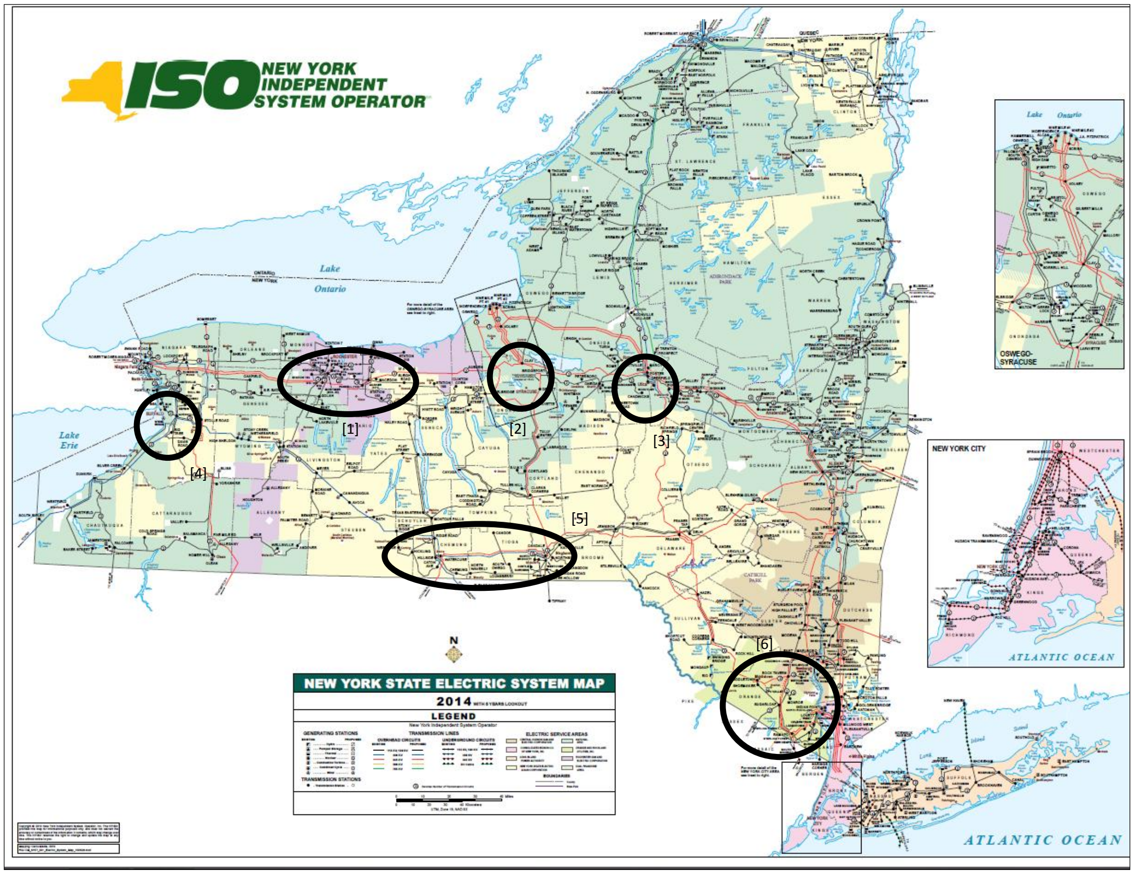
Table 2.5.6 High Peak Load Violations Observed Using Only the NERC P3 & P6 Planning Events

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	2015 Flow (%)	2019 Flow (%)	First Contingency	Second Contingency
C	NYSEG	Oakdale 345/115 2TR	428	556	600	112	-	Oakdale 345/115 3TR	Base Case
C	NYSEG	Oakdale 345/115 3TR	428	556	600	112	-	Oakdale 345/115 2TR	Base Case
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Clay-Wetzel)[1]	116	120	145	116	126	Elbridge 345/115 1TR	Base Case
						146	158	Clay-Woodard (#17) 115	Oswego-Elbridge-Lafayette (#17) 345
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Wetzel-Lockheed Martin)[1]	116	120	145	115	125	Clay-Woodard (#17) 115	Oswego-Elbridge-Lafayette (#17) 345
C	N.Grid	Clay-Woodard (#17) 115 (Euclid-Woodard)[1]	174	174	174	107	113	Clay-Lockheed Martin (#14) 115	Oswego-Elbridge-Lafayette (#17) 345
C	N.Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd.-Pine Grove)[1]	116	120	145	116	-	Clay-Teall (#11) 115	Dewitt 345/115 2TR
C	N.Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)[1]	116	120	145	121	-	Clay-Dewitt (#13) 345	Oswego-Elbridge-Lafayette (#17) 345
C	N.Grid	Clay-Dewitt (#3) 115 (Bartell Rd-Pine Grove)	116	120	145	110	-	Clay-Dewitt (#13) 345	Oswego-Elbridge-Lafayette (#17) 345
E	N.Grid	Porter-Yahnundasis (#3) 115 (Porter-Kelsey)[1]	116	120	145	112	116	Oswego-Elbridge-Lafayette (#17) 345	Clay-Dewitt (#13) 345
						-	118	Porter-Schuyler (#13) 115	Porter-Terminal (#6) 115
						101	-	Dewitt 345/115 2TR	Base Case
						-	105	Oswego-Elbridge-Lafayette (#17) 345	Base Case

Note:

(1) Overloaded element observed under summer peak load conditions

Figure 2.5.2: Thermal and Voltage Violations Under 90/10 Load Conditions



2.5.4. Light Load Analysis Results

Under all studied light load conditions no thermal or voltage violations are observed.

2.5.5. Review of Corrective Action Plans Identified in the 2013 Intermediate ATR

The Clay-Lockheed Martin (#14) 115 kV line was observed to have N-1 and N-1-1 thermal violations in the 2013 Intermediate ATR. The Corrective Acton Plan stated in the 2013 Intermediate ATR is to reconductor the transmission line by late 2016. National Grid has provided the same Corrective Action Plan in this year's ATR; however, the expected in-service date has moved to late 2017.

The 2013 Intermediate ATR identified a low voltage issue for a stuck bus-tie breaker at Porter 115 kV. The Corrective Action Plan identified is to install a second bus-tie breaker in series with the existing Porter bus-tie breaker effectively eliminating the stuck bus-tie breaker contingency. The proposed in-service date for this Corrective Action Plan stated in the 2013 Intermediate ATR is summer 2017. As this work has already been completed the impact of the stuck breaker contingency at the Porter 115 kV bus tie-breaker is resolved.

The Porter-Yahnundasis (#3) (Porter-Kelsey) 115 kV was observed to have N-1-1 thermal violations in the 2013 Intermediate ATR. The Corrective Action Plan stated in the 2013 Intermediate ATR is to reconductor the transmission line. National Grid has updated their Corrective Action Plan to instead install reactors on the Porter-Yahnundasis (#3) transmission line by late 2017.

2.6. **Stability Analysis**

2.6.1. Methodology

The dynamic data used in this analysis is developed from the NPCC 2013 BCD library. This data includes generator, exciter, power system stabilizers, SVC, power flow controller, and DC transmission controller models that provide dynamic control to the electrical system. The load model has significant impact on the stability performance of the BPS. For this study, a primary load model comprised of 100% constant impedance for both active and reactive power load is used 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 Québec, 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 model for reactive load.

Starting with the 2019 summer peak load stability base case, the NYISO created four NYCA margin cases (UPNY margin, Central margin, Western margin, and Moses margin). The margin cases are used to evaluate the stability performance of the NYCA system against normal design criteria contingencies at various transfer levels to evaluate if the studied interfaces are restricted by a stability constraint. The simulated contingency events are identified in Appendix I. For each margin case, the studied interfaces are tested at a power flow of at least 10% greater than limiting emergency thermal or voltage transfer limit. This ensures that the application of the margin does not result in the determination of a stability limit that is lower than the emergency thermal or voltage transfer limit. The methodology for this analysis is described in NYISO Transmission Planning Guideline #3-1 [6].

The UPNY-SENY and UPNY-Con Edison open interfaces of the UPNY margin case are loaded at 6,750 MW and 6,075 MW, respectively. The UPNY-SENY emergency thermal limit is more limiting at 5,300 MW and UPNY-Con Edison is voltage limited at 5,400 MW. This case has the Oswego Complex generation dispatched at an output of 5,250 MW and 1,200 MW of import from Hydro Quebec (supplied by Beauharnois hydro generation). The Chateauguay HVdc poles were taken out of service to exclude the dynamic benefit of the HVdc controls. The Ramapo PARs are scheduled at 200 MW each into New York.

The Central margin case has the Oswego Complex generation dispatched at an output of 5,250 MW and 1,200 MW of import from Hydro Quebec (supplied by Beauharnois hydro generation) with the Chateauguay HVdc poles out of service. The Central East and UPNY-SENY open interfaces of the Central margin case are loaded at 3,000 MW and 6,390 MW, respectively. The Central East Interface voltage limit is 2,700 MW and the UPNY-SENY emergency thermal limit is 5,300 MW.

The Western margin case is loaded to the following open interface levels: Dysinger East 2,740 MW, West Central 1,300 MW, Ontario-NY 1,715 MW, and HQ-NY 1,100 MW (Chateauguay HVdc 840 MW, Beauharnois 260 MW). The Dysinger East Interface emergency thermal limit is 2,450 MW and West Central has an emergency thermal limit of 1,050 MW.

The Moses margin case has the Moses South open interface loaded to 2,875 MW, HQ-NY loaded to 1,950 MW (Chateauguay HVdc 840 MW, Beauharnois 1,110 MW), and the St Lawrence L33/34 PARs scheduled at 200 MW each. The Moses South Interface emergency thermal limit is 2,575 MW.

The light load base case uses a load level of 45% of the peak load and Central East and Moses South open interface flows of 2,265 MW and 1,115 MW, respectively. The light load sensitivity assumes a wind generation dispatch of approximately 100%.

Diagrams and descriptions of these bases cases can be found in Appendix D.

For this ATR, NYISO Planning used the CLOD complex load model available in Siemens PTI PSS®E. The CLOD complex load model represents the expected dynamic behavior of loads that could impact the study area, considering the behavior of induction motor loads. The load model separates the load either at a bus, area, owner or zone based on percentages of large motors, small motors, transformer exciting current, discharge lighting and constant power that the user specifies. The NYCA load is represented by area based upon New York utility data at the retail level as reported to the U.S. Energy Information Administration (EIA), together with NYISO data which was used to adjust retail usage to BPS usage. To determine the percentage of large and small motor loads, the “End-Use Data Development for Power System Load Model in New England” study done by DNV GL Energy April 2014 (reference Section 4 & Appendix C) [19] was used as a reference. In the NYISO analysis, the Con Edison loads are modeled as similar to Massachusetts East. LIPA/ PSEG provided a CLOD model with parameters derived with input from an industry consultant and by referencing WECC materials. All other New York area loads are modeled similar to Massachusetts West. These dynamic load modeling assumptions result in a breakdown that is approximately 12% large motor, 50% small motor and 12% as constant power in NYCA. The remaining load on the bus after applying these specified percentages is varied as the voltage is raised to the second power. This dynamic load model was tested on the same normal design and extreme contingencies as the static load model for the 2019 peak and high peak load cases.

Stability analysis is not assessed in the Long-Term Transmission Planning Horizon (2024) as there are no proposed generation additions or changes from 2019 through 2024.

The methodology for identifying system instability is described in NYISO Transmission Planning Guideline #3-1, *Guideline for Stability Analysis and Determination of Stability-Based Transfer Limits* [6]. For a stability simulation to be deemed stable, oscillations in angle and voltage must exhibit positive damping within ten seconds after initiation of the disturbance. If a secondary mode of oscillation exists within the initial ten seconds, then the simulation time shall be increased sufficiently to demonstrate that successive modes of oscillation exhibit positive damping before the simulation may be deemed stable.

All simulations assume that generators with an angle separation greater than 300 degrees from the rest of the system will trip during post-contingency transient. The out-of-step scanning model (OSSCAN) and the generic relay models are used to determine the tripping of transmission lines and transformers for transient swings. The OSSCAN scans the entire network to check whether the apparent impedance is less than the line impedance. The generic relay models a typical distance impedance relay on the element.

For BPTF buses, the transient voltage response criterion is a recovery of 0.9 per unit (pu) by one second after the fault has cleared. For generator GSU buses, the assumed generator low voltage ride-through capability on non-wind generators is 0.65 pu by 0.4 seconds [18] after fault clearing. For wind generator GSU buses, the actual low voltage ride-through capability is used in the simulation.

The stability analysis evaluates 150 stability performance Planning Events that are expected to produce a more severe system impact on the BPTF. The contingencies evaluated include the most severe loss of reactive capability, and increased impedance on the BPTF system. The applied contingences are modeled to simulate the removal of all elements that the protection system or other automatic controls would disconnect without operator intervention. The stability performance Planning Events include the impact of successful high speed (less than on second) reclosing and unsuccessful high speed reclosing into a fault, where high speed reclosing is utilized.

2.6.2. Analysis Results

The normal design criteria contingencies are evaluated on the 2019 margin cases. There are no stability-limited interfaces in NYCA when tested at transfers 10% above the more restrictive of the thermal or voltage emergency transfer limit. The system is stable at the tested margin transfer level for all evaluated interfaces as seen in Appendix I Table I.1. In the 2010 CATR, Central East was stability limited at 2900 MW but for this ATR the interface was voltage limited at 2700 MW as explained in Section 2.4.2.

Stability performance Planning Events are evaluated on the 2019 summer 50/50 and 2019 light load cases. The stability performance Planning Events are listed in Appendix I. For the 2019 summer 50/50 base case, both the static (ZIP) and dynamic (CLOD) load models in the NYCA are tested. The results show all N-1 contingencies are stable and damped under 50/50 (with both load models) and light load conditions. The same normal design contingencies are tested on the 2019 summer high peak load and the high wind sensitivity case. The results show all tested contingencies are stable and damped.

Appendix I includes comparison plots of the static (ZIP) versus dynamic (CLOD) model. The comparisons show that induction motors are sensitive to changing frequency and voltage as observed by slower voltage recovery and higher frequency deviation than the static load model.

Table 2.6.1 lists representative critical contingencies on the NYCA interfaces used as the first element outage (N-1-0) for multiple element contingency analysis on the 2019 summer 50/50 and 2019 light load cases. The second contingencies (N-1-1) are selected from the normal design criteria contingencies. The same N-1-1 contingencies are also evaluated on the 2019 summer high peak load condition. The stability analysis results show all selected contingencies under N-1-1 conditions are stable and damped.

Table 2.6.1 Stability N-1-1 Analysis First Element Outages

Contingency Event	Interface
Rochester-Pannell 345 kV	West Central
Edic-New Scotland 345 kV	Central East
Fraser-Gilboa 345 kV	Central East
Marcy-Coopers Corners 345 kV	Central East
E. Fishkill-Roseton 345 kV	UPNY-SENY
Leeds-Pleasant Valley 345 kV	UPNY-SENY
Marcy-Massena 765 kV	Moses South
Ravenswood #3 Generation	Con Edison

This ATR demonstrates the New York State BPTF system meets the criteria for stability performance Planning Events. The New York State BPTF system security is maintained by limiting power transfers according to the determined stability limits. The ATR performed dynamic stability simulations for those contingencies expected to produce the more severe system results or 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 pulled out of synchronism other than by fault clearing action or special protection system response.

All stability results and some representative plots are listed in Appendix I.

2.7. Summary of Study Results Demonstrating Conformance

Table 2.7.1 provides a summary of the normal and emergency transfer limits for the open transmission interfaces used in NYISO transmission planning studies defined in Appendix E of this report. With the Corrective Action Plans identified for the transmission security violations noted in Section 2.5, these results confirm that the planned system meets the applicable reliability criteria; additionally, the application of design criteria contingencies show 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 NERC Reliability Rules, NPCC Transmission Design Criteria, and the NYSRC Reliability Rules. Subsequent annual assessments will review the continuing need for the system facilities identified in the Corrective Action Plans

Table 2.7.1 Transfer Limit Comparison

Interface	**2010 Comprehensive ATR (Study Year 2015)**				**2014 Intermediate ATR (Study Year 2019)**			
	Normal (MW)		**Emergency (MW)**		**Normal (MW)**		**Emergency (MW)**	
Dysinger East	2,700	T	2,775	T	1,850	T	2,450	T
West Central	1,425	T	1,500	T	450	T	1,050	T
Volney East	4,600	T	5,025	VX	4,225	T	4,225	VX
Moses South	2,475	T	2,675	T	2,350	T	2,575	T
Central East	2,900	S	2,900	S	2,450	T	2,700	VX
Total East	5,725	T	5,975	T	4,800	T	5,175	T
UPNY-SENY	5,250	T	5,900	T	5,075	T	5,300	T
UPNY-Con Edison	5,375	T	5,475	VX	4,850	T	5,400	V
Sprain Brook Dunwoodie South	5,350	VX	5,350	VX	5,050	V	5,050	V
Long Island Import	1,950	T	2,675	T	1,700	T	2,250	T

Notes:

- Transfer limits expressed in MW and rounded down to nearest 25 MW point.
- Thermal and voltage limits apply under summer peak load conditions.
- Emergency limits account for more restrictive voltage collapse limit.
- Transfer limits for all-lines-in condition.
- Limits determined in this study are not optimized.

Type Codes:

- T – Thermal
- V – Voltage Pre/Post-contingency low limit
- VX – Voltage 95% from collapse point
- S - Stability

3. Fault Current Assessment

3.1. Methodology

The short circuit levels for the fault current assessment evaluates the fault duty at BPS and other critical buses in the short-circuit representation. The fault duty is calculated using the ASPEN OneLiner® program following the NYISO guideline for Fault Current Assessment [15]. Consistent with generally accepted practices for short circuit studies, the guideline requires that the transmission lines and transformers be modeled in their normal operating condition with all generating units modeled in-service. This configuration provides adequate design margin for safety and reliability by yielding the worst-case and most conservative fault levels.

The lowest circuit breaker rating for each of the selected substations are obtained from the applicable transmission and generation owners. The ratings are the nameplate symmetrical rating, the de-rated symmetrical value as determined by the owner, or the approximate symmetrical value converted from a total current basis.

Circuit breakers rated on a total current basis are converted to an approximate symmetrical current rating by using the nominal voltage of the substation.

Advanced circuit breaker rating techniques – such as asymmetrical current analysis, de-rating for reclosing and de-rating for age are not considered by the NYISO in this analysis. Transmission Owners may take into account the effects of these advanced circuit breaker techniques in the ratings that are provided.

3.2. Description of the Short Circuit Base Case

The NYISO Statewide Short Circuit representation evaluated study year 2019 (case dated August 18, 2014, Revision 1, is used for this study). The short circuit representation includes the modeling assumptions discussed in Section 1.2.

3.3. Results

The fault current assessment identifies overdutied circuit breakers at the National Grid Porter 115 kV and 230 kV substations as well as the Con Edison Astoria West 138 kV substation. Table 3.3.1 summarizes the results of the fault current assessment. Appendix J contains a complete list of fault current assessment results.

Based on the planned generation and transmission facilities expected to be in-service and in consideration of the mitigation plans listed below, the analysis shows that the circuit breakers have the interrupting capability for the faults that they will be expected to interrupt.

Mitigation plans to resolve the overdutied circuit breakers are as follows. Subsequent annual assessments will review the continuing need for the Corrective Action Plans identified to resolve the violations observed on system facilities.

Porter 115 kV:

National Grid has planned to replace all Porter 115 kV circuit breakers, which is currently in progress with a scheduled completion by Winter 2014/2015. The circuit breakers will have a nameplate rating of 63 kA.

Porter 230 kV:

National Grid has a plan to add microprocessor relays at the Porter 230 kV substation, which is scheduled for completion by summer 2015.

Astoria West 138 kV:

Circuit breakers G1N and G2N belong to the Astoria unit 3 plant feeders and are overdutied due to the planned addition of the Q201 Berrians GT project (Note: Q224 Berrians II reflects additional capability of the Q201 Berrians plant). Breakers G1N and G2N will be replaced in order to accommodate the interconnection of the Q201 Berrians GT project. The timing of the replacements will be dependent on the Berrians project schedule.

Table 3.3.1 2014 ATR Overdutied Circuit Breaker Summary

Substation	kV	Breaker ID
Porter	115	R15, R25, R110, R120, R170, R320, R825, R835, R845
Porter	230	R10, R20, R30, R40, R50, R60, R70, R80, R90, R130, R200
Astoria West	138	G1N, G2N

4. Extreme Event Assessment

4.1. Methodology

Analysis of the NYCA steady state and stability performance for extreme contingencies is performed using the Siemens PTI PSS®E and PowerGem TARA software packages. Each contingency is simulated to evaluate the New York State BPTF transient stability, voltage, and thermal response in accordance with NPCC Transmission Design Criteria [1], NYSRC Reliability Rules [2], NERC Reliability Standards [3], and NYISO planning and operation practices [4]-[6], [12]-[13].

In order to test the ability of the system to return to a stable operating point after an extreme contingency, the NYISO performs dynamic simulations. The simulation is first initialized to the pre-contingency power flow conditions and then run to 0.1 seconds before altering the system configuration. For no-fault contingencies, this is a simple case of removing an element from service. In the case of a contingency that includes a fault, several events change the system, in sequence, to match breaker actions. After inspecting the simulation plots and dynamic simulation log files for each contingency, a determination is made whether the system remains stable after the event.

Power flow simulations are performed via the PowerGem TARA software package to determine voltage impacts and line overloads under contingency conditions. This procedure requires that each element taken out of service in the dynamics simulation be taken out of service for the post-contingency power flow.

The steady state and stability methodology for the extreme event assessment is the same as discussed in sections 2.5.1 and 2.6.1 of this report, respectively.

4.2. Description of Extreme Event Steady State and Stability Base Cases

Extreme contingencies are considered very low probability events. In accordance with the applicable reliability rules, the extreme contingencies are evaluated against the base cases discussed in Section 2.2 of the main report; however, the 2019 50/50 base case is modified for compliance with NPCC design criteria and the NYSRC reliability rules. The dynamic load model (CLOD) is also tested on the 2019 peak and high load cases.

For the 2014 Intermediate ATR, the 2019 50/50 base case generation is dispatched so that the transfer levels on the NYCA intra-Area interfaces are at or above their 75th percentile of expected transfer levels on a load flow duration basis and are less than 100% of the normal transfer limit. The expected transfer level is obtained by using actual flow values during the time period June 1 – August 31 for years 2013 and 2014 obtained from Markets and Operations Power Grid Data for Interface Limits and Flows. For the West Central Interface, the historic 75th percentile transfer level is greater than the 2019 normal transfer limit; therefore, the West Central Interface is modeled to be less than the normal transfer limit.

Details of the extreme contingency power flow and stability analysis are provided in Appendix K. The details of the results are classified as Critical Energy Infrastructure Information and therefore are not discussed in the body of this report.

4.3. Extreme Event Analysis

Extreme contingencies for the NYCA are developed in conformance to NPCC Transmission Design Criteria [1], NYSRC Reliability Rules [2], and NERC Reliability Standards [3]. For this study, approximately 55 extreme contingencies expected to produce more severe system impacts are evaluated including loss of entire substations, loss of entire generation plants, loss of all circuits along a transmission right-of-way, and the sudden loss of a fuel delivery system (i.e. gas pipeline contingencies). Most of the contingencies simulated are stable and show no thermal overloads over the Short-Term Emergency (STE) rating or significant voltage violations or deviations on the BPTF. Some contingencies show voltage violations, significant voltage drops, and/or thermal overloads on the underlying 138/115 kV sub-transmission system, but these conditions are local in nature. In a few cases, an extreme contingency may result in a loss of local load within an area due to low voltage or first-swing instability of isolated generators. With the exception of eight contingencies, all contingencies are stable when using the dynamic load model (CLOD); all contingencies converge with the static load model. The eight contingencies that fail to converge with the dynamic load model are due to low voltage in the local area. In all of the evaluated cases and conditions tested, the affected area is confined to the NYCA system. Details of the extreme contingency power flow and stability analysis are provided in Appendix K.

In September 2013, Levitan & Associates, Inc. (LAI) expanded on prior research conducted for the NYISO to update the assessment of the adequacy of the natural gas infrastructure in regards to meeting the fuel delivery needs of the gas-fired generation in the NYCA. Details of the LAI report are provided in the 2013 Intermediate ATR [7].

Eight potential gas-side contingencies are discussed in the LAI study, two of which are related to either New York City or Long Island. New York City and Long Island are required by the NYSRC Local Reliability Rules G-R2 and G-R3 to be operated so that the loss of a single gas facility does not result in the loss of electric load on their respective systems. Periodic assessments are performed by the Transmission Owners and reviewed by the NYISO and NYSRC to ensure compliance with these rules.

4.4. Extreme Event Summary

The purpose of the extreme contingency assessment is “to obtain an indication of system strength, or to determine the extent of a widespread System Disturbance, even though extreme contingencies do have low probabilities of occurrence [1].” In this review, the system response to extreme contingencies is comparable to previous reviews. This indicates that the strength of the planned interconnected power systems is not expected to deteriorate in the near future.

5. Extreme System Condition Assessment

NPCC Directory #1 [1] and the NYSRC Reliability Rules [2] require assessment of extreme system conditions, which have a low probability of occurrence, such as high peak load conditions (i.e. 90/10, extreme weather) or the loss of major gas supply. The high peak load condition is discussed in Sections 2.5 and 2.6 of this report.

5.1. Loss of Gas Supply Assessment

Natural gas-fired generation in NYCA is supplied by various networks of major gas pipelines (see 2013 Intermediate ATR Appendix O [18]). NYCA generation capacity has a balance of fuel mix which provides operational flexibility and reliability. Several generation plants have duel fuel capability. Table 5.1.1 provides a comparison of the available NYCA gas generation presented in the 2013 and 2014 Gold Book [9].

Table 5.1.1 Comparison of NYCA Gas Supply Capability

Fuel Type	2013 NYCA Capability (MW)	2014 NYCA Capability (MW)	Delta
Gas	2,963	3,226	263
Gas & Oil	18,011	17,627	-384

As shown in Table 5.1.1, the changes to the available NYCA gas supply do not materially change the results observed in the 2013 Intermediate ATR.

6. Review of Special Protection Systems

New York has not added nor changed any Type 1 SPS nor planned any new Type 1 SPS since the 2010 CATR. System conditions have not changed sufficiently to impact the operation or classification of existing SPS.

7. Review of Dynamic Control Systems

System conditions have not changed sufficiently to impact the operation or classification of previously reviewed dynamic control systems since the 2010 CATR.

8. Review of Exclusions from NPCC Basic Criteria

NPCC Directory #1 [1] contains a provision that allows a member to request an exclusion from criteria contingencies that are “simultaneous permanent phase to ground faults on different phases of each of two adjacent transmission circuits on a multiple circuit tower, with normal fault clearing.” The NYCA does not have any such exclusion at this time; therefore, none were reviewed. Furthermore, no requests for exclusions are anticipated in the near future.

9. Review of Additional NYSRC Requirements

This section addresses additional requirements specific to NYSRC Reliability Rules [2] that are not addressed in other sections of this report. On January 1, 2015, the NYSRC adopted version 34 of the Reliability Rules and Compliance manual. This version of the NYSRC Reliability Rules results in significant reformatting of the rules; however, the rules applicable to this study did not change. Previous sections of this report have addressed NYSRC Reliability Rules B-R2_R2 (Sections 2.3, 2.4, and 2.6, and 3), B-R2_R3 (Section 4), B-R2_R6 (Sections 2.5.3 and Section 5), B-R3 (Appendix C),

9.1. System Restoration Assessment (B-R2_R4)

NYSRC Reliability Rule B-R1_R5 [2] requires the NYISO to evaluate the impacts of system expansion plans on the NYCA System Restoration Plan:

- The Rochester Gas & Electric (RG&E) Rochester Transmission Reinforcement (Q#330) is a planned 345/115 kV substation (Station 255) located approximately 2 miles west of Station 80, connecting to the two Niagara-Rochester 345 kV lines.
- The NYSEG Watercure 345/230 kV transformer is an addition to the existing Watercure facility.
- The NYSEG Fraser 345/115 kV transformer is an addition to the existing Fraser facility.
- The NYSEG Gardenville 230/115 kV transformer is an addition to the existing Gardenville facility.

The potential impacts listed above have been communicated to NYISO Operations Engineering for consideration in the annual review and update of the NYCA System Restoration Plan.

9.2. Local Rules Consideration G-R1 through G-R3 (B-R2_R5)

The NYSRC has adopted Local Reliability Rules that apply to the New York City and Long Island zones to protect the reliable delivery of electricity for specific electric system characteristics and demographics relative to these zones. The NYISO requests information from the local Transmission Owners on changes in local system conditions that would impact the New York State BPS at the beginning of every year. The base case conditions are described in Section 2.2 of this report and summaries are included in the appendices which illustrate the application of the following local rules to the system model used in the assessments:

G-R1_R1-R2 Operating Reserves/Unit Commitment, G-R1_R3 Locational Reserves (New York City)

Local Operating Reserve rules are considered in the development of the base cases used for all reliability assessments.

G-R2 Loss of Generator Gas Supply (New York City),G-R3 Loss of Generator Gas Supply (Long Island)

Specific loss of generator gas supply studies are performed by Con Edison and PSEG-Long Island and are reviewed by the NYISO. The planned system is expected to be compatible with local rules regarding loss of generator gas supply.

G-R1_R4 Thunderstorm Watch (New York City)

Proposed facilities [9] included in this assessment may impact the Thunderstorm Watch contingency list due to substation reconfiguration and facility additions. The contingencies impacted will be evaluated before proposed facilities are in-service.

10. Overview Summary of System Performance

Eight assessments are made for the 2014 Intermediate ATR. In the first and second assessments, power flow and stability analysis are conducted to evaluate the thermal, voltage, and stability performance of the New York State BPTF for normal (i.e. design) contingencies as defined in the NERC Reliability Rules, NPCC Transmission Design Criteria, and the NYSRC Reliability Rules. Thermal and voltage performance is evaluated under peak load (50/50), high peak load, light load, and high transfer conditions; additionally, stability performance is evaluated using transfers that exceed the normal limits. Overall, the system performance based on transfer limit and dynamic stability analysis is acceptable.

As part of the first assessment, power flow analyses are conducted to evaluate the performance of the New York State BPTF under N-1 and N-1-1 conditions. The summer peak power flow analysis indicates N-1 thermal violations on the Clay-Lockheed Martin (#14) (Clay-Wetzel-Lockheed Martin) 115 kV for all study years and the Clay-Woodard (#17) (Euclid-Woodard) 115 kV transmission lines in 2019 and 2024. The N-1-1 evaluates show further violations at the National Grid Clay 115 kV station including: Clay 345/115 kV 1TR, Clay-S. Oswego (#4) (S. Oswego-Whitaker) 115 kV, Clay-Teall (#10) (Clay-Bartell Rd.-Pine Grove) 115 kV, and Clay-Dewitt (#3) (Clay-Bartell Rd) 115 kV circuits. The National Grid Porter-Yahnundasis (#3) (Porter-Kelsey) 115 kV transmission line also has violations under N-1-1 conditions. Additionally, two Pannell 345/115 kV transformers show thermal violations in 2015 under N-1-1 conditions. For these facilities, Corrective Action Plans are identified to mitigate the issues. For all other facilities, system adjustments are identified for each first contingency (N-1) such that there are no post-contingency thermal and/or voltage violations following any second contingency (N-1-1). 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 NERC Reliability Rules, NPCC Transmission Design Criteria, and the NYSRC Reliability Rules.

In the second assessment, stability analyses are conducted to evaluate the stability performance of the New York State BPTF for normal (or design) contingencies as defined in the NPCC Transmission Design Criteria, NYSRC Reliability Rules, and NERC Planning Events. The stability simulations show no stability issues for the studied peak and light load base cases under N-1 and N-1-1 conditions. The stability simulations show no issues for the high wind light load case under the same design contingencies evaluated for the peak case.

The third assessment evaluates the fault duty at each bus in a short-circuit representation. The analysis indicates that two BPS stations and another critical bus may experience over-dutied circuit breakers for the conditions tested. The applicable owners have identified Corrective Action Plans and are responsible for making the necessary facility upgrades as part of their internal planning process.

In the fourth assessment, power flow and stability analysis are conducted to evaluate the performance of the BPS for low probability extreme contingencies as defined in the NERC Reliability Rules, NPCC Transmission Design Criteria, and the NYSRC Reliability Rules. The dynamic load model was tested on these same extreme contingencies and found 8 of the 55 contingencies were unable to solve due to local low voltage issues; all contingencies are stable using the static load model. The power flow analysis results indicate, in all cases, that the extreme contingencies do not cause significant thermal or voltage problems over a widespread area for the system conditions tested. In a few cases, an extreme contingency may result in the loss of local load within an area due to low voltage or first-swing instability of isolated generators. In all of the evaluated cases and conditions tested, the affected area is confined to the NYCA system. Overall, the extreme contingency system conditions are comparable to the previous CATR and no serious consequences are identified.

The fifth assessment evaluates the extreme system conditions, which have a low probability of occurrence (e.g. loss of major fuel supply (such as gas) and high peak load conditions resulting from extreme weather). Under high peak load conditions, the violations identified under normal load conditions are exacerbated under high summer peak load conditions along with new overloads in the same areas (e.g. Clay 115 kV and Porter 115 kV stations). The increased loading also results in earlier occurrence of thermal violations (e.g. Porter-Yahnundasis (#3) 115 kV, Clay 345/115 kV 1TR, and Clay-S. Oswego (#4) 115 kV). The following are thermal/voltage violations for which sufficient system adjustments are not available in the planned system for the year that the violation is observed: Gardenville 230/115 kV (TB3), Huntley-Gardenville (#80) (Huntley-Sawyer) 230 kV, Rochester Station 80 345/115 kV (2TR and 5TR), Oakdale 345/115 kV (2TR and 3TR), Watercure 345/230 kV (1TR), W. Haverstraw 345/138 kV (Bank 194), and Middletown 345/138 kV (Bank 114). Stability analysis was also evaluated using high peak load. The stability simulations show no stability issues for this sensitivity case under the same design contingencies evaluated for the base case.

For the loss of gas supply assessment, system conditions have not changed in a manner to significantly impact the results identified in the 2013 Intermediate ATR.

The sixth assessment is a review of Special Protection Systems (SPS). New York has not added nor changed any Type 1 SPS nor planned any new Type 1 SPS since the 2010 CATR. System conditions have not changed sufficiently to impact the operation or classification of existing SPS.

The seventh assessment is a review of the Dynamic Control Systems (DCS). System conditions have not changed sufficiently to impact the operation or classification of previously reviewed DCS since the 2010 CATR.

For the eighth assessment, the NYCA has no existing exclusions to NPCC Basic Criteria and makes no request for new exclusions.

11. Conclusion

The analysis in the 2014 Intermediate ATR indicates that the New York State Bulk Power Transmission Facilities, as planned (including Corrective Action Plans), through year 2024, conform to the reliability criteria described in the NYSRC Reliability Rules, NPCC Directory #1, "Design and Operation of the Bulk Power System," and applicable NERC Reliability Standards. There are facilities that require Corrective Action Plans to meet the performance requirements. With the identified Corrective Action Plans in place, the 2014 Intermediate ATR confirms that no additional upgrades are necessary to meet the performance requirements of the NYSRC Reliability Rules, NPCC Directory #1, or NERC Reliability Standards.

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