2016 RNA

Appendices A – D

September 12, 2016 Draft

Appendix A – 2016 Reliability Needs Assessment Glossary

Term	Definition
10-year Study Period	10-year period starting with the year after the study is dated and projecting forward 10 years. For example, the 2016 RNA covers the 10-year Study Period of 2017 through 2026.
Adequacy	Encompassing both generation and transmission, adequacy refers to the ability of the bulk power system to supply the aggregate requirements of consumers at all times, accounting for scheduled and unscheduled outages of system components.
Alternative Regulated Solutions (ARS)	Regulated solutions submitted by a TO or other developer in response to a solicitation for solutions to a Reliability Need identified in an RNA.
Annual Transmission Reliability Assessment (ATRA)	An assessment, conducted by the NYISO staff in cooperation with Market Participants, to determine the System Upgrade Facilities required for each generation and merchant transmission project included in the Applicable Reliability Standards, to interconnect to the New York State Transmission System in compliance with Applicable Reliability Standards and the NYISO Minimum Interconnection Standard.
Area Transmission Review (ATR)	The NYISO, in its role as Planning Coordinator, is responsible for providing an annual report to the NPCC Compliance Committee in regard to its Area Transmission Review in accordance with the NPCC Reliability Compliance and Enforcement Program and in conformance with the NPCC Design and Operation of the Bulk Power System (Directory #1).
Best Available Retrofit Technology (BART)	NYS DEC regulation, required for compliance with the federal Clean Air Act, applying to fossil fueled electric generating units built between August 7, 1962 and August 7, 1977. Emissions control of SO_2, NOx and PM may be necessary for compliance. Compliance deadline is January 2014.
Best Technology Available (BTA)	NYS DEC policy establishing performance goals for new and existing electricity generating plants for Cooling Water Intake Structures. The policy would apply to plants with design intake capacity greater than 20 million gallons/day and prescribes reductions in fish mortality. The performance goals call for the use of wet, closed-cycle cooling systems at existing generating plants.
New York State Bulk Power Transmission Facility (BPTF)	The facilities identified as the New York State Bulk Power Transmission Facilities in the annual Area Transmission Review submitted to NPCC by the ISO pursuant to NPCC requirements.

Term	Definition
Capability Period	The Summer Capability Period lasts six months, from May 1 through October 31. The Winter Capability Period runs from November 1 through April 30 of the following year.
Capacity	The capability to generate or transmit electrical power, or the ability to reduce demand at the direction of the NYISO.
Capacity Resource Integration Service (CRIS)	CRIS is the service provided by NYISO to interconnect the Developer's Large Generating Facility or Merchant Transmission Facility to the New York State Transmission System in accordance with the NYISO Deliverability Interconnection Standard, to enable the New York State Transmission System to deliver electric capacity from the Large Generating Facility or Merchant Transmission Facility, pursuant to the terms of the NYISO OATT.
Class Year	The group of generation and merchant transmission projects included in any particular Annual Transmission Reliability Assessment (ATRA), in accordance with the criteria specified for including such projects in the assessment.
Clean Air Interstate Rule (CAIR)	USEPA rule to reduce interstate transport of fine particulate matter (PM) and ozone. CAIR provides a federal framework to limit the emission of SO_2 and NOx.
Clean Energy Fund (CEF)	A statewide program ordered by the NYPSC that mandates that 50 percent of all electricity consumed in New York by 2030 comes from clean and renewable energy sources.
Comprehensive Reliability Plan (CRP)	A biennial study undertaken by the NYISO that evaluates projects offered to meet New York's future electric power needs, as identified in the Reliability Needs Assessment (RNA). The CRP may trigger electric utilities to pursue regulated solutions or other developers to pursue alternative regulated solutions to meet Reliability Needs, if market-based solutions will not be available by the need date. It is the second step in the Reliability Planning Process (RPP).
Comprehensive System Planning Process (CSPP)	A transmission system planning process that is comprised of three components: 1) Local transmission owner planning; 2) Compilation of local plans into the Reliability Planning Process (RPP), which includes developing a Comprehensive Reliability Plan (CRP); 3) Channeling the CRP data into the Congestion Assessment and Resource Integration Study (CARIS)

Term	Definition
Congestion Assessment and Resource Integration Study (CARIS)	The third component of the Comprehensive System Planning Process (CSPP). The CARIS is based on the Comprehensive Reliability Plan (CRP).
Congestion	Congestion on the transmission system results from physical limits on how much power transmission equipment can carry without exceeding thermal, voltage and/or stability limits determined to maintain system reliability.
Contingencies	Contingencies are individual electrical system events (including disturbances and equipment failures) that are likely to happen.
Cross-State Air Pollution Rule (CSARP)	This USEPA rule requires the reduction of power plant emissions that contribute to exceedances of ozone and/or fine particle standards in other states.
Dependable Maximum Net Capability (DMNC)	The sustained maximum net output of a generator, as demonstrated by the performance of a test or through actual operation, averaged over a continuous time period as defined in the ISO Procedures. The DMNC test determines the amount of Installed Capacity used to calculate the Unforced Capacity that the Resource is permitted to supply to the NYCA.
Electric System Planning Work Group (ESPWG)	A NYISO governance working group for Market Participants designated to fulfill the planning functions assigned to it. The ESPWG is a working group that provides a forum for stakeholders and Market Participants to provide input into the NYISO's Comprehensive System Planning Process (CSPP), the NYISO's response to FERC reliability-related Orders and other directives, other system planning activities, policies regarding cost allocation and recovery for regulated reliability and/or economic projects, and related matters.
Federal Energy Regulatory Commission (FERC)	The federal energy regulatory agency within the U.S. Department of Energy that approves the NYISO's tariffs and regulates its operation of the bulk electricity grid, wholesale power markets, and planning and interconnection processes.
FERC 715	Annual report that is required by transmitting utilities operating grid facilities that are rated at or above 100 kilovolts. The report consists of transmission systems maps, a detailed description of transmission planning Reliability Criteria, detailed descriptions of transmission planning assessment practices, and detailed evaluation of anticipated system performance as measured against Reliability Criteria.
Forced Outage	An unanticipated loss of capacity due to the breakdown of a power plant or transmission line. It can also mean the intentional shutdown

Term	Definition
	of a generating unit or transmission line for emergency reasons.
Gap Solution	A solution to a Reliability Need that is designed to be temporary and to strive to be compatible with permanent market-based proposals. A permanent regulated solution, if appropriate, may proceed in parallel with a Gap Solution. The NYISO may call for a Gap Solution to an imminent threat to reliability of the Bulk Power Transmission Facilities if no market-based solutions, regulated backstop solutions, or alternative regulated solutions can meet the Reliability Needs in a timely manner.
Gold Book	Annual NYISO publication of its Load and Capacity Data Report.
Installed Capacity (ICAP)	A Generator or Load facility that complies with the requirements in the Reliability Rules and is capable of supplying and/or reducing the demand for Energy in the NYCA for the purpose of ensuring that sufficient Energy and Capacity are available to meet the Reliability Rules. The Installed Capacity requirement, established by the New York State Reliability Council (NYSRC), includes a margin of reserve in accordance with the Reliability Rules.
Installed Reserve Margin (IRM)	The amount of installed electric generation capacity above 100% of the forecasted peak electric demand that is required to meet NYSRC resource adequacy criteria. Most studies in recent years have indicated a need for a 15-20% reserve margin for adequate reliability in New York.
Interconnection Queue	A queue of transmission and generation projects that have submitted an Interconnection Request to the NYISO to be interconnected to the New York State Transmission System. All projects must undergo three studies – a Feasibility Study (unless parties agree not to perform it), a System Reliability Impact Study (SRIS) and a Facilities Study – before interconnecting to the grid.
Local Transmission Plan (LTP)	The Local Transmission Owner Plan, developed by each Transmission Owner, which describes its respective plans that may be under consideration or finalized for its own Transmission District.
Local Transmission Owner Planning Process (LTPP)	The first step in the Comprehensive System Planning Process (CSPP), under which transmission owners in New York's electricity markets provide their local transmission plans for consideration and comment by interested parties.
Loss of load expectation (LOLE)	LOLE establishes the amount of generation and demand-side resources needed - subject to the level of the availability of those resources, load uncertainty, available transmission system transfer capability and emergency operating procedures - to minimize the probability of an involuntary loss of firm electric load on the bulk electricity grid. The state's bulk electricity grid is designed to meet an

Term	Definition
	LOLE that is not greater than one occurrence of an involuntary load disconnection in 10 years, expressed mathematically as 0.1 days per year.
Market-Based Solutions	Investor-proposed projects that are driven by market needs to meet future reliability requirements of the bulk electricity grid as outlined in the RNA. Those solutions can include generation, transmission and demand response Programs.
Market Monitoring Unit	A consulting or other professional services firm, or other similar entity, retained by the NYISO Board pursuant to ISO Services Tariff Section 30.4.6.8.1, Attachment O - Market Monitoring Plan.
Market Participant	An entity, excluding the ISO, that produces, transmits, sells, and/or purchases for resale Capacity, Energy and Ancillary Services in the Wholesale Market. Market Participants include: Transmission Customers under the ISO OATT, Customers under the ISO Services Tariff, Power Exchanges, Transmission Owners, Primary Holders, LSEs, Suppliers and their designated agents. Market Participants also include entities buying or selling TCCs.
Mercury and Air Toxics Standards (MATS)	The rule applies to oil and coal fired generators and establishes limits for HAPs, acid gases, mercury (Hg), and particulate matter (PM). Compliance is required by March 2015, with extensions to 2017 for reliability critical units.
Mercury Reduction Program for Coal-Fired Electric Utility Steam Generating Units (MRP)	NYSDEC regulation of mercury emissions from coal-fired electric utility steam generating units with a nameplate capacity of more than 25 MW producing electricity for sale.
National Ambient Air Quality Standards (NAAQS)	Limits, set by the EPA, on pollutants considered harmful to public health and the environment.
New York Control Area (NYCA)	The area under the electrical control of the NYISO. It includes the entire state of New York, and is divided into 11 zones.
New York State Department of Environmental Conservation (NYSDEC)	The agency that implements New York State environmental conservation law, with some programs also governed by federal law.
New York Independent System Operator (NYISO)	Formed in 1997 and commencing operations in 1999, the NYISO is a not-for-profit organization that manages New York's bulk electricity grid – an 11,056-mile network of high voltage lines that carry electricity throughout the state. The NYISO also oversees the state's

Term	Definition
	wholesale electricity markets. The organization is governed by an independent Board of Directors and a governance structure made up of committees with Market Participants and stakeholders as members.
New York State Department of Public Service (NYDPS)	As defined in the New York Public Service Law, it serves as the staff for the New York State Public Service Commission.
New York State Energy Research and Development Authority (NYSERDA)	A corporation created under the New York State Public Authorities law and funded by the System Benefits Charge (SBC) and other sources. Among other responsibilities, NYSERDA is charged with conducting a multifaceted energy and environmental research and development program to meet New York State's diverse economic needs, and administering state System Benefits Charge, Renewable Portfolio Standard, energy efficiency programs, the Clean Energy Fund, and the NY-Sun Initiative.
New York State Public Service Commission (NYPSC)	The New York State Public Service Commission is the decision making body of the New York State Department of Public Service. The PSC regulates the state's electric, gas, steam, telecommunications, and water utilities and oversees the cable industry. The Commission has the responsibility for setting rates and ensuring that safe and adequate service is provided by New York's utilities. In addition, the Commission exercises jurisdiction over the siting of major gas and electric transmission facilities
NY-Sun Initiative	A program initiated by Governor Cuomo in 2012 and administered by NYSERDA for the purpose of obtaining more than 3,000 MW-DC of behind-the-meter solar PV by the end of 2023.
New York State Reliability Council (NYSRC)	A not-for-profit entity that develops, maintains, and, from time-to-time, updates the Reliability Rules which shall be complied with by the New York Independent System Operator ("NYISO") and all entities engaging in electric transmission, ancillary services, energy and power transactions on the New York State Power System.
North American Electric Reliability Corporation (NERC)	A not-for-profit organization that develops and enforces reliability standards; assesses reliability annually via 10-year and seasonal forecasts; monitors the bulk power system; and educates, trains, and certifies industry personnel. NERC is subject to oversight by the FERC and governmental authorities in Canada.
Northeast Power Coordinating Council (NPCC)	A not-for-profit corporation responsible for promoting and improving the reliability of the international, interconnected bulk power system in Northeastern North America.

Term	Definition
Open Access Transmission Tariff (OATT)	Document of Rates, Terms and Conditions, regulated by the FERC, under which the NYISO provides transmission service. The OATT is a dynamic document to which revisions are made on a collaborative basis by the NYISO, New York's Electricity Market Stakeholders, and the FERC.
Order 890	Adopted by FERC in February 2007, Order 890 is a change to FERC's 1996 transmission open access regulations (established in Orders 888 and 889). Order 890 is intended to provide for more effective competition, transparency and planning in wholesale electricity markets and transmission grid operations, as well as to strengthen the Open Access Transmission Tariff (OATT) with regard to non-discriminatory transmission service. Order 890 requires Transmission Providers – including the NYISO – to have a formal planning process that provides for a coordinated transmission planning process, including reliability and economic planning studies.
Order 1000	Order No. 1000 is a Final Rule that reforms the FERC electric transmission planning and cost allocation requirements for public utility transmission providers. The rule builds on the reforms of Order No. 890 and provides for transmission planning to meet transmission needs driven by Public Policy Requirements, interregional planning, opens transmission development for new transmission needs to non-incumbent developers, and provides for cost allocation and recovery of transmission upgrades.
Outage	The forced or scheduled removal of generating capacity or a transmission line from service.
Peak Demand	The maximum instantaneous power demand, measured in megawatts (MW), and also known as peak load, is usually measured and averaged over an hourly interval.
Reasonably Available Control Technology for Oxides of Nitrogen (NOx RACT)	Regulations promulgated by NYSDEC for the control of emissions of nitrogen oxides (NOx) from fossil fueled power plants. The regulations establish presumptive emission limits for each type of fossil fueled generator and fuel used as an electric generator in NY. The NOx RACT limits are part of the State Implementation Plan for achieving compliance with the National Ambient Air Quality Standard (NAAQS) for ozone.
Reactive Power Resources	Facilities such as generators, high voltage transmission lines, synchronous condensers, capacitor banks, and static VAr compensators that provide reactive power. Reactive power is the portion of electric power that establishes and sustains the electric and magnetic fields of alternating-current equipment. Reactive power is usually expressed as kilovolt-amperes reactive (kVAr) or

Term	Definition
	megavolt-ampere reactive (MVAr).
Regional Greenhouse Gas Initiative (RGGI)	A cooperative effort by nine Northeast and Mid-Atlantic states (not including New Jersey or Pennsylvania) to limit greenhouse gas emissions using a market-based cap-and-trade approach.
Regulated Backstop Solutions	Proposals required of certain TOs to meet Reliability Needs as outlined in the RNA. Those solutions can include generation, transmission or demand response. Non-Transmission Owner developers may also submit regulated solutions.
Reliability Criteria	The electric power system planning and operating policies, standards, criteria, guidelines, procedures, and rules promulgated by the North American Electric Reliability Corporation (NERC), Northeast Power Coordinating Council (NPCC), and the New York State Reliability Council (NYSRC), as they may be amended from time to time.
Reliability Need	A condition identified by the NYISO in the RNA as a violation or potential violation of Reliability Criteria.
Reliability Needs Assessment (RNA)	A biennial study which evaluates the resource adequacy and transmission system adequacy and security of the New York bulk power system over a ten year Study Period. Through this evaluation, the NYISO identifies Reliability Needs in accordance with applicable Reliability Criteria.
Reliability Planning Process (RPP)	The biennial process that includes evaluation of resource adequacy and transmission system security of the state's bulk electricity grid over a 10-year period and evaluates solutions to meet those needs. The RPP consists of two studies: the RNA, which identifies potential problems, and the CRP, which evaluates specific solutions to those problems.
Renewable Portfolio Standard (RPS)	Proceeding commenced by order of the NYDPS in 2004 which established the goal to increase renewable energy used in New York State to 30% of total New York energy usage (equivalent to approximately 3,700 MW of capacity) by 2015.
Responsible Transmission Owner (Responsible TO)	The Transmission Owner(s) or TOs designated by the NYISO, pursuant to the NYISO RPP, to prepare a proposal for a regulated solution to a Reliability Need or to proceed with a regulated solution to a Reliability Need. The Responsible TO will normally be the Transmission Owner in whose Transmission District the NYISO identifies a Reliability Need.
Security	The ability of the power system to withstand the loss of one or more elements without involuntarily disconnecting firm load.
Special Case Resources (SCR)	A NYISO demand response program designed to reduce power usage by businesses and large power users qualified to participate in the

Term	Definition
	NYISO's ICAP market. Companies that sign up as SCRs are paid in advance for agreeing to cut power upon NYISO request.
State Environmental Quality Review Act (SEQRA)	NYS law requiring the sponsoring or approving governmental body to identify and mitigate the significant environmental impacts of the activity/project it is proposing or permitting.
Study Period	The 10-year time period evaluated in the RNA.
System Reliability Impact Study (SRIS)	A study, conducted by the NYISO in accordance with Applicable Reliability Standards, to evaluate the impact of a proposed interconnection on the reliability of the New York State Transmission System.
System Benefits Charge (SBC)	An amount of money, charged to ratepayers on their electric bills, which is administered and allocated by NYSERDA towards energy-efficiency programs, research and development initiatives, low-income energy programs, and environmental disclosure activities.
Transfer Capability	The measure of the ability of interconnected electrical systems to reliably move or transfer power from one area to another over all transmission facilities (or paths) between those areas under specified system conditions.
Transmission Constraints	Limitations on the ability of a transmission system to transfer electricity during normal or emergency system conditions.
Transmission Owner (TO)	A public utility or authority that owns transmission facilities and provides Transmission Service under the NYISO's tariffs
Transmission Planning Advisory Subcommittee (TPAS)	An identified group of Market Participants that advises the NYISO Operating Committee and provides support to the NYISO Staff in regard to transmission planning matters including transmission system reliability, expansion, and interconnection
Unforced Capacity Delivery Rights (UDR)	Unforced capacity delivery rights are rights that may be granted to controllable lines to deliver generating capacity from locations outside the NYCA to localities within NYCA.
Weather Normalized	Adjustments made to normalize the impact of weather when making energy and peak demand forecasts. Using historical weather data, energy analysts can account for the influence of extreme weather conditions and adjust actual energy use and peak demand to estimate what would have happened if the hottest day or the coldest day had been the typical, or "normal," weather conditions. "Normal" is usually calculated by taking the average of the previous 20 years of weather data.
Zone	One of the eleven regions in the NYCA connected to each other by identified transmission interfaces and designated as Load Zones A-K.

Appendix B - The Reliability Planning Process

This appendix presents an overview of the NYISO's reliability planning process (RPP). A detailed discussion of the RPP, including applicable Reliability Criteria, is contained in NYISO Manual entitled: "Reliability Planning Process Manual," which is posted on the NYISO's website.

The NYISO RPP is an integral part of the NYISO's overall Comprehensive System Planning Process (CSPP). The CSPP is comprised of four components:

1. Local Transmission Planning Process (LTPP),
2. Reliability Planning Process (RPP),
3. Congestion Assessment and Resource Integration Study (CARIS), and
4. Public Policy Transmission Planning Process.

As part of the LTPP, local Transmission Owners perform transmission security studies for their BPTFs in their transmission areas according to all applicable criteria. Links to the Transmission Owner's LTPs can be found on the NYISO's website. The LTPP provides inputs for the RPP.

During the RPP, the NYISO conducts the Reliability Needs Assessment (RNA) and Comprehensive Reliability Plan (CRP). The RNA evaluates the adequacy and security of the bulk power system over a ten-year study period. In identifying resource adequacy needs, the NYISO identifies the amount of resources in megawatts (known as "compensatory megawatts") and the locations in which they are needed to meet those needs. After the RNA is complete, the NYISO requests and evaluates market-based solutions, regulated backstop solutions, and alternative regulated solutions that address the identified Reliability Needs. This step results in the development of the CRP for the ten-year study period.

The RPP is a long-range assessment of both resource adequacy and transmission reliability of the New York bulk power system conducted over a ten-year planning horizon. There are two different aspects to analyzing the bulk power system's reliability in the RNA: adequacy and security. Adequacy is a planning and probabilistic concept. A system is adequate if the probability of having sufficient transmission and generation to meet expected demand is equal to or less than the system's standard, which is expressed as a loss of load expectation (LOLE). The New York State bulk power system is planned to meet an LOLE that, at any given point in time, is less than or equal to an involuntary load disconnection that is not more frequent than once in every 10 years, or 0.1 days per year. This requirement forms the basis of New York's installed reserve margin (IRM) resource adequacy requirement.

Security is an operating and deterministic concept. This means that possible events are identified as having significant adverse reliability consequences, and the system is planned and operated so that the system can continue to serve load even if these events occur. Security requirements are sometimes referred to as N-1 or N-1-1. N is the number of system components. An N-1 requirement means that the system can withstand single disturbance events (*e.g.*, generator, bus section, transmission circuit, breaker failure, double-circuit tower) without violating thermal, voltage and stability limits or before affecting service to consumers. An N-1-1 requirement means that the Reliability Criteria apply after any critical element such as a generator, a transmission circuit, a transformer, series or shunt compensating device, or a high voltage direct current (HVDC) pole has already been lost. Generation and power flows can be adjusted by the use of 10-minute operating reserve, phase angle regulator control, and HVDC control and a second single disturbance is analyzed.

The RPP is anchored in the market-based philosophy of the NYISO and its Market Participants, which posits that market solutions should be the preferred choice to meet the identified Reliability Needs reported in the RNA. In the CRP, the reliability of the bulk power system is assessed and solutions to Reliability Needs evaluated in accordance with existing Reliability Criteria of the North American Electric Reliability Corporation (NERC), the Northeast Power Coordinating Council, Inc. (NPCC), and the New York State Reliability Council (NYSRC) as they may change from time to time. These criteria and a description of the nature of long-term bulk power system planning are described in detail in the applicable planning manual, and are briefly summarized below. In the event that market-based solutions do not materialize to meet a Reliability Need in a timely manner, the NYISO designates the Responsible TO or Responsible TOs or developer of an alternative regulated solution to proceed with a regulated solution in order to maintain system reliability. Under the RPP, the NYISO also has an affirmative obligation to report historic congestion across the transmission system. In addition, the draft RNA is provided to the Market Monitoring Unit for review and consideration of whether market rules changes are necessary to address an identified failure, if any, in one of the NYISO's competitive markets. If market failure is identified as the reason for the lack of market-based solutions, the NYISO will explore appropriate changes in its market rules with its stakeholders and Independent Market Monitor. The RPP does not substitute for the planning that each TO conducts to maintain the reliability of its own bulk and non-bulk power systems.

The NYISO does not license or construct projects to respond to identified Reliability Needs reported in the RNA. The ultimate approval of those projects lies with regulatory agencies such as the FERC, the NYPSC/NYDPS, environmental permitting agencies, and local governments. The NYISO monitors the progress and continued viability of proposed market and regulated projects to meet identified needs, and reports its findings in annual plans.

The CRP also provides inputs for the NYISO's economic planning process known as CARIS. CARIS Phase 1 examines congestion on the New York bulk power system and the costs and benefits of alternatives to alleviate that congestion. During CARIS Phase 2, the NYISO evaluates specific transmission project proposals for regulated cost recovery.

Another component of the CSPP is the Public Policy Transmission Planning Process. Under this component, interested entities propose, and the NYPSC identify, transmission needs driven by Public Policy Requirements. The NYISO then requests that interested entities submit proposed solutions to the Public Policy Transmission Need(s) identified by the NYPSC. The NYISO evaluates the viability and sufficiency of the proposed solutions to satisfy the identified Public Policy Transmission Need. Upon a confirmation by the NYPSC that a need for a transmission solution still exists, the NYISO then evaluates and may select the more efficient or cost-effective transmission solution to the identified need. The NYISO develops the Public Policy Transmission Planning Report containing its findings regarding the proposed solutions. This report is reviewed by NYISO stakeholders and approved by the Board of Directors.

In concert with these four components, interregional planning is conducted with NYISO's neighboring control areas in the United States and Canada under the Northeastern ISO/RTO Planning Coordination Protocol. The NYISO participates in interregional planning and may consider Interregional Transmission Projects in its regional planning processes.

Figure B-1 below summarizes the CSPP and **Figure B-2** summarizes the RPP process.

Figure B-1: NYISO's Comprehensive System Planning Process (CSPP)

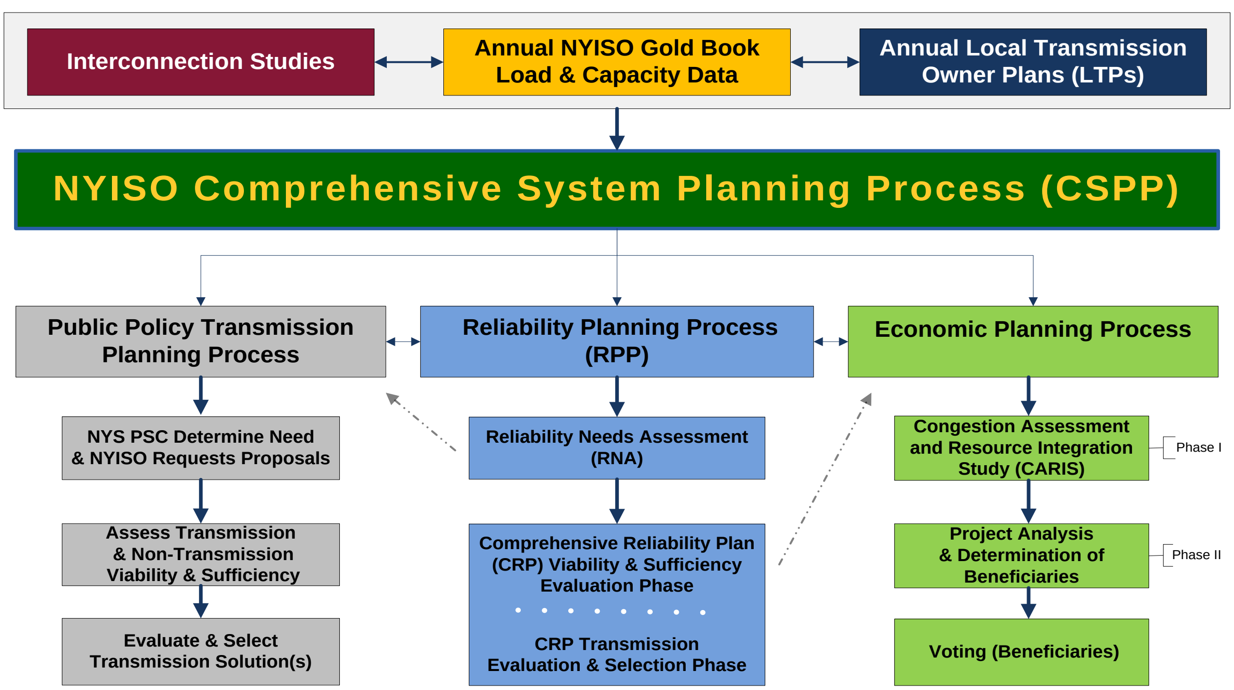
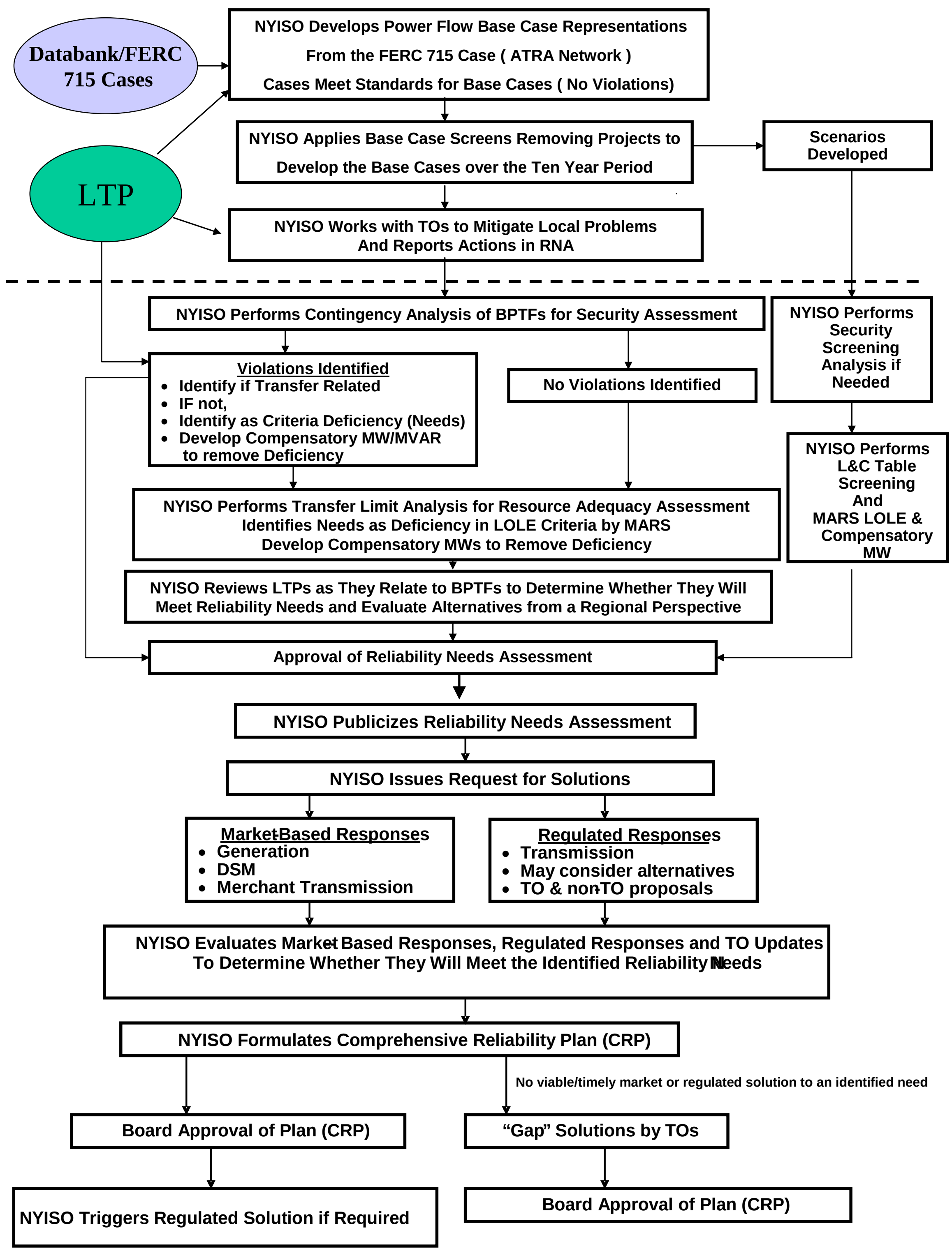


Figure B-2: NYISO Reliability Planning Process (RPP)



Appendix C - Load and Energy Forecast 2016-2026

C-1. Summary

In order to perform the 2016 RNA, a forecast of summer and winter peak demands and annual energy requirements was produced for the years 2016 – 2026. The electricity forecast is based on projections of New York's economy performed by Moody's Analytics in August 2015. The forecast includes detailed projections of employment, output, income, and other factors for twenty three regions in New York State. This appendix provides a summary of the electric energy and peak demand forecasts and the key economic input variables used to produce the forecasts. Table C-1 provides a summary of key economic and electric system growth rates from 2005 to 2026.

Table C-1: Summary of Economic & Electric System Growth Rates – Actual & Forecast

	Average Annual Growth			
	2005-2010	2010-2015	2016-2021	2021-2026
Total Employment	0.11%	1.57%	0.57%	0.34%
Gross State Product	0.98%	1.98%	1.56%	1.47%
Population	0.36%	0.39%	0.31%	0.29%
Total Real_Income	1.74%	2.53%	1.21%	1.36%
Weather Normalized Summer Peak	-0.37%	0.47%	0.12%	0.30%
Weather Normalized Annual Energy	-0.18%	-0.20%	-0.31%	-0.02%

C-2. Historic Overview

The New York Control Area (NYCA) is a summer peaking system and its summer peak has grown faster than annual energy and winter peak over the period from 2005 to 2015 on a weather-adjusted basis. Both summer and winter peaks show considerable year-to-year variability due to the influence of peak-producing weather conditions for the seasonal peaks. Annual energy is influenced by weather conditions over the entire year, which is much less variable than peak-producing conditions.

Table C-2 reports the NYCA historic seasonal peaks and annual energy growth since 2005. The table provides both actual results and weather-normalized results, together with annual average growth rates for each table entry. The growth rates are averaged over the period 2005 to 2015.

Table C-2: Historic Energy and Seasonal Peak Demand - Actual and Weather-Normalized

	Annual Energy - GWh		Summer Peak - MW		Winter Peak - MW		
Year	Actual	Weather Normalized	Actual	Weather Normalized	Year	Actual	Weather Normalized
2005	167,207	163,015	32,075	33,068	2005-06	24,947	24,770
2006	162,237	163,413	33,939	32,992	2006-07	25,057	25,030
2007	167,339	166,173	32,169	33,444	2007-08	25,021	25,490
2008	165,613	166,468	32,432	33,670	2008-09	24,673	25,016
2009	158,777	161,908	30,844	33,063	2009-10	24,074	24,537
2010	163,505	161,513	33,452	32,458	2010-11	24,654	24,452
2011	163,330	162,628	33,865	33,019	2011-12	23,901	24,630
2012	162,843	163,458	32,547	33,106	2012-13	24,658	24,630
2013	163,493	163,473	33,956	33,502	2013-14	25,738	24,610
2014	160,059	160,576	29,782	33,291	2014-15	24,648	24,500
2015	161,572	159,884	31,139	33,226	2015-16	23,319	24,220
	-0.34%	-0.19%	-0.30%	0.05%		-0.67%	-0.22%

C-3. Forecast Overview

Table C-3 shows historic and forecast growth rates of annual energy and summer peak demand for four different regions in New York and in total. The four regions are Zones A to F, Zones G to I, Zone J, and Zone K.

Table C-3: Annual Energy and Summer Peak Demand - Actual & Forecast

	Annual Energy - GWh					Summer Coincident Peak - MW				
Year	A to F	G to I	J	K	NYCA	A to F	G to I	J	K	NYCA
2005	70,269	19,984	54,007	22,948	167,208	11,792	4,237	10,810	5,236	32,075
2006	67,805	19,152	53,096	22,185	162,238	12,555	4,499	11,300	5,585	33,939
2007	69,888	19,955	54,750	22,748	167,341	11,475	4,349	10,970	5,375	32,169
2008	68,830	19,486	54,835	22,461	165,612	11,890	4,333	10,979	5,231	32,433
2009	64,982	18,806	53,100	21,892	158,780	11,382	4,034	10,366	5,063	30,845
2010	65,852	19,617	55,114	22,922	163,505	11,822	4,586	11,213	5,832	33,453
2011	67,314	19,252	54,059	22,704	163,329	11,903	4,655	11,374	5,935	33,867
2012	68,084	18,967	53,487	22,302	162,840	12,320	4,288	10,722	5,109	32,439
2013	68,929	19,155	53,316	22,114	163,514	12,251	4,596	11,456	5,653	33,956
2014	67,142	18,808	52,541	21,568	160,059	10,245	3,953	10,567	5,017	29,782
2015	66,970	19,211	53,485	21,906	161,572	11,490	4,113	10,410	5,126	31,139
2016	66,182	18,764	52,483	21,953	159,382	11,745	4,482	11,695	5,438	33,360
2017	66,162	18,643	52,152	21,756	158,713	11,801	4,485	11,696	5,381	33,363
2018	66,116	18,574	52,077	21,664	158,431	11,844	4,489	11,717	5,354	33,404
2019	66,040	18,473	51,873	21,713	158,099	11,878	4,495	11,756	5,348	33,477
2020	65,964	18,380	51,594	21,762	157,700	11,906	4,495	11,760	5,340	33,501
2021	65,894	18,212	50,889	21,908	156,903	11,925	4,499	11,761	5,370	33,555
2022	65,833	18,144	50,688	22,120	156,785	11,944	4,507	11,785	5,414	33,650
2023	65,772	18,086	50,526	22,411	156,795	11,960	4,517	11,807	5,464	33,748
2024	65,730	18,043	50,373	22,654	156,800	11,975	4,527	11,830	5,501	33,833
2025	65,694	17,993	50,219	22,873	156,779	11,989	4,536	11,851	5,550	33,926
2026	65,675	17,956	50,066	23,080	156,777	12,002	4,552	11,907	5,595	34,056
2005-15	-0.5%	-0.4%	-0.1%	-0.5%	-0.3%	-0.3%	-0.3%	-0.4%	-0.2%	-0.3%
2016-26	-0.1%	-0.4%	-0.5%	0.5%	-0.2%	0.2%	0.2%	0.2%	0.3%	0.2%
2005-10	-1.3%	-0.4%	0.4%	0.0%	-0.4%	0.1%	1.6%	0.7%	2.2%	0.8%
2010-15	0.3%	-0.4%	-0.6%	-0.9%	-0.2%	-0.6%	-2.2%	-1.5%	-2.5%	-1.4%
2016-21	-0.1%	-0.6%	-0.6%	0.0%	-0.3%	0.3%	0.1%	0.1%	-0.3%	0.1%
2021-26	-0.1%	-0.3%	-0.3%	1.0%	0.0%	0.1%	0.2%	0.2%	0.8%	0.3%

C-4. Forecast Methodology

The NYISO methodology for producing the long-term forecasts for the Reliability Needs Assessment consists of the following steps.

Econometric forecasts were developed for zonal energy using monthly data from 2002 through 2015. For each zone, the NYISO estimated an ensemble of econometric models using economic output, employment, cooling degree days, and heating degree days. Each zonal forecast was evaluated and compared to historic data, both actual and weather-adjusted usage. The zonal model chosen for the forecast was the one which best represented recent history and the regional growth for that zone. The NYISO also received and evaluated forecasts from Consolidated Edison and PSEG-LIPA for Zones H, I, J and K, which were used in combination with the forecasts the NYISO developed for Zones A through G.

The summer & winter non-coincident and coincident peak forecasts for Zones H, I, J, and K were derived from the forecasts submitted to the NYISO by Con-Ed and LIPA. For the remaining zones, the NYISO derived the summer and winter coincident peak demands from the zonal energy forecasts by using average zonal weather-normalized load factors from 2008 through 2015. The 2016 summer peak forecast was matched to coincide with the 2016 ICAP forecast.

C-4.1. Demand Side Management

The New York State Public Service Commission (NYPSC) initiated a Clean Energy Fund, which includes the NY-Sun Initiative, as a mean to achieve reductions in annual electric energy and summer peak demand for the foreseaable future. The Clean Energy Fund supersedes the Energy Efficiency Portfolio Standard, which was in effect from 2008 through 2015 (with some carry-over of unspent EEPS funds).

Guided by the programatic content and authorized spending for the Clean Energy Fund, the NYISO developed individual energy and demand forecasts for

- energy efficiency impacts,
- building codes and appliance standards,
- distributed generation, and
- behind-the-meter solar photovoltaic (PV).

The NYISO considered the following factors in developing the 2016 RNA baseline forecast:

- NYPSC-approved spending levels for the programs under its jurisdiction, as described in the Clean Energy Fund Order and related information from NYSERDA;
- Expected realization rates, participation rates, and timing of planned energy efficiency programs;
- Impacts of new appliance efficiency standards, and building codes and standards;
- Specific energy efficiency plans proposed by Long Island Public Authority, The Power Authority of the State of New York, and Consolidated Edison Company of New York, Inc.;
- The actual rates of implementation of EEPS based on data received from the New York State Department of Public Service Staff;
- Actual and projected impacts of behind-the-meter solar PV installations; and
- Actual and projected impacts of distributed energy generation installation.

Once the energy and demand impacts of these programs were developed, zonal level forecasts were produced by adjusting the econometric forecast to arrive at the base case forecast.

Figure C-1: 2016 Gold Book Zonal Energy Forecast Growth Rates - 2016 to 2026

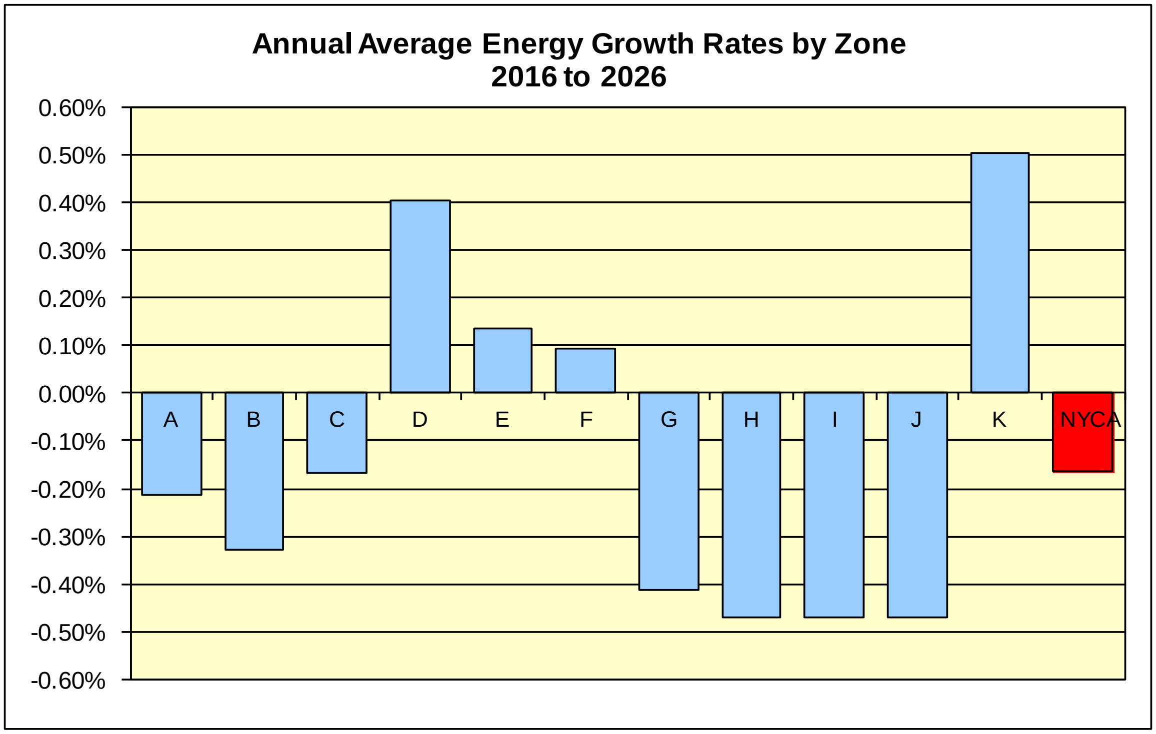


Figure C-2: Gold Book Summer Peak Demand Zonal Forecast Growth Rates - 2016 to 2026

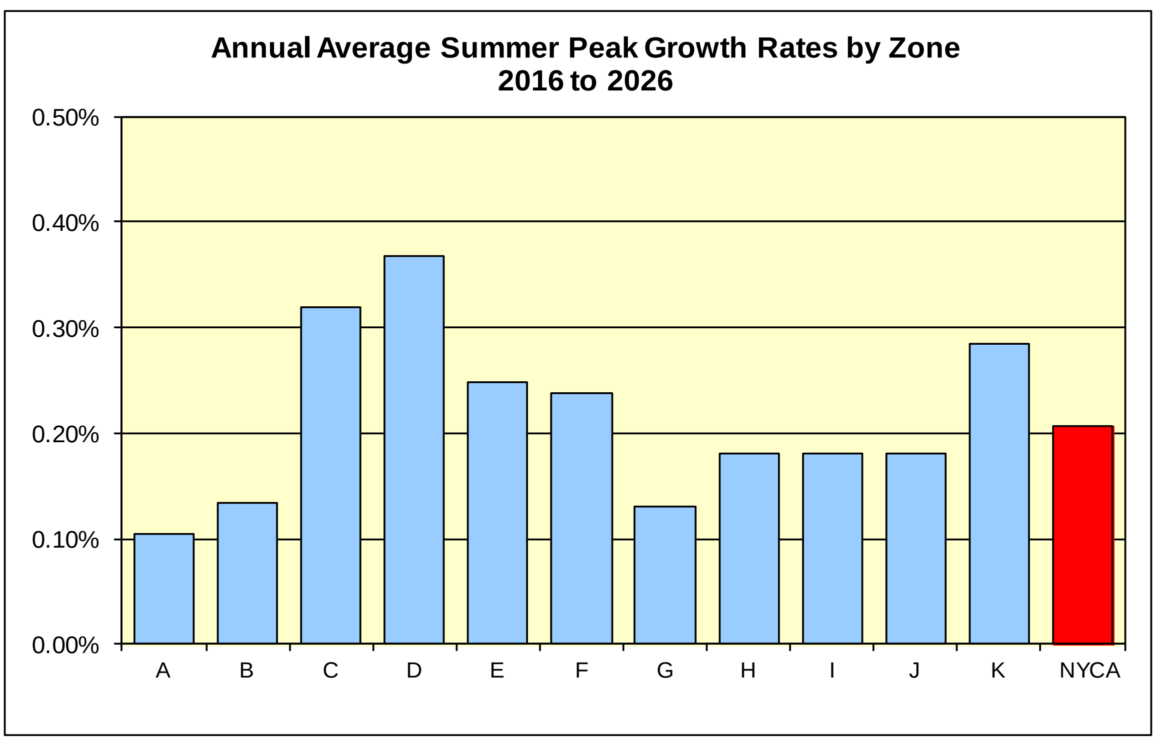


Table C-4: Annual Energy by Zone – Actual & 2016 Gold Book Baseline Forecast (GWh)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2005	16,498	10,227	17,568	6,593	7,594	11,789	10,924	2,625	6,435	54,007	22,948	167,208
2006	15,998	10,003	16,839	6,289	7,339	11,337	10,417	2,461	6,274	53,096	22,185	162,238
2007	16,258	10,207	17,028	6,641	7,837	11,917	10,909	2,702	6,344	54,750	22,748	167,341
2008	15,835	10,089	16,721	6,734	7,856	11,595	10,607	2,935	5,944	54,835	22,461	165,612
2009	15,149	9,860	15,949	5,140	7,893	10,991	10,189	2,917	5,700	53,100	21,892	158,780
2010	15,903	10,128	16,209	4,312	7,906	11,394	10,384	2,969	6,264	55,114	22,922	163,505
2011	16,017	10,040	16,167	5,903	7,752	11,435	10,066	2,978	6,208	54,059	22,704	163,329
2012	15,595	10,009	16,117	6,574	7,943	11,846	9,938	2,930	6,099	53,487	22,302	162,840
2013	15,790	9,981	16,368	6,448	8,312	12,030	9,965	2,986	6,204	53,316	22,114	163,514
2014	15,890	9,902	16,347	4,835	8,158	12,010	9,834	2,886	6,088	52,541	21,568	160,059
2015	15,761	9,906	16,299	4,441	8,141	12,422	10,065	2,847	6,299	53,485	21,906	161,572
2016	15,651	9,858	16,027	4,458	8,063	12,125	9,812	2,769	6,183	52,483	21,953	159,382
2017	15,587	9,823	15,986	4,525	8,091	12,150	9,748	2,751	6,144	52,152	21,756	158,713
2018	15,525	9,790	15,942	4,594	8,105	12,160	9,690	2,749	6,135	52,077	21,664	158,431
2019	15,475	9,760	15,899	4,622	8,115	12,169	9,624	2,738	6,111	51,873	21,713	158,099
2020	15,442	9,726	15,860	4,629	8,128	12,179	9,580	2,722	6,078	51,594	21,762	157,700
2021	15,411	9,698	15,836	4,631	8,129	12,189	9,530	2,687	5,995	50,889	21,908	156,903
2022	15,384	9,665	15,814	4,633	8,139	12,198	9,497	2,676	5,971	50,688	22,120	156,785
2023	15,362	9,629	15,798	4,635	8,140	12,208	9,467	2,667	5,952	50,526	22,411	156,795
2024	15,343	9,594	15,783	4,637	8,152	12,221	9,451	2,658	5,934	50,373	22,654	156,800
2025	15,330	9,561	15,772	4,639	8,162	12,230	9,426	2,651	5,916	50,219	22,873	156,779
2026	15,322	9,538	15,761	4,641	8,172	12,241	9,416	2,642	5,898	50,066	23,080	156,777

Table C-5: Summer Coincident Peak Demand by Zone – Actual & 2016 Gold Book Baseline Forecast (MW)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2005	2,726	1,923	2,897	768	1,314	2,164	2,236	592	1,409	10,810	5,236	32,075
2006	2,735	2,110	3,128	767	1,435	2,380	2,436	596	1,467	11,300	5,585	33,939
2007	2,592	1,860	2,786	795	1,257	2,185	2,316	595	1,438	10,970	5,375	32,169
2008	2,611	2,001	2,939	801	1,268	2,270	2,277	657	1,399	10,979	5,231	32,433
2009	2,595	1,939	2,780	536	1,351	2,181	2,159	596	1,279	10,366	5,063	30,845
2010	2,663	1,985	2,846	552	1,437	2,339	2,399	700	1,487	11,213	5,832	33,453
2011	2,556	2,019	2,872	776	1,447	2,233	2,415	730	1,510	11,374	5,935	33,867
2012	2,743	2,107	2,888	774	1,420	2,388	2,242	653	1,393	10,722	5,109	32,439
2013	2,549	2,030	2,921	819	1,540	2,392	2,358	721	1,517	11,456	5,653	33,956
2014	2,227	1,617	2,574	527	1,267	2,033	2,036	584	1,333	10,567	5,017	29,782
2015	2,632	1,926	2,705	557	1,376	2,294	2,151	617	1,345	10,410	5,126	31,139
2016	2,680	1,992	2,810	535	1,352	2,376	2,290	656	1,536	11,695	5,438	33,360
2017	2,684	1,997	2,828	543	1,358	2,391	2,293	656	1,536	11,696	5,381	33,363
2018	2,688	2,003	2,841	551	1,363	2,398	2,293	658	1,538	11,717	5,354	33,404
2019	2,692	2,006	2,855	554	1,367	2,404	2,291	660	1,544	11,756	5,348	33,477
2020	2,695	2,009	2,867	555	1,371	2,409	2,290	660	1,545	11,760	5,340	33,501
2021	2,697	2,011	2,874	555	1,374	2,414	2,294	660	1,545	11,761	5,370	33,555
2022	2,700	2,013	2,880	555	1,377	2,419	2,299	660	1,548	11,785	5,414	33,650
2023	2,702	2,015	2,886	555	1,379	2,423	2,304	662	1,551	11,807	5,464	33,748
2024	2,704	2,017	2,891	555	1,382	2,426	2,309	665	1,553	11,830	5,501	33,833
2025	2,706	2,018	2,896	555	1,384	2,430	2,314	665	1,557	11,851	5,550	33,926
2026	2,708	2,019	2,901	555	1,386	2,433	2,320	668	1,564	11,907	5,595	34,056

Table C-6: Winter Coincident Peak Demand by Zone – Actual & 2016 Gold Book Baseline Forecast (MW)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2005-06	2,450	1,544	2,700	890	1,266	1,886	1,663	515	955	7,497	3,581	24,947
2006-07	2,382	1,566	2,755	921	1,274	1,888	1,638	504	944	7,680	3,505	25,057
2007-08	2,336	1,536	2,621	936	1,312	1,886	1,727	524	904	7,643	3,596	25,021
2008-09	2,274	1,567	2,533	930	1,289	1,771	1,634	529	884	7,692	3,570	24,673
2009-10	2,330	1,555	2,558	648	1,289	1,788	1,527	561	813	7,562	3,443	24,074
2010-11	2,413	1,606	2,657	645	1,296	1,825	1,586	526	927	7,661	3,512	24,654
2011-12	2,220	1,535	2,532	904	1,243	1,765	1,618	490	893	7,323	3,378	23,901
2012-13	2,343	1,568	2,672	954	1,348	1,923	1,539	510	947	7,456	3,399	24,658
2013-14	2,358	1,645	2,781	848	1,415	1,989	1,700	625	974	7,810	3,594	25,739
2014-15	2,419	1,617	2,689	725	1,339	1,925	1,556	537	954	7,481	3,406	24,648
2015-16	2,253	1,486	2,469	667	1,307	1,861	1,496	453	889	7,274	3,164	23,319
2016-17	2,334	1,573	2,623	653	1,320	1,868	1,575	529	914	7,510	3,546	24,445
2017-18	2,338	1,577	2,639	663	1,326	1,880	1,577	529	914	7,510	3,540	24,493
2018-19	2,341	1,582	2,651	673	1,330	1,886	1,577	530	915	7,524	3,548	24,557
2019-20	2,344	1,584	2,665	676	1,334	1,890	1,575	532	919	7,549	3,549	24,617
2020-21	2,346	1,587	2,675	678	1,338	1,894	1,575	532	919	7,551	3,575	24,670
2021-22	2,349	1,589	2,682	678	1,341	1,898	1,577	532	919	7,552	3,599	24,716
2022-23	2,351	1,590	2,688	678	1,344	1,901	1,581	532	921	7,567	3,637	24,790
2023-24	2,353	1,591	2,693	678	1,346	1,905	1,584	534	923	7,581	3,661	24,849
2024-25	2,355	1,593	2,698	678	1,349	1,908	1,588	536	924	7,596	3,697	24,922
2025-26	2,356	1,594	2,703	678	1,351	1,910	1,591	536	926	7,610	3,726	24,981
2026-27	2,358	1,595	2,707	678	1,353	1,913	1,595	538	931	7,646	3,755	25,069

Table C-7: Behind-the-Meter Solar PV and 2016 RNA Base Case Annual Energy by Zone – (GWh)

2016 Gold Book Behind the Meter Solar PV Energy Forecast

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2016	55	34	77	6	46	159	148	15	26	110	377	1,053
2017	89	43	124	9	67	220	201	17	30	139	511	1,450
2018	104	66	159	13	90	278	274	17	33	171	562	1,767
2019	126	86	194	16	110	336	343	20	37	202	597	2,067
2020	151	111	231	20	126	379	416	22	41	230	628	2,355
2021	177	138	269	24	143	418	489	22	44	261	647	2,632
2022	204	167	306	27	160	452	558	24	47	283	654	2,882
2023	230	194	340	30	176	481	621	26	50	315	661	3,124
2024	252	218	370	32	190	503	674	26	54	346	669	3,334
2025	270	238	394	34	201	520	717	29	58	375	676	3,512
2026	285	254	412	34	211	533	752	31	61	405	683	3,661

2016 RNA Baseline Forecast With SPV

2016	15,706	9,892	16,104	4,464	8,109	12,284	9,960	2,784	6,209	52,593	22,330	160,435
2017	15,676	9,866	16,110	4,534	8,158	12,370	9,949	2,768	6,174	52,291	22,267	160,163
2018	15,629	9,856	16,101	4,607	8,195	12,438	9,964	2,766	6,168	52,248	22,226	160,198
2019	15,601	9,846	16,093	4,638	8,225	12,505	9,967	2,758	6,148	52,075	22,310	160,166
2020	15,593	9,837	16,091	4,649	8,254	12,558	9,996	2,744	6,119	51,824	22,390	160,055
2021	15,588	9,836	16,105	4,655	8,272	12,607	10,019	2,709	6,039	51,150	22,555	159,535
2022	15,588	9,832	16,120	4,660	8,299	12,650	10,055	2,700	6,018	50,971	22,774	159,667
2023	15,592	9,823	16,138	4,665	8,316	12,689	10,088	2,693	6,002	50,841	23,072	159,919
2024	15,595	9,812	16,153	4,669	8,342	12,724	10,125	2,684	5,988	50,719	23,323	160,134
2025	15,600	9,799	16,166	4,673	8,363	12,750	10,143	2,680	5,974	50,594	23,549	160,291
2026	15,607	9,792	16,173	4,675	8,383	12,774	10,168	2,673	5,959	50,471	23,763	160,438

Table C-8: Behind-the-Meter Solar PV and 2016 RNA Base Case Summer Peak Demand Forecast by Zone – (MW)

2016 Gold Book Behind the Meter Solar PV Summer Peak Demand Forecast

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2016	10	6	15	2	9	31	30	3	6	25	121	258
2017	14	7	20	2	13	41	37	5	8	43	173	363
2018	16	10	24	2	14	47	46	5	10	52	195	421
2019	18	12	28	3	16	52	54	5	11	62	210	471
2020	21	15	33	3	18	57	63	5	12	69	222	518
2021	24	18	37	4	20	62	71	7	13	78	231	565
2022	27	21	41	4	23	66	80	7	14	89	234	606
2023	30	24	45	4	25	69	87	7	16	101	237	645
2024	32	27	48	5	26	72	93	7	18	114	240	682
2025	34	29	51	5	28	74	98	10	20	128	243	720
2026	36	31	53	5	29	75	101	10	21	139	247	747

2016 RNA Baseline Forecast With SPV

2016	2,690	1,998	2,825	537	1,361	2,407	2,320	659	1,542	11,720	5,559	33,618
2017	2,698	2,004	2,848	545	1,371	2,432	2,330	661	1,544	11,739	5,554	33,726
2018	2,704	2,013	2,865	553	1,377	2,445	2,339	663	1,548	11,769	5,549	33,825
2019	2,710	2,018	2,883	557	1,383	2,456	2,345	665	1,555	11,818	5,558	33,948
2020	2,716	2,024	2,900	558	1,389	2,466	2,353	665	1,557	11,829	5,562	34,019
2021	2,721	2,029	2,911	559	1,394	2,476	2,365	667	1,558	11,839	5,601	34,120
2022	2,727	2,034	2,921	559	1,400	2,485	2,379	667	1,562	11,874	5,648	34,256
2023	2,732	2,039	2,931	559	1,404	2,492	2,391	669	1,567	11,908	5,701	34,393
2024	2,736	2,044	2,939	560	1,408	2,498	2,402	672	1,571	11,944	5,741	34,515
2025	2,740	2,047	2,947	560	1,412	2,504	2,412	675	1,577	11,979	5,793	34,646
2026	2,744	2,050	2,954	560	1,415	2,508	2,421	678	1,585	12,046	5,842	34,803

Appendix D - Transmission System Security and Resource Adequacy Assessments

The analysis performed during the Reliability Needs Assessment requires the development of base cases for transmission security analysis and for resource adequacy analysis. The power flow system model is used for transmission security assessment and the development of the transfer limits to be implemented in the Multi-Area Reliability Simulation (MARS) model. A comprehensive assessment of the transmission system is conducted through a series of steady-state power flow, transient stability, and short circuit studies.

The MARS model was used to determine whether adequate resources would be available to meet the NYSRC and NPCC reliability criteria of one day in ten years (0.1 days/year). The results showed no resource adequacy needs in any of the ten-year Study Period (*i.e.*, 2017 to 2026) (See Section 5.2.4 of this report). The MARS model was also used to evaluate selected scenarios (See Section 6 of this report).

D-1 2014 RNA Assumption Matrix

D-1.1 Assumption Matrix for Resource Adequacy Assessment

2016 RNA Resource Adequacy Assumptions Matrix				
#	**Parameter**	**2017 IRM Model Assumptions**	**Basis for IRM Recommendation**	**2016 RNA Assumptions**
Load Parameters				
1	Peak Load Forecast (Preliminary Base Case – Parametric & Sensitivities)	2016 Gold Book NYCA: 33,363 MW NYC: 11,795 MW LI: 5,422 MW G-J: 16,313 MW	Gold Book Forecast is used for Preliminary Base Case parametric study and sensitivity cases	2016 Gold Book The GB 2016 baseline load contains the impact (reduction) of behind- the -meter solar at the time of NYCA peak. The behind the meter solar impact MW are added back to the NYCA zonal loads in order to model solar resources discretely.
3	Load Shape (Multiple Load Shape)	Bin 1: 2006 Bin 2: 2002 Bins 3-7: 2007	ICS Recommendation.	Same
4	Load Forecast Uncertainty	Zonal Model to reflect current data with input from Con Ed and LIPA.	Cool weather patterns mean LFU does not need to be revisited.	Same
Generation Parameters				
1	Existing Generating Unit Capacities	2016 Gold Book values. Use min (DMNC vs. CRIS) capacity value	2016 Gold Book publication	Same, but adjusted for RNA inclusion rules
2	Proposed New Units (Non- Renewable)	MW of new or returning non- wind resources	2016 Gold Book publication and generator notifications	Inclusion Rules Applied
3	Retirements and Mothballed units	MW retirements or mothballs reported	NYSRC Policy 5 guidelines on retirement or mothball disposition in IRM studies.	Inclusion Rules and TB185 Applied
4	Forced and Partial Outage Rates	Five-year (2011-2015) GADS data for each unit represented. Those units with less than five years – use representative data.	Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period (2011-2015)	Same
5	Planned Outages	Based on schedules received by the NYISO and adjusted for history	Updated schedules	Same

2016 RNA Resource Adequacy Assumptions Matrix				
#	**Parameter**	**2017 IRM Model Assumptions**	**Basis for IRM Recommendation**	**2016 RNA Assumptions**
6	Summer Maintenance	Nominal YY MWs – divided equally between upstate and downstate	Review of most recent data	Same
7	Combustion Turbine Derates	Derate based on temperature correction curves provided	Operational history indicates the derates are in-line with manufacturer's curves	Same
8	Existing and Proposed New Wind Units	MW Wind Capacity	Renewable units based on RPS agreements, interconnection Queue, and ICS input.	Inclusion Rules Applied
9	Wind Shape	Actual hourly plant output over the period 2012-2015. New units may have wind readings taken at or near the site	NYISO to prepare paper on new functionality of the GE MARS program to randomly select an annual wind shape from multiple years of production data	Probabilistic model will be incorporated based on five years of input shapes with one shape per iteration year being randomly selected in Monte Carlo process
10	Solar Resources	31.5 MW metered solar capacity. Model chooses from 4 years of production data output covering the period 2012-2015. New units may use a nearby plant or utilize solar readings taken at or near the site	Concepts in the paper referenced in Item No. 9 may also apply to solar modeling to treat solar as if it were resource on the system. GE MARS program can randomly select a solar shape from multiple years of production data	For the metered solar probabilistic model will be incorporated based on production data shapes with one shape per iteration year being randomly selected in Monte Carlo process. The large projection of increasing solar installations over the ten year period require a discrete model with some level of detailed hourly performance. A probabilistic model of the solar shapes similar to the wind shapes will be developed.
11	Small Hydro Resources	Derate by yy%	Review of five years of unit production data over the years 2011 to 2015	Same
12	Large Hydro	Probabilistic Model based on 5 years of GADS data	Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period (2011-2015)	Same
Transaction - Imports / Exports				
1	Capacity Purchases	Grandfathered amounts: PJM – 1080 MW	Grandfathered Rights, ETCNL, and other awarded long-term rights including 20 MW CRIS	Modeled as explicit contracts

2016 RNA Resource Adequacy Assumptions Matrix				
#	Parameter	2017 IRM Model Assumptions	Basis for IRM Recommendation	2016 RNA Assumptions
		HQ – 1090 MW HQ TO 1110 MW All contracts modeled as equivalent contracts	potentially awarded to HQUS	
2	Capacity Sales	Long Term firm sales Summer yyy MW	These are long-term contracts filed with FERC	Modeled as equivalent contracts sold from ROS surplus zones
3	FCM Sales	Xxxx MW	Sensitivity based on Examination of Neighbor's FCM auction results	What is currently sold is modeled as equivalent contracts sold from ROS surplus zones
4	New UDRs	No new UDR projects	Existing UDR elections are made by August 1st and will be incorporated into the model	Same
Topology				
1	Interface Limits	All changes reviewed and commented on by TPAS	Based on 201x: Operating Study, Operations Engineering Voltage Studies, Comprehensive Planning Process, and additional analysis including interregional planning initiatives	Developed by review of previous studies and specific analysis during the RNA study process
2	New Transmission	Identified	Based on TO provided models and NYISO review	Based on TO- provided firm plans and NYISO review. *Note:* Inclusion Rules applied to the Leeds - Hurley 345 kV Series Compensation System Deliverability Upgrade
3	Cable Forced Outage Rates	All existing Cable EFORs updated for NYC and LI to reflect most recent five-year history	Based on TO analysis	Update used

2016 RNA Resource Adequacy Assumptions Matrix				
#	**Parameter**	**2017 IRM Model Assumptions**	**Basis for IRM Recommendation**	**2016 RNA Assumptions**
Emergency Operating Procedures				
1	Special Case Resources	July 2016 – MW based on registrations and modeled as aaa MW of effective capacity. Monthly variation based on historical experience (Calls Limited to 5/month.)*	Those sold for the program discounted to historic availability. Summer values calculated from July 2016 registrations	2016 Gold Book with effective capacity modeled
2	EDRP Resources	July 2016 bb MW registered model as MW in July and proportional to monthly peak load in other months. Limit to five calls per month	Those sold for the program discounted to historic availability. Summer values calculated from July 2016 registrations and forecast growth.	2016 Gold Book with effective capacity modeled
3	Other EOPs	MW of non-SCR/non-EDRP resources	Based on TO information, measured data, and NYISO forecasts	Same
External Control Areas				
1	PJM	Load and Capacity data provided by PJM/NPCC CP-8	Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes. NYISO to prepare white paper on external EOPs	As per RNA Procedure
2	ISONE	Load and Capacity data provided by ISONE/NPCC CP-8 Data may be adjusted per NYSRC Policy 5	Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes.	As per RNA Procedure
3	HQ	Load and Capacity data provided by HQ/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 See	Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes.	As per RNA Procedure
4	IESO	Load and Capacity data provided by IESO/NPCC	Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes.	As per RNA Procedure

2016 RNA Resource Adequacy Assumptions Matrix				
#	**Parameter**	**2017 IRM Model Assumptions**	**Basis for IRM Recommendation**	**2016 RNA Assumptions**
		CP-8 data may be adjusted per NYSRC Policy 5		
5	Reserve Sharing	All NPCC Control Areas indicate that they will share reserves equally among all members	Per NPCC CP-8 WG	Same
Miscellaneous				
1	MARS Model Version	Version 3.20	Per benchmark testing and ICS recommendation	Version 3.20
2	Environmental Initiatives	No estimated impacts based on review of existing rules and retirement trends	Review of existing regulations and rules.	Same

D-1.2 Assumption Matrix for Transmission Security Assessment

Parameter	2016 RNA Transmission Security Studies Modeling Assumptions	Source
Peak Load	NYCA baseline coincident summer peak forecast, which already includes EE and DG (including solar) reductions	2016 Gold Book
Load model	ConEd: voltage varying	2016 FERC 715 filing
	Rest of NYCA: constant power	
System representation	Per updates received through Databank process (Subject to RNA Base Case inclusion rules)	NYISO RAD Manual, 2016 FERC 715 filing
Inter-area interchange schedules	Consistent with ERAG MMWG interchange schedule	2016 FERC 715 filing, MMWG
Inter-area controllable tie schedules	Consistent with applicable tariffs and known firm contracts or rights	2016 FERC 715 filing
In-city series reactors	Consistent with ConEdison operating protocol (All series reactors in-service for summer)	2016 FERC 715 filing, ConEd protocol
SVCs, FACTS	Set at zero pre-contingency; allowed to adjust post-contingency	NYISO T&D Manual
Transformer & PAR taps	Taps allowed to adjust pre-contingency; fixed post-contingency	2016 FERC 715 filing
Switched shunts	Allowed to adjust pre-contingency; fixed post-contingency	2016 FERC 715 filing
Fault current analysis settings	Per Fault Current Assessment Guideline	NYISO Fault Current Assessment Guideline
Model Version	Power flow: PSS/E v33.5.2, PSS/MUST v11.0, TARA v810a	
	Dynamics: PSS/E v33.5.2	
	Short Circuit: ASPEN v12.4	

D-2 RNA Power Flow Base Case Development and Thermal Transfer Limit Results

D- 2.1 Development of RNA Power Flow Base Cases

The base cases used in analyzing the performance of the transmission system were developed from the 2016 FERC 715 filing power flow case library. The load representation in the power flow model is the summer peak load forecast reported in the 2016 Gold Book Table 1-2a baseline forecast of coincident peak demand. The system representation for the NPCC Areas in the base cases is from the 2015 Base Case Development (BCD) libraries compiled by the NPCC SS-37 Base Case Development working group. The PJM system representation was derived from the PJM Regional Transmission Expansion Plan (RTEP) planning process models. The remaining models are from the Eastern Interconnection Reliability Assessment Group (ERAG) Multiregional Modeling Working Group (MMWG) 2015 power flow model library.

The NYISO utilized the RNA Base Case inclusion rules to screen the projects and plans for inclusion or exclusion from the 2016 RNA Base Case. The RNA Base Case inclusion rules, set forth in the Reliability Planning Process Manual are:

1. TO LTPs for non-BPTF facilities and NYPA transmission plans for non-BPTF, which are reported to the NYISO as firm transmission plans, will be included.
2. Regulated BPTF projects not in-service or not under construction, including TO LTPs, will be included if:
    a. the project is: (i) triggered in the RPP; (ii) has been selected in PPTPP; (iii) approved by beneficiaries under CARIS; or (iv) part of a TO LTP or the NYPA transmission plans, and
    b. the project is expected to be in-service within 3 years or other reasonable time frame based on the nature of the project, and
    c. the project has an application that has been deemed complete for a certificate under Article VII of the New York Public Service Law or other major regulatory approval, if required, and
    d. the project has an approved System Reliability Impact Study ("SRIS"), or an approved System Impact Study ("SIS") (as applicable), if required, and
    e. the project is making reasonable progress under the applicable planning process of Attachment Y of the OATT.
3. Market based BPTF projects not in-service or not under construction will be included if:
    a. the project is expected to be in-service within 3 years or other reasonable time frame based on the nature of the project, and
    b. the project has an approved SRIS, or an approved SIS (as applicable), if required, and
    c. the project has an application that has been deemed complete for a certificate under Article VII of the New York Public Service Law or other major regulatory approval, if required, and
    d. the project has an executed contract with a credit worthy entity for at least half of the project capacity.
4. BPTF projects that are in-service will be included.
5. BPTF projects under construction will be included if:
    e. the project is expected to be in-service within 3 years or other reasonable time frame based on the nature of the project, and
    f. the project is making reasonable progress toward entering service by its project in-service date.

6. Generators currently in an outage state or that intend to enter such a state, will be modeled as of the effective date of entering that outage state as indicated in **Table D2-1**, below.

Table D2-1: Modeling of Generators in Outage States

Generator Outage State	Modeling in RNA
Forced Out	In-service
Inactive Reserve	In-service
ICAP Ineligible Forced Outage	Out-of-service, unless the owner has provided NYISO a positive indication* that the unit will be returning to service other than pursuant to an RMR agreement or RSSA**
Noticed intent to mothball or retire to the NYPSC or to the NYISO	Out-of-service
Operating in accordance with an RMR agreement or RSSA	Out-of-service
In a Mothball Outage or mothballed under the pre-May 1, 2015 rules	Out-of-service, unless the owner has provided NYISO a positive indication* that the unit will be returning to service other than pursuant to an RMR agreement or RSSA**
Retired	Out-of-service

* Positive indications that a unit will be returning to service include, but not limited to, the following:

- Commenced Repair as defined in MST Section 2.3, or indications of repair evidenced by items such as, but not limited to: (i) a repair plan including schedule, (ii) a list of permits required with indications of active status, (iii) invoices for material, or (iv) contracts for construction.
- Indications of restart are evidenced by items such as, but not limited to: (i) visible site activity, (ii) labor arrangements, (iii) fuel supply arrangements, or (iv) unit testing.

** If such positive indication is provided to the NYISO, the unit will be modeled in the year of its return in the Study Period.

Specifically, the 2016 RNA Base Case does not include all projects currently listed on the NYISO's interconnection queue or those shown in the 2016 Gold Book. It includes only those which met the screening requirements for inclusion, as shown in the **Table 4-3** of this report.

The generation deactivation assumptions are reflected in Table 4-4 of this Report. The firm transmission plans included in 2016 RNA Base Case are listed in **Table D2-2** below.

Table D2-2: Firm Transmission Plans included in 2016 RNA Base Case

Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to (2)	Year	Nominal Voltage in kV Operating	Design	# of ckts	Thermal Ratings (4) Summer	Winter	Project Description / Conductor Size
CHGE	Todd Hill	Fishkill Plains	5.26	In-Service	2015	115	115	1	1167	1433	Rebuild line with 1033 ACSR
LIPA	Randall Ave	Wildwood	N/A	In-Service	2015	138	138	-	150 MVAR	150 MVAR	Dynamic Reactive Support System (DRSS)
NGRID	Luther Forest	North Troy	-18.30	RETIRED	2015	115	115	1	937	1141	605 ACSR
NGRID	Luther Forest	Eastover Road (New Station)	17.50	In-Service	2015	115	115	1	937	1141	Luther Forest-North Troy Loop (0.9 miles new 1113 kcmil ACSR)
NGRID	Eastover Road (New Station)	North Troy	2.60	In-Service	2015	115	115	1	937	1141	Luther Forest-North Troy Loop (0.9 miles new 1113 kcmil ACSR)
NGRID	Eastover Road (New Station)	North Troy	2.60	In-Service	2015	115	115	1	916	1118	Battenkill-North Troy Loop (0.9 miles new)
NGRID	Battenkill	North Troy	-22.39	RETIRED	2015	115	115	1	916	1118	605 ACSR
NGRID	Battenkill	Eastover Road (New Station)	21.59	In-Service	2015	115	115	1	937	1141	Battenkill-North Troy Loop (0.9 miles new)
NGRID	Gardenville	Homer Hill	-65.69	In-Service	2015	115	115	2	584	708	New Five Mile substation
NGRID	Gardenville	Five Mile Rd (New Station)	58.30	In-Service	2015	115	115	2	129MVA	156MVA	New Five Mile substation
NGRID	Five Mile Rd (New Station)	Homer Hill	8.00	In-Service	2015	115	115	2	221MVA	270MVA	New Five Mile substation
NGRID	Homer City	Stolle Road	-204.11	In-Service	2015	345	345	1	1013	1200	New Five Mile substation
NGRID	Homer City	Five Mile Rd (New Station)	151.11	In-Service	2015	345	345	1	1013	1200	New Five Mile substation
NGRID	Five Mile Rd (New Station)	Stolle Road	53.00	In-Service	2015	345	345	1	1013	1200	New Five Mile substation
NGRID	Sawyer 230kV	Sawyer 23kV	-	In-Service	2015	230/23	230/23	1	-	-	Addition of Overcurrent relays
NGRID	Clay	Clay	xfmr	In-Service	2015	345/115	345/115	1	478MVA	590MVA	Replace TB1 transformer & reconfigure Clay 345 kV for TB2 transformer
NGRID	Five Mile Rd (New Station)	Five Mile Rd (New Station)	xfmr	In-Service	2015	345/115	345/115	-	478MVA	590MVA	New Five Mile substation
NYPA	Gilboa	Gilboa	GSU	In-Service	2015	345/17	345/17	1	325 MVA	325 MVA	Replacement of Blenheim-Gilboa GSU #2
NYPA	Niagara	Niagara	Auto Transformer	In-Service	2015	345/230	345/230	1	697 MVA	717 MVA	Replacement of Niagara AT# 4
NYPA	Massena	Massena	Auto-Transformer	In-Service	2015	765/230	765/230	1	936 MVA	1296 MVA	Replacement of Massena 765/230 kV Auto-Transformer Bank #2
NYSEG	Goudey	AES Westover	Reconfiguration	In-Service	2015	115	115	-	N/A	N/A	Substation separation
NYSEG	Jennison	AES Oneonta	Reconfiguration	In-Service	2015	115	115	-	N/A	N/A	Substation separation
NYSEG	Coopers Corners	Coopers Corners	Shunt Reactor	In-Service	2015	345	345	1	200 MVAR	200 MVAR	Shunt Reactor Installation
NYSEG	Homer City	Watercure Road	-177.00	In-Service	2015	345	345	1	1549	1552	2156 ACR
NYSEG	Watercure Road	Mainesburg	26.00	In-Service	2015	345	345	1	1549	1552	2156 ACR
NYSEG	Mainesburg	Homer City	151.00	In-Service	2015	345	345	1	1549	1552	2156 ACR
RGE	Station 69	Station 69	Cap Bank	In-Service	2015	115	115	1	20 MVAR	20 MVAR	Capacitor Bank (DOE)
RGE	Mortimer	Station 251	1	In-Service	2015	115	115	2	1396	1707	New 115 kV Line
RGE	Station 251	Station 33	0.98	In-Service	2015	115	115	2	1396	1707	New 115 kV Line
RGE	Station 42	Station 23	Phase Shifter	In-Service	2015	115	115	1	253 MVA	285 MVA	Phase Shifter
RGE	Station 251 (New Station)	Station 251 (New Station)	xfmr	In-Service	2015	115/34.5	115/34.5	2	30 MVA	33.8 MVA	Transformer
CHGE	Pleasant Valley	Todd Hill	5.53	S	2016	115	115	1	917	1282	Rebuild line with 1033 ACSR
ConEd	Rock Tavern	Sugarloaf	11.80	S	2016	345	345	1	1971 MVA	2390 MVA	2-1590 ACSR
ConEd	Goethals	Linden Co-Gen	-1.50	S	2016	345	345	1	2500	2500	Feeder Separation
ConEd	Goethals	Linden Co-Gen	1.50	S	2016	345	345	1	1250	1250	Feeder Separation
ConEd	Goethals	Linden Co-Gen	1.50	S	2016	345	345	1	1250	1250	Feeder Separation

Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to (2)	Year	Nominal Voltage in kV Operating	Design	# of ckts	Thermal Ratings (4) Summer	Winter	Project Description / Conductor Size
ConEd	East 13th Street	East 13th Street	Reconfiguration	S	2016	345	345		N/A	N/A	Reconfiguration
NGRID	New Scotland	Long Lane	4.22	In-Service	2016	115	115	1	600	600	20.5% Series Reactor #7 Unionville
NGRID	New Scotland	Feura Bush	4.08	S	2016	115	115	1	600	600	12.5% Series Reactor #9 Unionville
NGRID	Clay	GE	6.52	In-Service	2016	115	115	1	220MVA	268MVA	reconductor 4/0 CU & 477 ACSR with 795ACSR (line#14)
NGRID	Huntley	Huntley	-	S	2016	230	230	1			Install two 100MVAR cap banks
NGRID	Packard	Huntley 77	-	S	2016	230	230	1			1.5% series reactor
NGRID	Packard	Huntley 78	-	S	2016	230	230	1			1.5% series reactor
NGRID	Packard	Huntley 77	-	S	2016	230	230	1	556 MVA	680 MVA	Conductor Clearance Upgrade to STE Rating
NGRID	Edic 345 kV	Edic 345 kV	Reconfiguration	W	2016	345	345	1	-	-	Create new bay by adding 2 new 345kV breakers, reconnect transformer
NGRID/NYSEG	Homer City	Five Mile Rd (New Station)	-151.11	S	2016	345	345	1	1013	1200	New Piercebook Station (First Energy)
NGRID/NYSEG	Homer City	Farmers Valley	120.00	S	2016	345	345	1	1013	1200	New Piercebook Station (First Energy)
NGRID/NYSEG	Farmers Valley	Five Mile Rd (New Station)	31.00	S	2016	345	345	1	1013	1200	New Piercebook Station (First Energy)
NYPA	Moses	Moses	Cap Bank	In-Service	2016	115	115	1	100 MVAR	100 MVAR	Cap Bank Installation to Replace Moses Synchronous Condensers
NYPA	Marcy	Coopers Corners	Series Comp	S	2016	345	345	1	1776 MVA	1793 MVA	Installation of Series Compensation on UCC2-41
NYPA	Edic	Fraser	Series Comp	S	2016	345	345	1	1793 MVA	1793 MVA	Installation of Series Compensation on EF24-40
NYPA	Fraser	Coopers Corners	Series Comp	S	2016	345	345	1	1494 MVA	1793 MVA	Installation of Series Compensation on FCC33
NYPA	Niagara	Niagara	GSU	S	2016	115/13.8	115/13.8	1	250 MVA	250 MVA	Replacement of Niagara GSU #5
NYPA	Massena	Massena	Auto-Transformer	In-Service	2016	765/230	765/230	1	936 MVA	1296 MVA	Replacement of Massena 765/230 kV Auto-Transformer Bank #1
NYSEG	Wood Street	Katonah	11.70	W	2016	115	115	1	1079	1310	convert 46kV to 115kV
NYSEG	Elbridge	State Street	14.50	W	2016	115	115	1	250 MVA	305 MVA	1033 ACSR
NYSEG	Fraser	Coopers Corners	21.80	S	2016	345	345	1	2500	3000	ACCR 1742-T9 Reconductor
NYSEG	Stephentown	Stephentown	xfmr	W	2016	115/34.5	115/34.5	1	37 MVA	44MVA	Transformer #2
NYSEG	Eelpot Road	Eelpot Road	xfmr	W	2016	115/34.5	115/34.5	2	59.2MVA	66.9MVA	Transformer #2
O & R	Harings Corner (RECO)	Tappan (NY)	-	W	2016	69	69	1	1096	1314	Three-way switch station
O & R	Ramapo	Sugarloaf	16.00	S	2016	345	345	1	3030	3210	2-1590 ACSR
O & R	Sugarloaf	Sugarloaf	xfmr	S	2016	345/138	345/138	1	562 MVA	562 MVA	Transformer
O & R	O&R's Line 26	Sterling Forest	xfmr	S	2016	138/69	138/69	1	214 MVA	214 MVA	Transformer
ConEd	East 13th Street	East 13th Street	Reconfiguration	S	2017	345	345		N/A	N/A	Reconfiguration
NGRID	Mohican	Battenkill	14.2	S	2017	115	115	1	933	1140	Replace 14.2 miles of conductor w/min 1033.5 ACSR
NGRID	Mohican	Luther Forest	34.47	S	2017	115	115	1	937	1141	Replace 14.2 miles of conductor w/min 795 kcmil ACSR 26/7
NGRID	Menands	State Campus	5.00	S	2017	115	115	1	744	744	Replace 3.2 miles of 4/0 Cu conductor with 795kcmil ACSR 26/7
NGRID	Wolf Rd	Menands	4.54	S	2017	115	115	1	808	856	Replace 2.1 miles of 4/0 Cu conductor with 795kcmil ACSR 26/7
NGRID	Edic	Marcy Nanocenter	1.3	S	2017	115	115	2	556MVA	680MVA	New Circuit to Customer Station (MVEdge)
NGRID	Clay	Dewitt	10.24	W	2017	115	115	1	220MVA	268MVA	Reconductor 4/0 CU to 795ACSR
NGRID	Clay	Teall	12.75	W	2017	115	115	1	220 MVA	268MVA	Reconductor 4/0 CU to 795ACSR
NGRID	Eastover Road	Eastover Road	xfmr #2	S	2017	230/115	230/115	1	381MVA	466MVA	New/2nd 230-115 kV Transformer
NGRID	Edic	Edic	xfmr	S	2017	345/115	345/115	2	505MVA	603MVA	Add Transformer for MVEdge (TR#5&#6)
NYPA	Cumberland Head	Gordon Landing	1.63	W	2017	115	230	1	1147	1316	Replacement of PV-20 Submarine Cable
NYSEG	Wood Street	Carmel	1.34	W	2017	115	115	1	775	945	477 ACSR
NYSEG	Elbridge	State Street	14.50	W	2017	115	115	1	1255	1531	Reconductor 336.4 ACSR to 1194 KCM
NYSEG	Willet	Willet	xfmr	W	2017	115/34.5	115/34.5	1	39 MVA	44 MVA	Transformer #2
NYSEG	Gardenville	Gardenville	xfmr	S	2017	230/115	230/115	1	200 MVA	225 MVA	NYSEG Transformer #3 and Station Reconfiguration
RGE	Station 33	Station 262	2.97	W	2017	115	115	1	2008	2409	Underground Cable
RGE	Station 262	Station 23	1.46	W	2017	115	115	1	2008	2409	Underground Cable
RGE	Station 80	Station 80	-	S	2017	345	345				Station 80 Reconfiguration (GRTA)
RGE	Station 23	Station 23	xfmr	W	2017	15/11.5/11.	15/11.5/11.	2	75 MVA	84 MVA	Transformer
RGE	Station 23	Station 23	xfmr	W	2017	115/34.5	115/34.5	2	75 MVA	84 MVA	Transformer
RGE	Station 122 (Station upgrade)	Station 122 (Station upgrade)	xfmr	S	2017	345/115	345/115	3	494 MVA	527 MVA	Transformer Replacement and Station Reconfiguration (GRTA)

Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to (2)	Year	Nominal Voltage in kV Operating	Design	# of ckts	Thermal Ratings (4) Summer	Winter	Project Description / Conductor Size
CHGE	Hurley Avenue	Leeds	Series Compensation	S	2018	345	345	1	2336	2866	21% Compensation
ConEd	Greenwood	Greenwood	Reconfiguration	S	2018	138	138		N/A	N/A	Reconfiguration
NGRID	Oneida	Porter	Reactor	S	2018	115	115	1	-		Install reactor on Line #7; 6%
NGRID	Porter	Yahnundasis	Reactor	S	2018	115	115	1	-		Install reactor on Line #3;8%
NGRID	Battenkill	Eastover Road	-22.72	S	2018	115	115	1	937	1141	New Schaghticoke Switching Station
NGRID	Battenkill	Schaghticoke (New Station)	14.31	S	2018	115	115	1	937	1141	New Schaghticoke Switching Station
NGRID	Schaghticoke (New Station)	Eastover Road	8.41	S	2018	115	115	1	937	1141	New Schaghticoke Switching Station
NGRID	Mohican	Luther Forest	-34.47	S	2018	115	115	1	937	1141	New Schaghticoke Switching Station
NGRID	Mohican	Schaghticoke (New Station)	28.13	S	2018	115	115	1	937	1141	New Schaghticoke Switching Station
NGRID	Luther Forest	Schaghticoke (New Station)	6.34	S	2018	115	115	1	1280	1563	New Schaghticoke Switching Station
NGRID	Gardenville	Erie	0.30	S	2018	115	115	1	648	846	Replace 400CU and 636AL with 795 ACSR
NGRID	Gardenville 115 kV	Gardenville 115 kV	-	S	2018	-	-	-	-	-	Rebuild of Gardenville 115 kV station to full breaker and a half
NYPA	Moses	Moses	Cap Bank	W	2018	115	115	1	100 MVAR	100 MVAR	Cap Bank Installation to Replace Moses Synchronous Condensers
NYSEG	Falls Park	Klinekill (Line 630) circuit 1		S	2018	34.5	34.5		36MVA	49MVA	
NYSEG	Falls Park	Klinekill (Line 630) circuit 2		S	2018	34.5	34.5		36MVA	49MVA	
NYSEG	Windham	-	Cap Bank	S	2018	115	115	1	5.4 MVAR	5.4 MVAR	Capacitor bank
NYSEG	Falls Park	Schodack(NG)		S	2018	115	115	1	129MVA	156MVA	Tap to interconnect NG Line 14
NYSEG	Falls Park	Churchtown		S	2018	115	115	1	129MVA	156MVA	Tap to interconnect NG Line 14
NYSEG	Falls Park 115/34.5kV Substation			S	2018	115/34.5	115/34.5				Tap to interconnect NG Line 14
NYSEG	Falls Park	Falls Park	xfmr	S	2018	115/34.5	115/34.5	1	53MVA	59	Transformer #1
NYSEG	Flat Street	Flat Street	xfmr	W	2018	115/34.5	115/34.5	2	40MVA	45.2MVA	Transformer #2
NYSEG	Watercure Road	Watercure Road	xfmr	S	2018	345/230	345/230	1	426 MVA	494 MVA	Transformer
O & R	North Rockland (New Station)	Lovett	xfmr	S	2018	345/138	345/138	1	562 MVA	562 MVA	Transformer
O & R/ConEd	Ladentown	Buchanan	-9.5	S	2018	345	345	1	3000	3211	2-2493 ACAR
O & R/ConEd	Ladentown	North Rockland (New Station)	5.5	S	2018	345	345	1	3000	3211	2-2493 ACAR
O & R/ConEd	North Rockland (New Station)	Buchanan	4	S	2018	345	345	1	3000	3211	2-2493 ACAR
RGE	Station 67	Station 418	3.5	W	2018	115	115	1	1255	1255	New 115kV Line
RGE	Station 262	Station 262	xfmr	S	2018	115/34.5	115/34.5	1	56 MVA	63 MVA	Transformer
ConEd	Rainey	Corona	xfmr/Phase shifter	S	2019	345/138	345/138	1	268 MVA	320 MVA	xfmr/Phase shifter
NGRID	Spier	Rotterdam (#2)	-32.74	S	2019	115	115	1	1168	1416	New Lasher Rd Switching Station
NGRID	Spier	Lasher Rd (New Station) (#2)	21.69	S	2019	115	115	1	1168	1416	New Lasher Rd Switching Station
NGRID	Lasher Rd (New Station)	Rotterdam	11.05	S	2019	115	115	1	2080	2392	New Lasher Rd Switching Station
NGRID	Spier	Luther Forest (#302)	-34.21	S	2019	115	115	1	916	1070	New Lasher Rd Switching Station
NGRID	Spier	Lasher Rd (New Station) (#302)	21.72	S	2019	115	115	1	916	1118	New Lasher Rd Switching Station
NGRID	Lasher Rd (New Station)	Luther Forest	12.49	S	2019	115	115	1	990	1070	New Lasher Rd Switching Station
NGRID	Dunkirk	Dunkirk	-	S	2019	115	115	1			Add second bus tie breaker
NYPA	Niagara	Rochester	-70.20	W	2019	345	345	1	2177	2662	2-795 ACSR
NYPA	Niagara	Station 255 (New Station)	66.40	W	2019	345	345	1	2177	2662	2-795 ACSR
NYPA	Station 255 (New Station)	Rochester	3.80	W	2019	345	345	1	2177	2662	2-795 ACSR
NYPA	Dysinger Tap	Rochester	-44.00	W	2019	345	345	1	2177	2662	2-795 ACSR
NYPA	Dysinger Tap	Station 255 (New Station)	40.20	W	2019	345	345	1	2177	2662	2-795 ACSR
NYPA	Station 255 (New Station)	Rochester	3.80	W	2019	345	345	1	2177	2662	2-795 ACSR
NYSEG	Meyer	Meyer	xfmr	S	2019	115/34.5	115/34.5	2	59.2MVA	66.9MVA	Transformer #2
RGE	Station 168	Mortimer (NG Trunk #2)	26.4	S	2019	115	115	1	145 MVA	176 MVA	Station 168 Reinforcement Project
RGE	Station 168	Elbridge (NG Trunk # 6)	45.5	S	2019	115	115	1	145 MVA	176 MVA	Station 168 Reinforcement Project
RGE	Station 255 (New Station)	Rochester	3.80	W	2019	345	345	1	2177	2662	2-795 ACSR
RGE	Station 255 (New Station)	Station 255 (New Station)	xfmr	W	2019	345/115	345/115	1	400 MVA	450 MVA	Transformer
CHGE	St. Pool	High Falls	5.61	S	2020	115	115	1	1010	1245	1-795 ACSR
CHGE	High Falls	Kerhonkson	10.03	S	2020	115	115	1	1010	1245	1-795 ACSR
CHGE	Modena	Galeville	4.62	S	2020	115	115	1	1010	1245	1-795 ACSR
CHGE	Galeville	Kerhonkson	8.96	S	2020	115	115	1	1010	1245	1-795 ACSR
NGRID	Gardenville	Dunkirk	20.5	S	2020	115	115	2	1105	1346	Replace 20.5 miles of 141 and 142 lines
RGE	Station 255 (New Station)	Station 418	9.60	W	2020	115	115	1	1506	1807	New 115kV Line
RGE	Station 255 (New Station)	Station 23	11.10	W	2020	115	115	1	1506	1807	New 115kV Line
RGE	Station 255 (New Station)	Station 255 (New Station)	xfmr	W	2020	345/115	345/115	2	400 MVA	450 MVA	Transformer
O & R	Montvale (RECO)	-	Cap Bank	S	2022	69	69	1	32 MVAR	32 MVAR	Capacitor bank

D-2.2 Emergency Thermal Transfer Limit Analysis

The NYISO performed analyses of the RNA Base Cases to determine emergency thermal transfer limits for the key interfaces to be used in the MARS resource adequacy analysis. **Table D2-3** reports the emergency thermal transfer limits for the RNA base system conditions:

Table D2-3: Emergency Thermal Transfer Limits

Interface	2017		2021	
Dysinger East	1700	1	1700	1
Volney East	5650	2	5650	2
Moses South	2650	3	2650	3
Central East MARS	4425	4	4475	4
F to G	3475	5	3475	5
UPNY-SENY MARS	5500	6	5600	6
I to J	4400	7	4400	7
I to K (Y49/Y50)	1190	8	1190	8

Limiting Facility		Rating	Contingency
1	Packard - Huntley 230kV (77)	746	Niagara - Packard 230kV Packard 230/115kV BK 3 Packard - Huntley 230kV (78)
2	Oakdale - Fraser 345kV	1380	Edic - Fraser 345kV
3	Marcy 765/345kV T2 transformer	1971	Marcy 765/345kV T1
4	Porter - Rotterdam 230kV (30)	560	Porter - Rotterdam 230kV (31)
5	New Scotland-Leeds 345kV	1724	New Scotland-Leeds 345kV
6	Leeds-Pleasant Valley 345 kV	1725	Athens-Pleasant Valley 345 kV
7	Mott Haven-Rainey 345 kV	786	Pre-disturbance
8	Shore Rd - Glenwood So 138 kV	358	Sprain Brook - E.G.C. 345 kV (Y49)

Table D2-4: Dynamic Limit Tables

Year	Interface	Oswego Complex Units*				
		All available	Any 1 out	Any 2 out	Any 3 out	Any 4 (or more) out
All	Central East MARS	3050	2990	2885	2770	2645
	CE Group	4925	4840	4685	4510	4310

* 9 Mile Point 1, 9 Mile Point 2, Oswego 5, Oswego 6, Independence (Modeled as one unit in MARS)

Year	Interface	Barrett Steam units (1 and 2)		
		Both available	Any 1 out	Both out
All	LI Sum	120	91	-67
	CE-LIPA (towards Zone J)	505	390	236

Year	Interface	Northport Units	
		All available	Any out
All	Norwalk CT to K (NNC)	70	369

D-3 2016 RNA MARS Model Base Case Development

The system representation for PJM, Ontario, New England, and Hydro Quebec modeled in the 2016 RNA Base Case was developed from the NPCC CP-8 2014 Summer Assessment. To avoid overdependence on emergency assistance from the external areas, the emergency operating procedure data was removed from the model for each external area. In addition, the capacity of the external areas was further modified such that the LOLE value of each external area was a minimum value of 0.10 and capped at a value of 0.15 through the year 10 (2026). The external area model was then frozen for the remaining study years (2017–2026). Because the load forecast in the NYCA continues to increase for the years 2017–2026, the LOLE for each of the external areas can experience increases despite the freeze of external loads and capacity.

The topology used in the MARS model preliminary RNA Base Case is represented in **Figures D-1**, **D-2**, and **D-3**. The topology used for the final RNA Base Case resource adequacy results is located in Figures 5-2 to 5-4 in the body of the report. The changes in the NYCA topology from the preliminary to the final RNA Base Case reflect LIPA's ratings re-calculation. The internal transfer limits modeled are the summer emergency ratings derived from the RNA Power Flow cases discussed above. The external transfer limits are developed from the NPCC CP-8 Summer Assessment MARS database with changes based upon the RNA Base Case assumptions.

Figure D-1: MARS Preliminary Base Case Topology for Year 1 (2017)

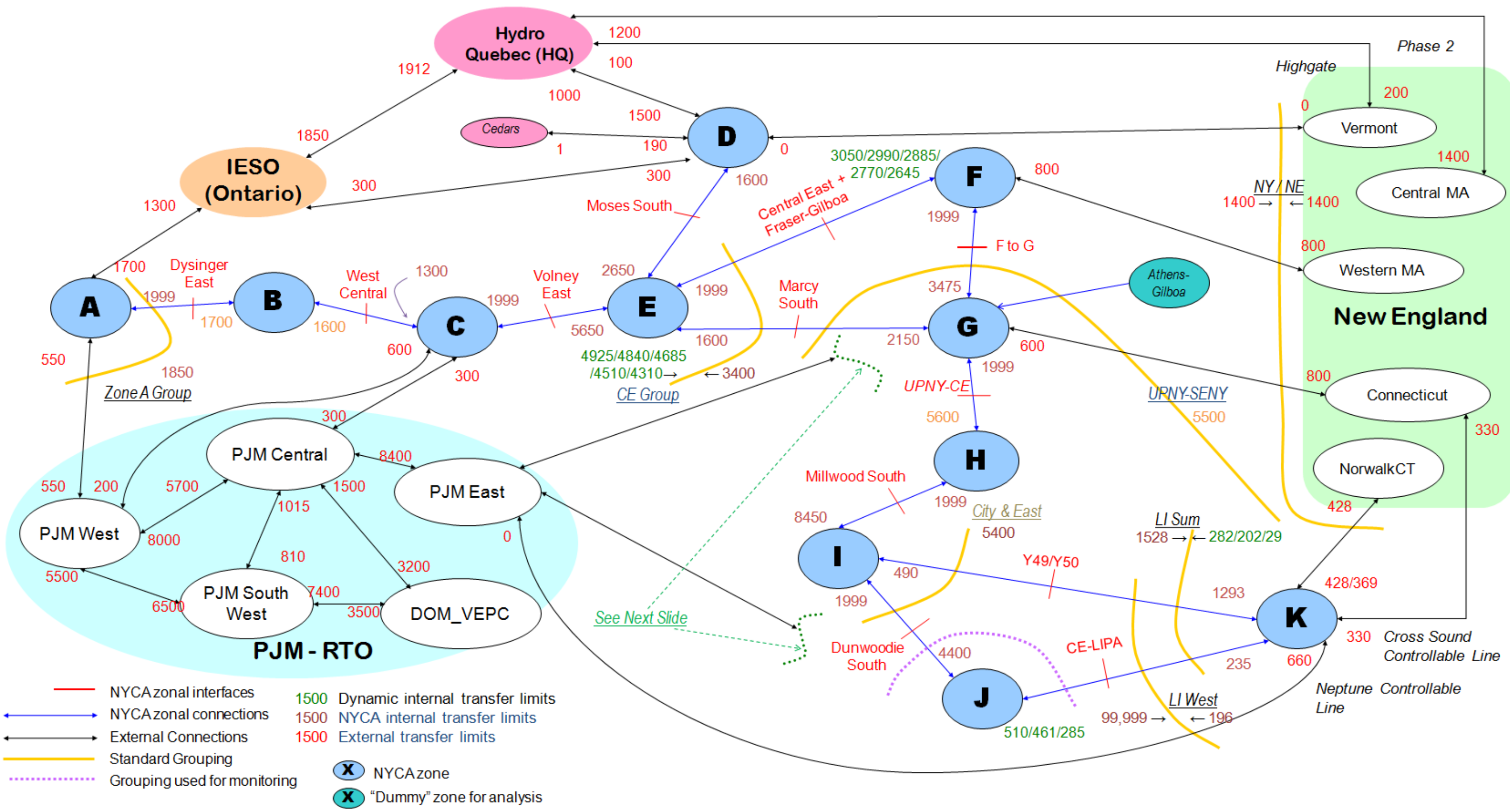


Figure D-2: NYCA MARS Preliminary Base Case Topology for Year 2 through 10 (2018-2026)

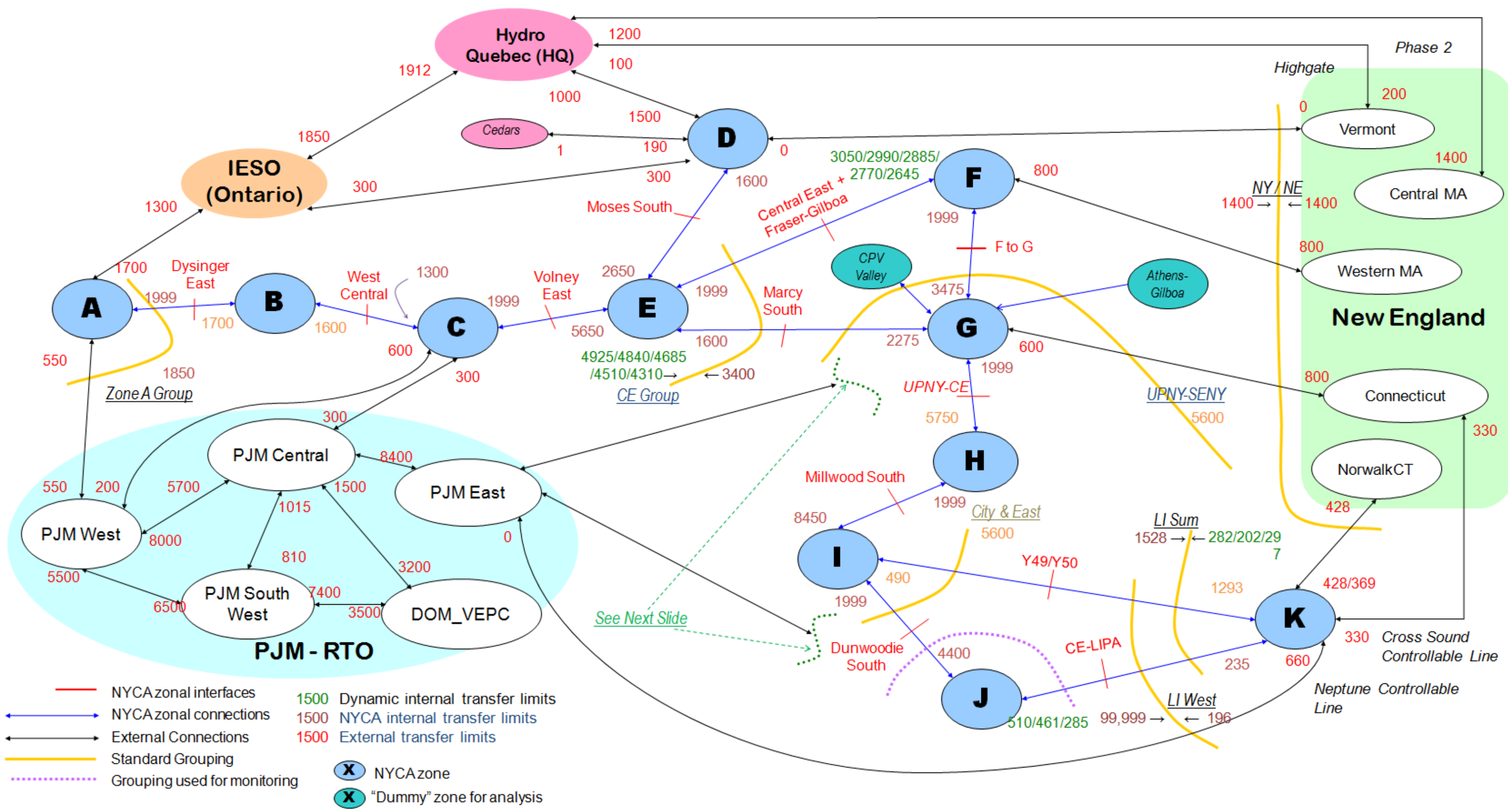
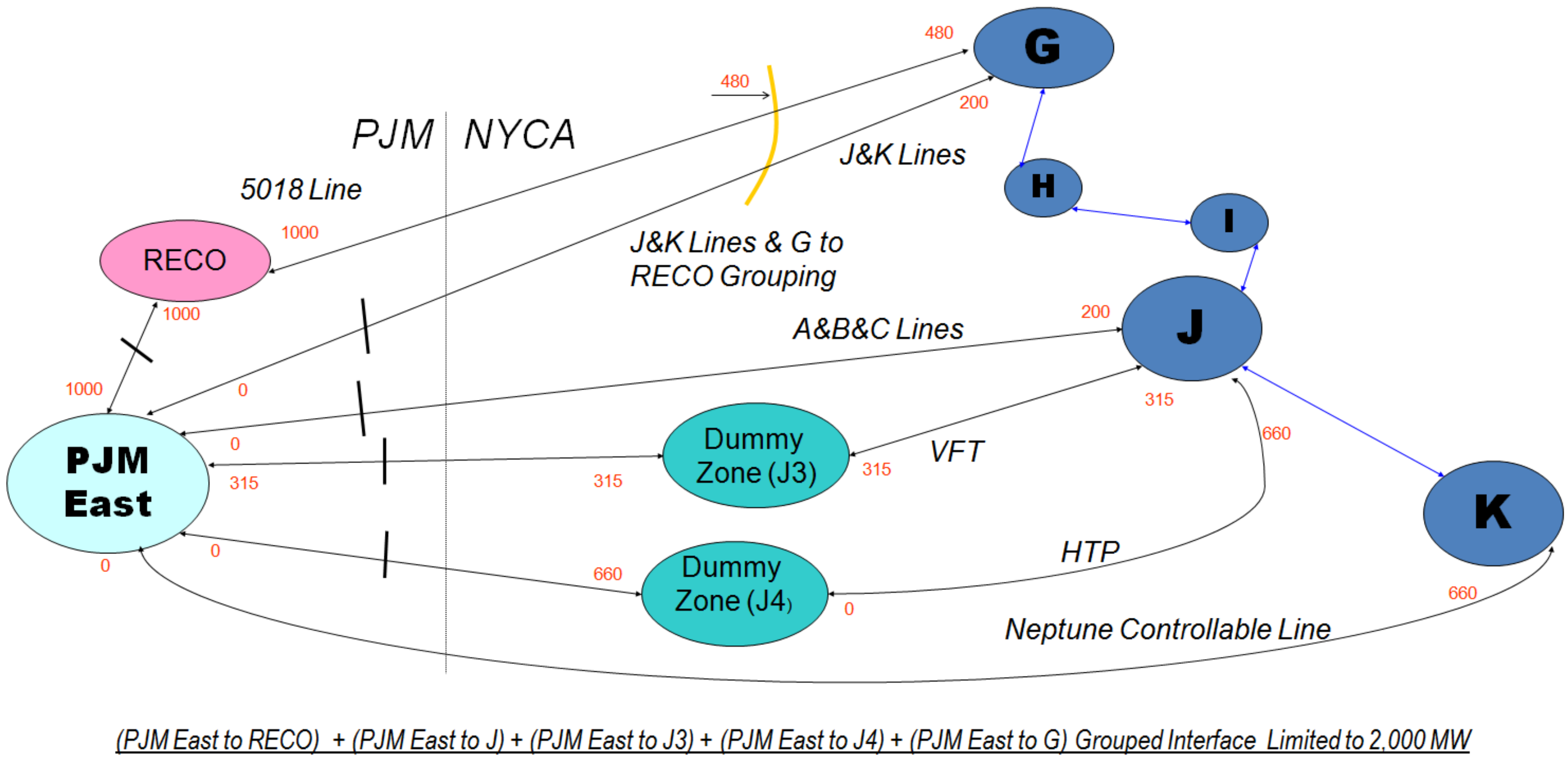


Figure D-3: PJM SENY Detail MARS Topology for Year 1 through 10 (2017-2026)



D-4 Short Circuit Assessment

Table D-4 provides the results of NYISO's short circuit screening test. Individual breaker assessment (IBA) is required for any breakers whose rating is exceeded by the maximum fault current. Either NYISO or the Transmission Owner may complete the IBA.

Table D-4: 2014 RNA Fault Current Analysis Summary Table

Substation	Nominal kV	Lowest Rated Circuit Breaker	TO Number	2016 RNA Maximum Bus Fault	IBA Required	Breaker(s) Overdutied
Academy	345	63	2	32.9	N	N
ADIRONDACK	230	25	5	9.4	N	N
AES SOMERSET	345	40	4	17.5	N	N
ALPS	345	40	5	17.6	N	N
AST-EAST-E	138	63	2	56.7	N	N
AST-EAST-W	138	63	2	56.7	N	N
AST-WEST-N	138	45	2	44.3	N	N
AST-WEST-S	138	45	2	44.3	N	N
AstoriaAnnex	345	63	7	46.7	N	N
ATHENS	345	48.7	5	34.7	N	N
BARRETT2	138	57.8	3	48.7	N	N
BAYONNE 345	345	50	2	24.6	N	N
BOONVILLE	115	29.7	5	10.8	N	N
BOWLINE 2	345	40	6	28.0	N	N
BOWLINE1	345	40	6	28.2	N	N
BRKHAVEN	138	37	3	26.8	N	N
BUCHAN N	345	63	2	30.2	N	N
BUCHAN S	345	63	2	39.7	N	N
BUCHANAN	138	40	2	15.7	N	N
C.ISLIP	138	38.9	3	28.2	N	N
CANANDAIGUA	230	40	4	6.4	N	N
CARLE PL	138	63	3	41.2	N	N
CHASES LAKE	230	40	5	8.9	N	N
CLARKS CNRS	115	40	4	17.4	N	N
CLARKS CNRS	345	40	4	11.4	N	N
CLAY	115	44.4	5	37.1	N	N
CLAY	345	49	5	31.4	N	N
COOPERS CRN	345	40	4	19.0	N	N
COOPERS CRN4	115	22.636	4	20.1	N	N
COOPERS CRN8	115	22.636	4	20.1	N	N

Substation	Nominal kV	Lowest Rated Circuit Breaker	TO Number	2016 RNA Maximum Bus Fault	IBA Required	Breaker(s) Overdutied
CORONA N.	138	63	2	56.3	N	N
CORONA S.	138	63	2	56.3	N	N
DEWITT	115	63	5	28.6	N	N
DEWITT	345	39.9	5	18.3	N	N
DUFFY AVE	345	63	3	8.5	N	N
Duley	230	40	7	7.3	N	N
DUN NO	138	40	2	34.6	N	N
DUN SO	138	40	2	30.7	N	N
DUNKIRK	230	29.5	5	9.6	N	N
DUNWOODIE	345	63	2	51.4	N	N
E 13 ST	138	63	2	47.7	N	N
E FISHKILL	115	40	9	24.7	N	N
E FISHKILL	345	50	2	40.7	N	N
E15ST 46	345	63	2	54.8	N	N
EASTOVER	230	50	5	10.7	N	N
EASTOVER N	115	50	5	24.8	N	N
EASTVIEW	138	63	2	37.1	N	N
EDIC	345	40	5	32.7	N	N
EGC PAR	345	63	7	25.6	N	N
EGC-1	138	80	3	70.4	N	N
EGC-2	138	80	3	70.4	N	N
ELBRIDGE	115	63	5	26.6	N	N
ELBRIDGE	345	39.9	5	15.7	N	N
ELWOOD 1	138	63	3	38.4	N	N
ELWOOD 2	138	63	3	38.1	N	N
FARRAGUT	345	63	2	60.5	N	N
FITZPATRICK	345	37	7	38.0	Y	N
FIVE MILE RD	115	39.7	5	12.8	N	N
FIVE MILE RD	345	40	5	5.8	N	N
FR KILLS	138	40	2	36.1	N	N
FR KILLS	345	63	2	27.2	N	N
FRASER	115	40	4	18.8	N	N
FRASER	345	40	4	19.1	N	N
FREEPORT	138	63	3	35.9	N	N
GARDEN (NM)	34.5	21	5	13.8	N	N
GARDEN BS3	115	39.9	5	33.3	N	N
GARDEN BS4	115	39.9	5	33.4	N	N
GARDEN BS5-7	115	39.9	5	33.5	N	N

Substation	Nominal kV	Lowest Rated Circuit Breaker	TO Number	2016 RNA Maximum Bus Fault	IBA Required	Breaker(s) Overdutied
GARDEN BS6-8	115	39.9	5	33.5	N	N
GARDENVILLE1	230	30.859	5	18.8	N	N
GILBOA 345	345	50	7	25.1	N	N
GLNWD NO	138	63	3	45.1	N	N
GLNWD SO	138	63	3	44.6	N	N
GOETHL N	345	63	2	29.6	N	N
GOETHL S	345	63	2	29.6	N	N
GOW N	345	63	2	28.3	N	N
GOW S	345	63	2	28.3	N	N
GREENLWN	138	63	3	29.1	N	N
HAUPAGUE	138	63	3	22.0	N	N
High Sheldon	230	40	4	10.0	N	N
HILLSIDE #4	115	21.0555	4	18.2	N	N
HILLSIDE #8	115	21.0555	4	18.2	N	N
HILLSIDE 230	230	28.6	4	13.7	N	N
HILLSIDE#4	34.5	21.6842	4	17.8	N	N
HOLBROOK	138	57.8	3	48.6	N	N
HOLTSGT-NYPA	138	63	3	53.4	N	N
HUNTLEY 68	230	31.8	5	17.1	N	N
HUNTLEY 70	230	31.8	5	17.1	N	N
HURLEY	345	40	9	19.0	N	N
HURLEY AVE	115	37.867	9	18.9	N	N
INDEPENDENCE	345	41.9	5	36.2	N	N
JAMAICA	138	63	2	49.7	N	N
LADENTOWN	345	63	6	41.4	N	N
LAFAYETTE	345	40	5	17.3	N	N
LCST GRV	138	63	3	39.7	N	N
LEEDS	345	36.6	5	35.4	N	N
LHH WHITE	115	38.1	5	10.5	N	N
LKSUCS P	138	63	3	32.4	N	N
MARCY 345	345	63	7	32.0	N	N
MARCY 765	765	63	7	9.7	N	N
MASSENA 765	765	63	7	8.1	N	N
MEYER	34.5	21.6842	4	10.9	N	N
MEYER	115	18.888	4	10.7	N	N
MEYER	230	40	4	7.0	N	N
MIDDLETN TAP	345	63	7	19.9	N	N
MILLR PL	138	63	3	14.7	N	N

Substation	Nominal kV	Lowest Rated Circuit Breaker	TO Number	2016 RNA Maximum Bus Fault	IBA Required	Breaker(s) Overdutied
MILLWOOD	138	40	2	19.4	N	N
MILLWOOD	345	63	2	45.6	N	N
MOTT HAVEN	345	63	2	50.0	N	N
NEWBRID	138	80	3	69.1	N	N
NEWBRIDG	345	57.3	3	8.6	N	N
NIAGARA 345	345	63	7	33.1	N	N
NIAGRA E 115	115	50	7	36.8	N	N
NIAGRA E 230	230	63	7	53.5	N	N
NIAGRA W 115	115	50	7	26.8	N	N
NIAGRA W 230	230	63	7	53.5	N	N
NMP#1	345	50	5	40.2	N	N
NMP#2	345	50	5	40.8	N	N
NRTHPRT1	138	63	3	59.8	N	N
NRTHPRT1-2	138	63	3	59.9	N	N
NRTHPRT2	138	63	3	59.9	N	N
NRTHPRT3	138	63	3	44.3	N	N
NRTHPRT4	138	63	3	44.2	N	N
NSCOT 77B	345	38.8	5	31.5	N	N
NSCOT 99B	345	38.8	5	31.5	N	N
NSCOT33	115	63	5	46.6	N	N
NSCOT77	115	63	5	46.6	N	N
NSCOT99	115	63	5	46.6	N	N
OAKDALE	34.5	22.9543	4	19.4	N	N
OAKDALE	115	40	4	26.8	N	N
OAKDALE 345	345	40	4	12.5	N	N
OAKWOOD	138	57.8	3	28.2	N	N
ONEIDA EAST	115	28.4	5	14.9	N	N
ONEIDA WEST	115	28.4	5	14.9	N	N
OSWEGO	345	40.6	5	31.4	N	N
OSWEGO M3	115	40	5	21.1	N	N
PACKARD 2&3	230	47.8	5	39.6	N	N
PACKARD 4&5	230	47.8	5	39.6	N	N
PACKARD 6	230	47.8	5	39.7	N	N
PACKARD NRTH	115	63	5	29.0	N	N
PACKARD STH	115	63	5	24.9	N	N
Patnode	230	63	7	9.2	N	N
PILGRIM	138	63	3	59.5	N	N
PLATTSBURGH	115	25	7	17.0	N	N

Substation	Nominal kV	Lowest Rated Circuit Breaker	TO Number	2016 RNA Maximum Bus Fault	IBA Required	Breaker(s) Overdutied
PLEASANT VAL	115	38.012	9	28.0	N	N
PLEASANT VAL	345	63	2	41.9	N	N
PORTER	115	55.5	5	41.3	N	N
PORTER	230	21	5	19.5	N	N
PT JEFF	138	63	3	32.1	N	N
PVILLE-1	345	63	2	22.0	N	N
PVILLE-2	345	63	2	22.2	N	N
RAINEY	345	63	2	56.7	N	N
RAMAPO	345	63	2	46.8	N	N
REYNOLDS	345	40	5	14.9	N	N
REYNOLDS RD	115	43	5	38.1	N	N
RIVERHD	138	63	3	17.4	N	N
RNKNKOMA	138	63	3	36.5	N	N
ROBINSON RD.	34.5	21.8944	4	16.9	N	N
ROBINSON RD.	115	37.8639	4	18.5	N	N
ROBINSON RD.	230	43	4	14.0	N	N
ROCK TAV	115	43.203	9	25.8	N	N
ROCK TAVERN	345	63	9	35.0	N	N
Roseton	345	63	9	37.2	N	N
ROSLYN	138	63	3	30.9	N	N
ROTTERDAM66H	230	39.9	5	13.6	N	N
ROTTERDAM77H	230	23.6	5	13.5	N	N
ROTTERDAM99H	230	23.2	5	13.6	N	N
RULND RD	138	63	3	45.8	N	N
Ryan	230	40	7	10.4	N	N
S OSWEGO	115	39.2	5	20.6	N	N
S RIPLEY	230	40	5	10.3	N	N
S013A	115	40	8	18.1	N	N
S080 345kV	345	40	8	16.5	N	N
S080 922	115	40	8	16.0	N	N
S082 B2	115	40	8	34.6	N	N
S082 B3	115	40	8	34.5	N	N
S122	345	40	8	15.9	N	N
S122 925	115	40	8	32.4	N	N
S255	115	40	8	20.2	N	N

Substation	Nominal kV	Lowest Rated Circuit Breaker	TO Number	2016 RNA Maximum Bus Fault	IBA Required	Breaker(s) Overdutied
S255	345	40	8	16.3	N	N
SB TR N7	138	63	2	27.0	N	N
SB TR S6	138	63	2	29.2	N	N
SCHUYLER	115	36	5	15.4	N	N
SCRIBA	345	48.3	5	43.1	N	N
SCRIBA C	115	40	5	10.4	N	N
SCRIBA D	115	40	5	10.3	N	N
SHORE RD	345	63	3	28.0	N	N
SHORE RD1	138	57.8	3	48.3	N	N
SHORE RD2	138	57.8	3	48.3	N	N
SHOREHAM1	138	52.2	3	27.7	N	N
SHOREHAM2	138	52.2	3	27.7	N	N
SILLS RD1	138	63	3	31.7	N	N
SMAH	138	40	237	27.3	N	N
SPRN BRK	345	63	2	52.7	N	N
ST LAWRN 115	115	46.3	7	40.8	N	N
ST LAWRN 230	230	33.1	7	31.9	N	N
STOLLE	115	23.9068	4	15.5	N	N
STOLLE ROAD	230	40	4	13.3	N	N
STOLLE ROAD	345	40	4	4.7	N	N
STONEYRIDGE	230	40	4	7.1	N	N
STONY CREEK	230	40	4	8.9	N	N
SUGLF 345TAP	345	63	9	27.5	N	N
SYOSSET	138	63	3	34.1	N	N
TEALL	115	40	5	25.9	N	N
TERMINAL	115	28.4	5	17.0	N	N
TREMNT11	138	63	2	42.9	N	N
TREMNT12	138	63	2	42.8	N	N
TX9	138	50	2	13.4	N	N
VALLEY	115	40	5	8.4	N	N
VERNON E	138	63	2	43.9	N	N
VERNON W	138	63	2	34.8	N	N
VLY STRM1	138	63	3	53.7	N	N
VLY STRM2	138	63	3	53.9	N	N
VOLNEY	345	44.8	5	34.5	N	N
W 49 ST	345	63	2	51.8	N	N
WADNGRV1	138	56.4	3	25.8	N	N
WATERCURE230	230	40	4	13.7	N	N

Substation	Nominal kV	Lowest Rated Circuit Breaker	TO Number	2016 RNA Maximum Bus Fault	IBA Required	Breaker(s) Overdutied
WATERCURE345	345	40	4	9.1	N	N
WATKINS	115	40	5	8.7	N	N
Wethersfield	230	40	4	8.7	N	N
WHAV	138	40	6	30.7	N	N
WILDWOOD	138	63	3	27.6	N	N
WILLIS 230	230	33.1	7	12.4	N	N
WOOD ST.	115	40	4	20.0	N	N
WOODARD	115	35.7	5	15.5	N	N
YAHNUNDASIS	115	25.1	5	10.5	N	N

Table D-5 provides the results of NYISO's IBA for FitzPatrick 345kV.

Table D-5: NYISO IBA for 2016 RNA Study

Bus Number	Bus	Breaker	Interrupting Breaker Capacity (A)	Maximum Interrupting Fault Duty (A)	Breaker Overstressed
147830	FITZPATRICK	10052	37000	4177	NO
147830	FITZPATRICK	10042	37000	32840	NO

D-6 Transmission Security Violations of the 2014 RNA Base Case

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
A	N. Grid	Packard-Huntley (#77) 230	556	644	746	STOLLRD - GARDENVILL 230 66	PACKARD 230/115 3TR	100.31	-	-
A	N. Grid	Packard-Huntley (#77) 230	556	644	746	STOLLRD - GARDENVILL 230 66	SB:PA230_R3230	100.27	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	LN:115:182N	T:77&78	106.37	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	LN:115:182S	T:77&78	105.9	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	LN:115:180	T:77&78	104.32	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 77 230	SB:PA230_R3230	103.56	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 77 230	PACKARD 230/115 3TR	103.54	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 77 230	SB:PA230_R0306	103.51	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 78 230	SB:PA230_R3430	101	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 78 230	PACKARD 230/115 4TR	100.95	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 78 230	SB:PA230_R506	100.93	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 78 230	SB:HUNT230_R1302	100.69	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 78 230	PACKARD - HUNTLEY 230 77	100.67	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 78 230	T:77&78	100.67	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 77 230	SB:HUNT230_R1502	100.65	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 78 230	OE:PACK_77	100.65	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 77 230	PACKARD - HUNTLEY 230 78	100.62	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 77 230	T:77&78	100.62	-	-
A	NYSEG	Stolle-Gardenville (#66) 230	474 534	478 615	478 705	N10 PACKARD - HUNTLEY 77 230	OE:PACK_78	100.58	-	-
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#1) 345	1195 1301	1195 1501	1195 1685	STOLLRD - GARDENVILL 230 66	SB:CLAY345_R20	103.2	-	-
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#1) 345	1195 1301	1195 1501	1195 1685	STOLLRD - GARDENVILL 230 66	PANL - CLAY 345 2	102.05	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#1) 345	1195 1301	1195 1501	1195 1685	STOLLRD - GARDENVILL 230 66	SB:CLAY345_R935	101.61	-	-
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#1) 345	1195 1301	1195 1501	1195 1685	N10 PACKARD - HUNTLEY 77 230	SB:CLAY345_R20	100.85	-	-
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#1) 345	1195 1301	1195 1501	1195 1685	N10 PACKARD - HUNTLEY 78 230	SB:CLAY345_R20	100.19	-	-
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#2) 345	1195 1301	1195 1501	1195 1685	STOLLRD - GARDENVILL 230 66	SB:CLAY345_R10	103.34	-	-
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#2) 345	1195 1301	1195 1501	1195 1685	STOLLRD - GARDENVILL 230 66	PANL - CLAY 345 1	102.19	-	-
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#2) 345	1195 1301	1195 1501	1195 1685	STOLLRD - GARDENVILL 230 66	SB:CLAY345_R945	101.76	-	-
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#2) 345	1195 1301	1195 1501	1195 1685	N10 PACKARD - HUNTLEY 77 230	SB:CLAY345_R10	100.99	-	-
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#2) 345	1195 1301	1195 1501	1195 1685	N10 PACKARD - HUNTLEY 78 230	SB:CLAY345_R10	100.32	-	-
B/C	NYPA, RG&E, N. Grid	Clay-Pannell (#2) 345	1195 1301	1195 1501	1195 1685	STOLLRD - GARDENVILL 230 66	SB:PANN345_3808	100.12	-	-
C	N. Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116 220	120 252	145 280	CLAY - DEW 345 13	OS - EL - LFYTE 345 17	108.9	-	-
C	N. Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116 220	120 252	145 280	CLAY - DEW 345 13	T:17&11	108.73	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
C	N. Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116 220	120 252	145 280	OS - EL - LFYTE 345 17	CLAY - DEW 345 13	107.7	-	-
C	N. Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116 220	120 252	145 280	OS - EL - LFYTE 345 17	SB:CLAY345_R925	105.83	-	-
C	N. Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116 220	120 252	145 280	CLAY - TEAL 10 115	SB:DEWI345_R220	103.19	-	-
C	N. Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116 220	120 252	145 280	CLAY - TEAL 10 115	SB:DEWI345_R915	103.18	-	-
C	N. Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116 220	120 252	145 280	CLAY - TEAL 10 115	SB:DEWI345_R130	103.17	-	-
C	N. Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116 220	120 252	145 280	CLAY - TEAL 10 115	DEWITT 345/115 2TR	100.61	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	CLAY - TEAL 11 115	SB:DEWI345_R220	106.69	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	CLAY - TEAL 11 115	SB:DEWI345_R915	106.68	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	CLAY - DEW 3 115	SB:DEWI345_R220	106.67	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	CLAY - TEAL 11 115	SB:DEWI345_R130	106.66	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	CLAY - DEW 3 115	SB:DEWI345_R915	106.65	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	CLAY - DEW 3 115	SB:DEWI345_R130	106.64	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	CLAY - DEW 3 115	DEWITT 345/115 2TR	104.01	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	CLAY - TEAL 11 115	DEWITT 345/115 2TR	103.32	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	DEWITT 345/115 2TR	CLAY - TEAL 11 115	102.64	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	DEWITT 345/115 2TR	SB:CLAY115_R865	101.27	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	DEWITT 345/115 2TR	SB:CLAY115_R110	101.06	-	-
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	CLAY - DEW 345 13	OS - EL - LFYTE 345 17	100.52	-	-
C	NYSGE	Oakdale 345/115 2TR	428	556	600	N10 PACKARD - HUNTLEY 77 230	SB:OAKD345_31-B322	101.77	102.75	107.24
C	NYSGE	Oakdale 345/115 2TR	428	556	600	N10 PACKARD - HUNTLEY 78 230	SB:OAKD345_31-B322	100.77	102.78	107.26
C	NYSGE	Oakdale 345/115 2TR	428	556	600	STOLLRD - GARDENVILL 230 66	SB:OAKD345_31-B322	101.12	102.6	106.5
C	NYSGE	Oakdale 345/115 2TR	428	556	600	ROBINSON - STOLLRD 230 65	SB:OAKD345_31-B322	-	100.48	105.73
C	NYSGE	Oakdale 345/115 2TR	428	556	600	NIAGARA - ROBINSON 345 64	SB:OAKD345_31-B322	-	-	101.8
C	NYSGE	Oakdale 345/115 2TR	428	556	600	FRASER 345/115 2TR	SB:OAKD345_31-B322	-	-	101.39
D	N. Grid	Porter-Oneida (#7) 115 (Power-W. Utica)	116	120	145	PORTER - YAHNUNDASIS 115	SB:OSWE_R985	102.74	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
D	N. Grid	Porter-Oneida (#7) 115 (Power-W. Utica)	116	120	145	STOLLRD - GARDENVILL 230 66	B:PORTER115C	100.27	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	B:PORTER115D	115.94	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	PORTER - ONEIDA 115	SB:OSWE_R985	113.64	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	N10 PACKARD - HUNTLEY 78 230	B:PORTER115D	113.06	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	N10 PACKARD - HUNTLEY 77 230	B:PORTER115D	112.57	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	PORTER - ONEIDA 115	110.22	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	DEWITT 345/115 2TR	B:PORTER115D	110.06	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	ROBINSON - STOLLRD 230 65	B:PORTER115D	107.66	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	N10 PACKARD - HUNTLEY 78 230	PORTER - ONEIDA 115	107.41	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	OSWEGO - VOLNEY 345 12	B:PORTER115D	107.22	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	N10 PACKARD - HUNTLEY 77 230	PORTER - ONEIDA 115	107.21	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	PORTER - ONEIDA 115	SB:DEWI345_R915	107.16	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	PORTER - ONEIDA 115	SB:DEWI345_R220	107.14	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	PORTER - ONEIDA 115	SB:DEWI345_R130	107.13	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	OS - EL - LFYTE 345 17	B:PORTER115D	106.72	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLAY - INDEPNC 345 26	B:PORTER115D	106.08	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	N10 PACKARD - HUNTLEY 78 230	SB:OSWE_R985	105.93	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	NIAGARA - ROBINSON 345 64	B:PORTER115D	105.88	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	N10 PACKARD - HUNTLEY 77 230	SB:OSWE_R985	105.68	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	OSWEGO 345/115 1TR	B:PORTER115D	105.25	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	LN:115:182S	B:PORTER115D	104.97	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	GEN:9MIPT2_LOG08	B:PORTER115D	104.92	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	LN:115:182N	B:PORTER115D	104.8	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLAY - TEAL 11 115	B:PORTER115D	104.53	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLAY 345/115 1TR	B:PORTER115D	104.47	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	GEN:OSWEGO 6	B:PORTER115D	104.43	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	GEN:OSWEGO 5	B:PORTER115D	104.4	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	GEN:KINTIGH_LOG01	B:PORTER115D	104.19	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	PTR TRMNL 115	PTR SCHLR 115	104.03	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	DEWITT 345/115 2TR	PORTER - ONEIDA 115	103.97	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	Porter - Boonville 1 115	B:PORTER115D	103.88	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	PTR WATKINS 115	B:PORTER115D	103.65	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	EDIC - FRASER 345 EF24-40	B:PORTER115D	103.48	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLAY - 9MI1 8 345	B:PORTER115D	103.15	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	ELBRIDGE 345/115 1TR	B:PORTER115D	103.14	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	OS - EL - LFYTE 345 17	SB:CLAY345_R925	103.02	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLAY - DEW 345 13	B:PORTER115D	102.98	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	VE08:L/O OAKDALE-FRASER 345 32	B:PORTER115D	102.9	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	GEN:ESYR	B:PORTER115D	102.81	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	GEN:9MIPT1	B:PORTER115D	102.5	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	PTR SCHLR 115	PTR TRMNL 115	102.42	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	FARRAGUTW - E13ST 345 48/Q35M	B:PORTER115D	102.2	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	ROBINSON - STOLLRD 230 65	PORTER - ONEIDA 115	101.99	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLAY 345/115 2TR	B:PORTER115D	101.93	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	SB:DEWI345_R915	101.78	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	SB:DEWI345_R130	101.77	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	SB:DEWI345_R220	101.77	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	OS - EL - LFYTE 345 17	CLAY - DEW 345 13	101.76	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	OSWEGO - VOLNEY 345 12	PORTER - ONEIDA 115	101.59	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLARKS CORNERS 345/115 BK1	B:PORTER115D	101.43	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLARKS CORNERS 345/115 BK2	B:PORTER115D	101.43	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	SB:FRAS345_32-3362	101.26	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLAY - DEW 345 13	OS - EL - LFYTE 345 17	101.04	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	SB:OSWE_R935	100.99	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	SB:FRAS345_B1-3262	100.99	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	VE08:L/O OAKDALE-FRASER 345 32	100.99	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	SB:OSWE_R965	100.98	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	DEWITT 345/115 2TR	100.95	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	OS - EL - LFYTE 345 17	PORTER - ONEIDA 115	100.91	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	OS - EL - LFYTE 345 17	100.78	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	SB:OAKD345_B3-3222	100.66	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLAY - INDEPNC 345 26	PORTER - ONEIDA 115	100.62	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	SB:OAKD345_32-B222	100.61	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	CLAY - DEW 345 13	T:17&11	100.53	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	SB:LAFAYETTE_VE10	100.46	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	LN:115:182S	SB:OSWE_R985	100.39	-	-

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	1st Contingency	2nd Contingency	2017 Flow (%)	2021 Flow (%)	2026 Flow (%)
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	NIAGARA - ROBINSON 345 64	PORTER - ONEIDA 115	100.31	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	STOLLRD - GARDENVILL 230 66	T:17&11	100.3	-	-
D	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	LN:115:182N	SB:OSWE_R985	100.25	-	-
K	LIPA	East Garden City-Valley Stream (#262) 138	226	285	310	138-291	138-292	105.31	107.12	115.58
K	LIPA	East Garden City-Valley Stream (#262) 138	226	285	310	138-291	5 :VST NEW1	105.29	107.1	115.57
K	LIPA	East Garden City-Valley Stream (#262) 138	226	285	310	138-292	138-291	105.05	106.36	114.78