2016 Reliability Needs Assessment

Focus on Preliminary RNA

New York Independent System Operator

DRAFT REPORT

July xx, 2016

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Executive Summary

To be completed at a later time

1. Introduction

The Reliability Needs Assessment (RNA) is developed by the NYISO in conjunction with Market Participants and all interested parties as the first step in the reliability planning process. The RNA is the foundation study used in the development of the NYISO Comprehensive Reliability Plan (CRP). The RNA is performed to evaluate electric system reliability for both transmission security and resource adequacy over a 10-year study period. If the RNA identifies any violation of Reliability Criteria for Bulk Power Transmission Facilities (BPTF), the NYISO will report a Reliability Need quantified by an amount of compensatory megawatts (MW). After approval of the RNA, the NYISO will request market-based and alternative regulated proposals from interested parties to address the identified Reliability Needs, and designate one or more Responsible Transmission Owners to develop a regulated backstop solution to address each identified Reliability Need. This report sets forth the NYISO's preliminary findings from the 2016 RNA *First* Pass assessment for years 2017 to 2026.

The CRP will provide a plan for continued reliability of the bulk power system during the study period depending on a combination of additional resources. The resources may be provided by market-based solutions being developed in response to market forces and the request for solutions following the approval of this RNA. If the market does not adequately respond, continued reliability will be ensured by either regulated solutions being developed by the TOs which are obligated to provide reliable service to their customers or alternative regulated solutions being developed by others. To maintain the system's long-term reliability, these additional resources must be readily available or in development at the appropriate time to address the specific need. Just as important as the electric system plan is the process of planning itself. Electric system planning is an ongoing process of evaluating, monitoring, and updating as conditions warrant. Along with addressing reliability, the Comprehensive System Planning Process (CSPP) is also designed to provide information that is both informative and of value to the New York wholesale electricity marketplace.

Proposed solutions that are submitted in response to an identified Reliability Need are evaluated in the development of the CRP and must satisfy Reliability Criteria. However, the solutions submitted to the NYISO for evaluation in the CRP do not have to be in the same amounts of MW or locations as the compensatory MW reported in the RNA. There are various combinations of resources and transmission upgrades that could meet the needs identified in the RNA. The reconfiguration of transmission facilities and/or modifications to operating protocols identified in the solution phase could result in changes and/or modifications of the needs identified in the RNA.

This report begins with the recent changes to the CSPP that were implemented since the 2014 RNA and affect the processing of the 2016 RNA. Next, this report summarizes the 2014 CRP findings and prior reliability plans. The report continues with a summary of the load and resource forecast for the next 10 years, the RNA base case assumptions and methodology, and the RNA findings for years 2017 through 2026. Detailed analyses, data and results, and the underlying modeling assumptions are contained in the appendices.

For informational purposes, this RNA report also provides the marketplace with the latest historical information available for the past five years of congestion via a link to the NYISO's website. The 2016 CRP will serves as the foundation for the 2017 Congestion Assessment and Resource Integration Study (CARIS). A more detailed evaluation of system congestion is presented in the CARIS.

2. Overview of CSPP Changes

The NYISO CSPP has undergone substantive process changes since the 2014 RNA. The current CSPP was approved by the Federal Energy Regulatory Commission (FERC) and its requirements are contained in Attachment Y of the NYISO's Open Access Transmission Tariff (OATT). The detailed process of the CSPP is contained in the Reliability Planning Process (RPP) Manual.

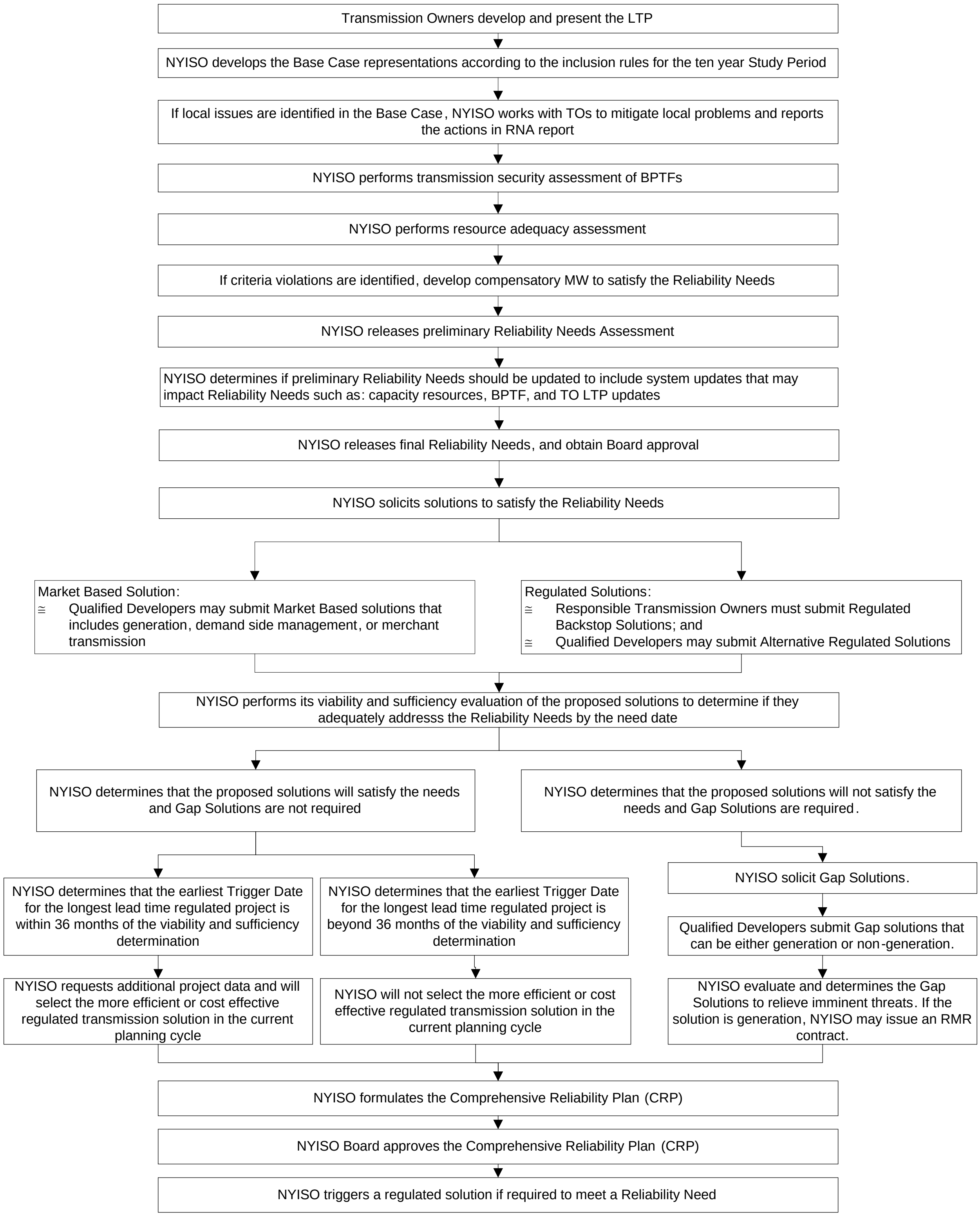
The primary change to the CSPP that affects the processing of the 2016 RNA is the implementation of a two pass process for the identification of Reliability Needs in the RNA. The first pass *("First Pass")* is considered "preliminary" with the NYISO releasing preliminary RNA results and a draft report to the Stakeholders. Thereafter, the NYISO starts the second pass *("Second Pass")* to determine if the preliminary Reliability Needs identified in the *First Pass* should be updated in light of subsequent system updates that may impact those needs. In finalizing the Reliability Needs during the *Second Pass*, system changes that occurred since the initial lock down date of the RNA assumptions matrix will be considered, such as:

- Updates to previously submitted Local Transmission Plans (LTPs) or New York Power Authority (NYPA) plans that have reached a stage of development to be included and that may impact the preliminary Reliability Needs,
- Changes in Bulk Power Transmission Facilities (BPTFs), and
- Change in resources such as generating unit status, load forecast, or demand response that may impact the preliminary Reliability Needs.

If the NYISO determines that the preliminary Reliability Needs identified in the *First Pass* could increase or decrease due to system changes since the initial lock down date, the NYISO will re-establish the base cases with the system updates and re-assess the Reliability Needs during the *Second Pass*. Otherwise, if the NYISO determines that the Reliability Needs would not be impacted, the preliminary Reliability Needs obtained in the *First Pass* would become the final Reliability Needs in the draft RNA report that would be reviewed and approved through the NYISO's stakeholder process.

After the NYISO Board of Directors approves the RNA Report, the NYISO will request updates to previously provided LTPs and NYPA transmission plans before issuing a request for regulated backstop, market-based, and alternative regulated solutions to meet the identified Reliability Needs identified in the RNA. Prior to responding to the RNA, the Responsible Tranmission Owner(s) will report at the Electric System Planning Working Group (ESPWG) and the Transmission Planning Advisory Subcommittee (TPAS) information regarding any updates in its LTPs that could affect the Reliability Needs. Also, NYPA, at the NYISO's request, will similarly report at the ESPWG and TPAS any information about its transmission plans that could affect the Reliability Needs. The NYISO will present at the ESPWG and TPAS updates to its determination under Section 31.2.2.4.2 of Attachment Y to the OATT with respect to the TOs' LTPs. The NYISO will then request solutions to the Reliability Needs with recognition of the updates to the TOs' LTPs and NYPA transmission plans on the Reliability Needs, if any. Developers should use this information in responding to the Reliability Needs, as appropriate. Further details of the RPP, including the CRP and RNA processes, are contained in Appendix X and the NYISO's Reliability Planning Process Manual (Manual 26) located on the NYISO website. An overview of the CRP, including the updated RNA process, is illustrated in Figure 2-1 below.

Figure 2-1: NYISO Comprehensive Reliability Plan Process



3. Summary of Prior CRPs - To be updated for Final report

4. RNA Base Case Assumptions, Drivers, and Methodology

The NYISO has established procedures and a schedule for the collection and submission of data and for the preparation of the models used in the RNA. The NYISO's CSPP procedures are designed to allow its planning activities to be performed in an open and transparent manner under a defined set of rules and to be aligned and coordinated with the related activities of the North American Electric Reliability Council (NERC), the Northeast Power Coordinating Council (NPCC), and the New York State Reliability Council (NYSRC). The assumptions underlying the RNA were reviewed at the Transmission Planning Advisory Subcommittee (TPAS) and the Electric System Planning Working Group (ESPWG) and are shown in Appendix X. The study period analyzed in the 2016 RNA is ten years covering years 2017 through 2026.

This section highlights the key assumptions and modeling data updates that will impact the findings of the RNA. These include: (1) the load model forecast, (2) level of Special Case Resources, (3) the change in generation resource status, (4) Local Transmission Plans, and (5) Bulk Transmission Projects.

Both the security and adequacy studies in the RNA Base Case use a peak demand and energy forecast originating from the baseline forecast reported in the 2016 Gold Book. The baseline forecast includes the impacts of energy efficiency programs, building codes and standards, distributed energy generation, and behind-the-meter solar photovoltaic power (solar PV). The econometric forecast incorporates only the growth due to the economy and does not account for the impacts of the aforementioned programs. For the resource adequacy study, the behind-the-meter solar PV is modeled explicitly as a generation resource to account for the intermittent nature of its availability. As a result, the forecast used for the resource adequacy study is the baseline forecast with the behind-the-meter solar PV forecast MWs added back.

The RNA Base Cases were developed in accordance with NYISO procedures using projections for the installation and deactivation of generation resources and transmission facilities that were developed in conjunction with Market Participants and Transmission Owners. The changes in resources were included in the RNA Base Case using the NYISO 2016 FERC 715 filing as a starting point, adding and removing resources consistent with the base case inclusion screening process provided in the Reliability Planning Process (RPP) Manual. Resources in the NYCA that choose to participate in markets outside of New York are modeled as equivalent contracts, whereby their capacity is removed from the NYCA and reflected in the neighboring market's control area load and capacity balance to meet their modeled LOLE target.

Representations of neighboring systems are derived from interregional coordination conducted under the NPCC, and pursuant to the Northeast ISO/RTO Planning Coordination Protocol.

4.1. Annual Energy and Summer Peak Demand Forecasts

This section reports the baseline forecast, the econometric forecast, the behind-the-meter solar PV forecast, and the baseline forecast with behind-the-meter solar PV added back. These forecasts are all obtained from the 2016 Gold Book. The baseline forecast includes the impacts of energy efficiency, distributed energy resources, and behind-the-meter solar PV. The econometric forecast does not include those impacts. The baseline forecast with solar PV has the behind-the-meter solar PV MW forecast added back to the baseline forecast. This forecast is used for the resource adequacy study where behind-the-meter solar PV is modeled as a generating resource.

The demand-side management impacts included, or accounted for, in the 2016 Base Case forecast are based upon actual and projected spending levels and realization rates for state-sponsored programs such as the Clean Energy Fund and the NY-Sun Initiative. They also include the impacts of building codes and appliance efficiency standards and distributed generation. The NYISO reviewed and discussed with Market Participants, during meetings of the ESPWG and TPAS, projections for the potential impact of energy efficiency, solar PV, and other demand-side management impacts over the 10-year study period. The factors considered in developing the 2016 RNA base case forecast are included in Appendix C.

The assumptions for the 2016 economic growth, energy efficiency program impacts, and behind-the-meter solar PV impacts were also discussed with Market Participants during meetings of the ESPWG and TPAS in March and April of 2016. The ESPWG and TPAS reviewed and discussed the assumptions used in the 2016 RNA base case forecast in accordance with procedures established for the RNA.

The annual average energy growth rate of the basline forecast in the 2016 Gold Book decreased to -0.16%, as compared to 0.16% in the 2014 Gold Book. The 2016 Gold Book's annual average baseline summer peak demand growth decreased to 0.21%, as compared to 0.83% in the 2014 Gold Book. The lower energy growth rate is attributed to both the economy and the continued impact of energy efficiency and behind-the-meter solar PV. While these factors had a smaller impact on summer peak growth than on annual energy growth, peak growth is still expected to be lower in 2016 than it was in 2014. To account for the risk that not all energy efficiency and solar PV impacts will be realized, a high-load growth scenario is modeled.

Table 4-1 below summarizes the three forecasts used in the 2016 RNA. Table 4-1 shows a comparison of the baseline forecasts and energy efficiency program impacts contained in the 2014 RNA and the 2016 RNA. Figure 4-1 and Figure 4-2 present actual, weather-normalized forecasts of annual energy and summer peak demand for the 2016 RNA. Figure 4-3 and Figure 4-4 present the NYISO's projections of annual energy and summer peak demand in the 2016 RNA for energy efficiency, distributed generation, and behind-the-meter solar PV.

Table 4-1: 2016 RNA Econometric, Baseline, and Baseline With SPV Forecasts Added Back In

Econometric, Baseline and Adjusted Energy Forecasts

Annual GWh	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2016 Econometric Forecast	163,243	164,818	166,439	167,715	168,804	169,420	170,548	171,772	172,929	174,016	175,103
2016 Baseline Forecast	159,382	158,713	158,431	158,099	157,700	156,903	156,785	156,795	156,800	156,779	156,777
+ 2016 Solar PV Forecast	1,053	1,450	1,767	2,067	2,355	2,632	2,882	3,124	3,334	3,512	3,661
2016 Baseline With SPV	160,435	160,163	160,198	160,166	160,055	159,535	159,667	159,919	160,134	160,291	160,438

Energy Impacts of Energy Efficiency, Distributed Generation & Solar PV

Cumulative GWh	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Solar PV	1,053	1,450	1,767	2,067	2,355	2,632	2,882	3,124	3,334	3,512	3,661
EE & Distributed Generation	2,808	4,655	6,241	7,549	8,749	9,885	10,881	11,853	12,795	13,725	14,665
Total	3,861	6,105	8,008	9,616	11,104	12,517	13,763	14,977	16,129	17,237	18,326

Econometric, Baseline and Adjusted Summer Peak Forecasts

Summer Peak MW	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2016 Econometric Forecast	34,055	34,533	34,922	35,243	35,487	35,747	36,005	36,261	36,497	36,745	37,018
2016 Baseline Forecast	33,360	33,363	33,404	33,477	33,501	33,555	33,650	33,748	33,833	33,926	34,056
+ 2016 Solar PV Forecast	258	363	421	471	518	565	606	645	682	720	747
2016 Baseline With SPV	33,618	33,726	33,825	33,948	34,019	34,120	34,256	34,393	34,515	34,646	34,803

Summer Peak Demand Impacts of Energy Efficiency, Distributed Generation & Solar PV

Cumulative MW	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Solar PV	258	363	421	471	518	565	606	645	682	720	747
EE & Distributed Generation	437	807	1,097	1,295	1,468	1,627	1,749	1,868	1,982	2,099	2,215
Total	695	1,170	1,518	1,766	1,986	2,192	2,355	2,513	2,664	2,819	2,962

Table 4-2: Comparison of 2014 RNA & 2016 Baseline Forecasts

Comparison of Baseline Energy Forecasts - 2014 & 2016 RNA (GWh)

Annual GWh	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2014 RNA Baseline	163,161	163,214	163,907	163,604	163,753	164,305	165,101	164,830	164,975	165,109	165,721		
2016 RNA Baseline			160,435	160,163	160,198	160,166	160,055	159,535	159,667	159,919	160,134	160,291	160,438
Change from 2014 RNA			-3,472	-3,441	-3,555	-4,139	-5,046	-5,295	-5,308	-5,190	-5,587	NA	NA

Comparison of Baseline Peak Forecasts - 2014 & 2016 RNA (MW)

Annual MW	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2014 RNA Baseline	33,666	34,066	34,412	34,766	35,111	35,454	35,656	35,890	36,127	36,369	36,580		
2016 RNA Baseline			33,360	33,363	33,404	33,477	33,501	33,555	33,650	33,748	33,833	33,926	34,056
Change from 2014 RNA			-1,052	-1,403	-1,707	-1,977	-2,155	-2,335	-2,477	-2,621	-2,747	NA	NA

Comparison of Energy Impacts from Statewide Energy Efficiency & Distributed Generation - 2014 RNA & 2016 RNA (GWh)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2014 RNA Baseline	1,361	3,096	4,637	5,933	6,987	7,993	8,977	9,879	10,766	11,646	12,513		
2016 RNA Baseline			2,808	4,655	6,241	7,549	8,749	9,885	10,881	11,853	12,795	13,725	14,665
Change from 2014 RNA			-1,829	-1,278	-746	-444	-228	6	115	207	282	NA	NA

Comparison of Peak Impacts from Statewide Energy Efficiency & Distributed Energy - 2014 RNA & 2016 RNA (MW)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2014 RNA Baseline	224	491	748	925	1,091	1,243	1,401	1,545	1,690	1,832	2,079		
2016 RNA Baseline			437	807	1,097	1,295	1,468	1,627	1,749	1,868	1,982	2,099	2,215
Change from 2014 RNA			-311	-118	6	52	67	82	59	36	-97	NA	NA

Figure 4-1: 2016 Econometric, Baseline and Baseline With SPV Energy Forecasts

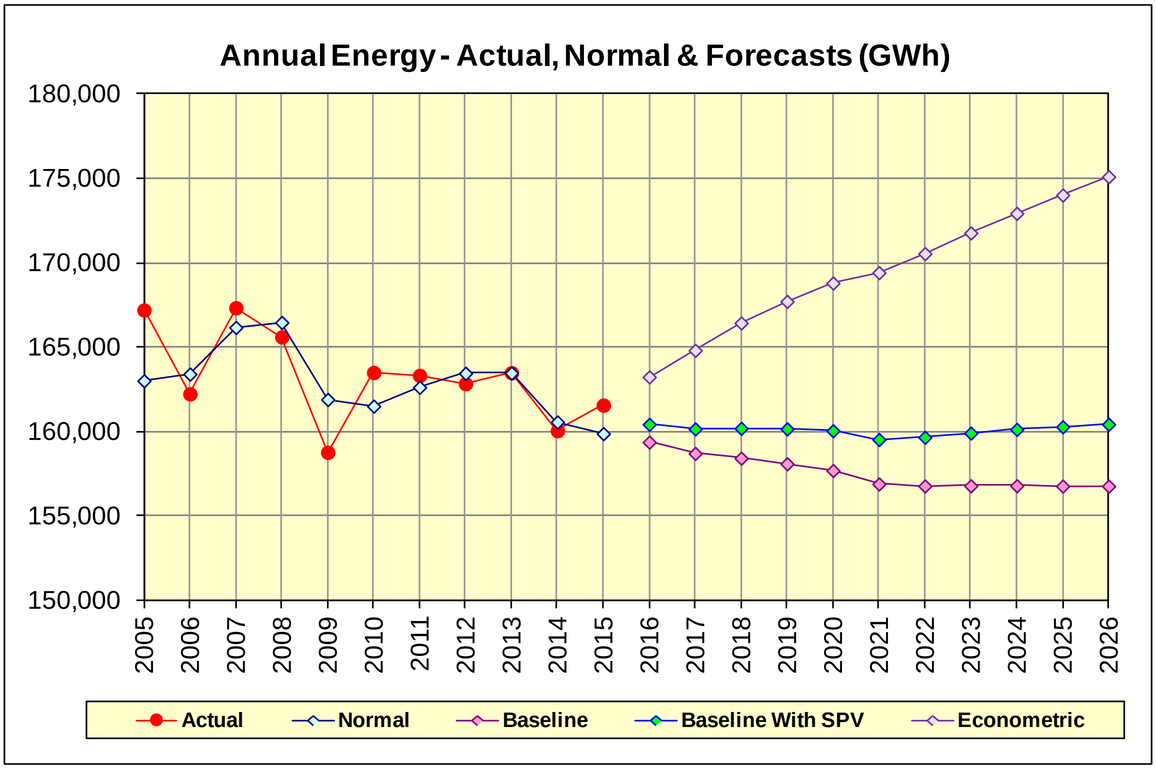


Figure 4-2: 2016 Econometric, Baseline and Baseline With SPV Summer Peak Demand Forecast

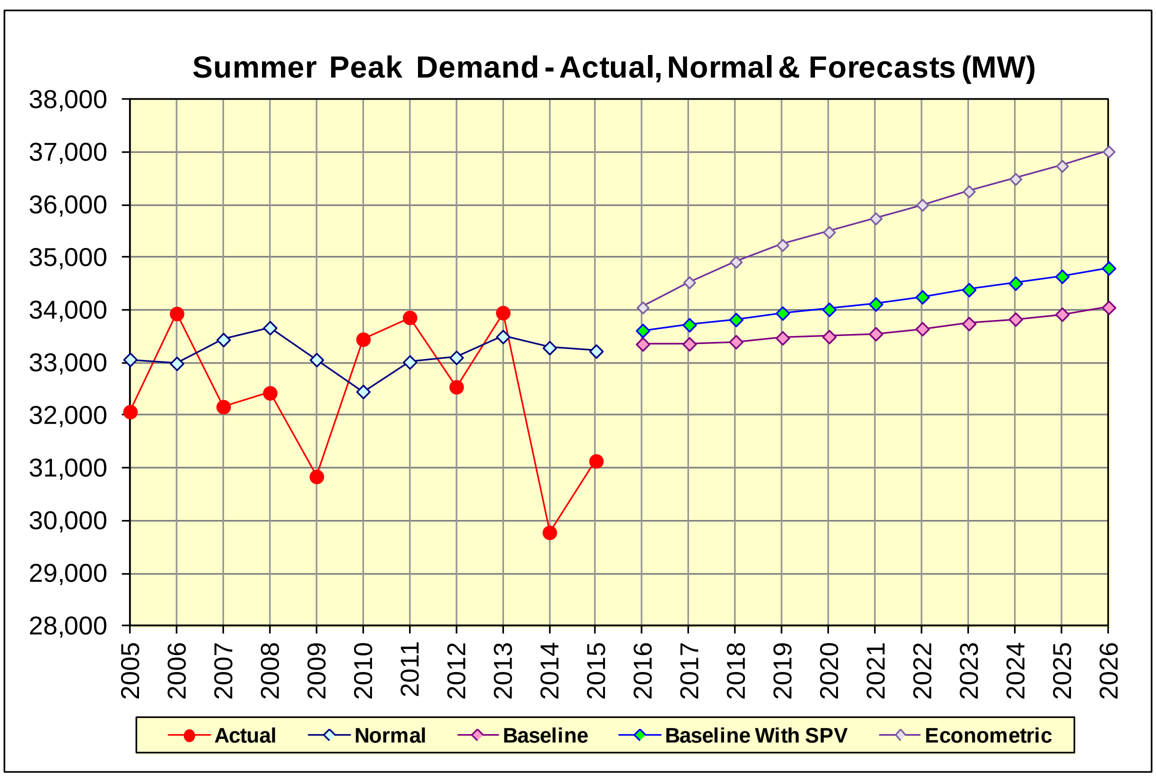


Figure 4-3: 2016 Energy Efficiency & Behind-the-Meter Solar PV – Annual Energy

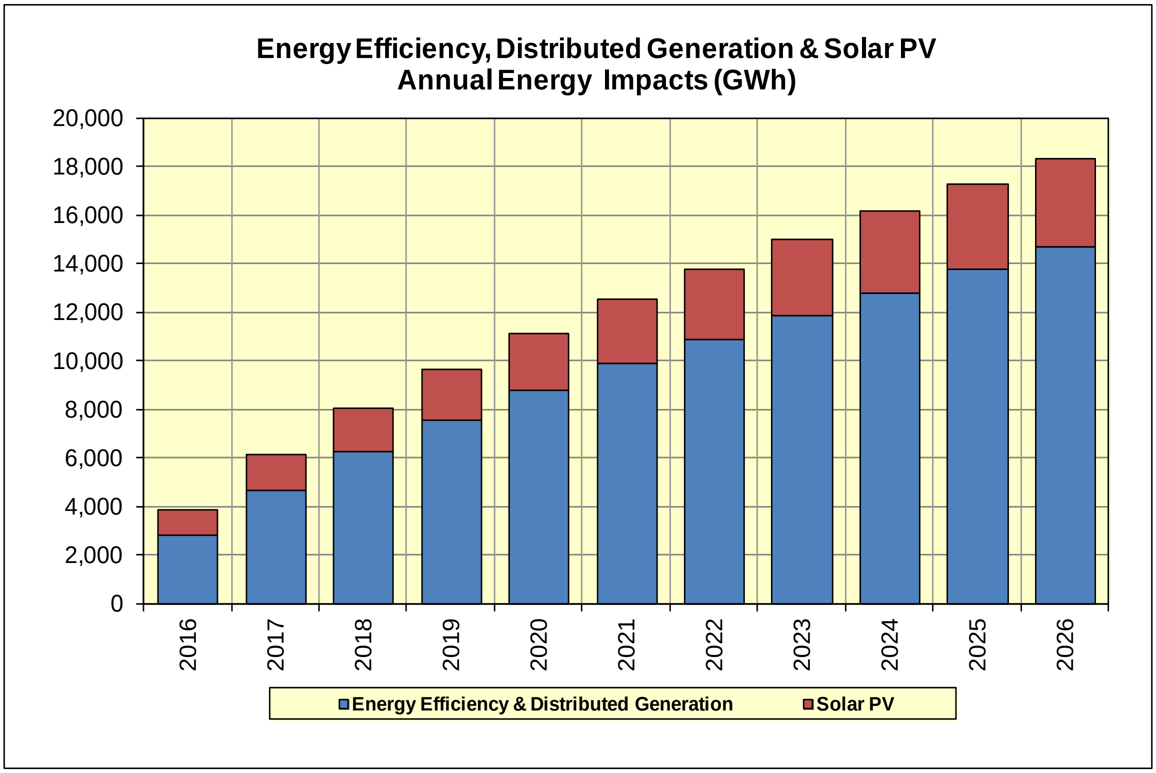
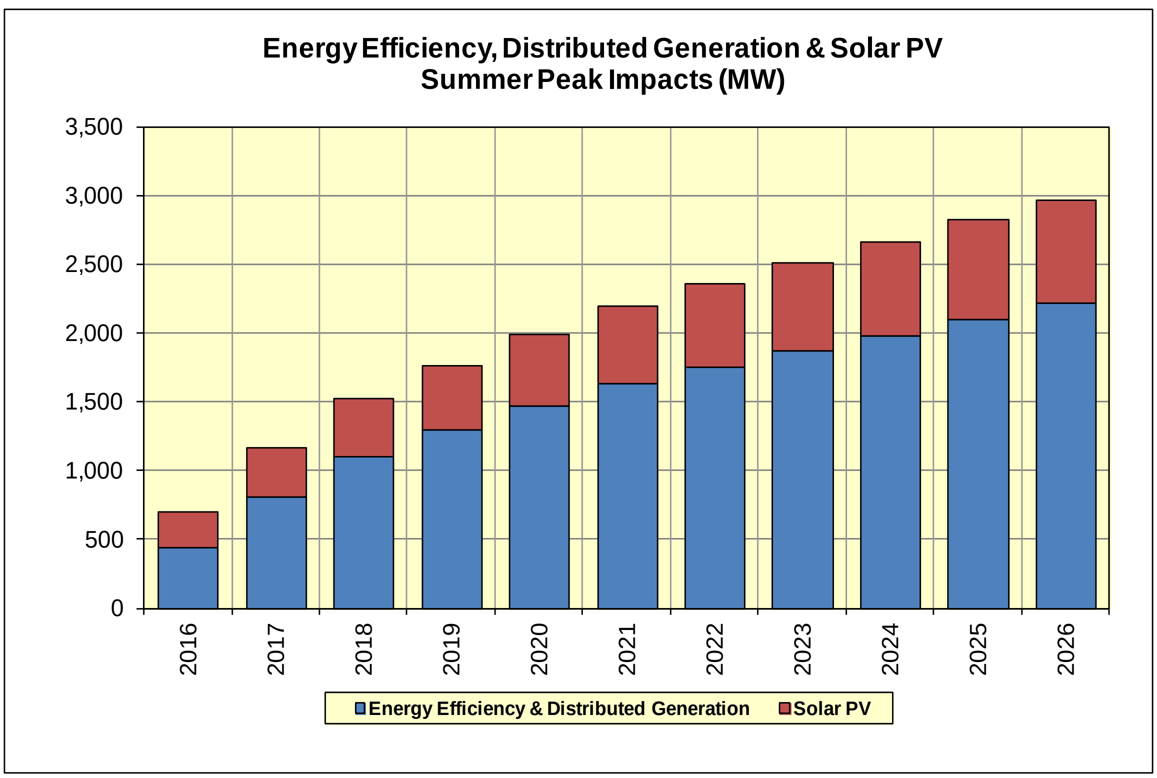


Figure 4-4: 2016 Energy Efficiency & Behind-the-Meter Solar PV – Summer Peak



In the 2016 RNA, the baseline forecast with behind-the-meter solar PV added back in is used as the load forecast for the base case. The purpose of using that baseline forcast as the load forecast is to properly account for the uncertainty in the load forecast resulting from solar PV as an intermittent resource. The load shapes used in the study were adjusted consistent with the NYISO's past practice from historic shape to a shape the meets the forecasted criteria of zonal peak, NYCA peak, and G-J Locality peak.

To model the behind-the-meter solar PV resource, zonal shapes were created by aggregating measured irradiance data from New York weather stations for years 2011 through 2015. This information was used in conjunction with the General Electric's Multi-Area Reliability Simulation (MARS) probabilistic shape selection algorithm to introduce a degree of variability and intermittency into the solar PV model. The ensemble average of the annual shapes meets the forecast for solar PV contribution at the time of NYCA peak.

The combination of the load shapes with the solar shapes results in a set of net load shapes that, at time of NYCA peak, meets the forecast criteria of the baseline forecast. Discretely modeling behind-the-meter solar PV as a resource also offers the benefit of being able to adjust the amount of resource available across the system.

4.2. Forecast of Special Case Resources

The 2016 RNA Special Case Resource (SCR) MW levels are based on the 2016 Gold Book value of 1,248 MW, adjusted for their performance. Transmission security analysis, which evaluates normal transfer criteria, does not consider SCRs.

4.3. Capacity Resource Additions and Removals

Since the 2014 RNA, resources have been added to the system, some mothball notices have been withdrawn and the associated facilities have returned to the system, and some resources have been removed. A total of **1,078 MW** has been added to the 2016 RNA Base Case as new generation. Meanwhile, a total of **2,573 MW** has been removed from the 2014 RNA base case because these units are currently in a deactivation state (*e.g.*, retired, mothballed, or proposed to retire/mothball). The comparison of generation status between the 2014 RNA and 2016 RNA is detailed in **Table 4-3** and **Table 4-4** below. The MW values represent the Capacity Resources Interconnection Service (CRIS) MW values as shown in the 2016 Gold Book.

Table 4-3: Generation Additions

Project Name	Zone	Requested CRIS MW	2016 RNA *(1st year of Base Case inclusion)*	2014 RNA Status
CPV Valley Energy Center	G	680	2018	O/S
Taylor Biomass	G	19	2018	**I/S**
Copenhagen Wind	E	79.9	2018	O/S
East River 1 Uprate	J	12.1	2017	O/S
East River 1 Uprate	J	12.1	2017	O/S
Black Oak Wind	C	0	2017	O/S
Sithe Independence Uprate	C	43	2017	O/S
Marble River Wind	D	215.2	2017	O/S
HQ-US *(External CRIS Rights)*	E	20	2017	O/S
Stony Creek Uprate	C	5.9	2017	O/S
Bowline 2 Uprate	G	10	2017	O/S
Total		**1,097**		
Additions from 2014 RNA		**1,078**		

Table 4-4: Generation Deactivations

OWNER / OPERATOR	STATION UNIT	ZONE	CRIS	2016 RNA Status	2014 RNA/CRP Status
Erie Blvd. Hydro - Seneca Oswego	Seneca Oswego Fulton 1	C	0.7	O/S	O/S
Erie Blvd. Hydro - Seneca Oswego	Seneca Oswego Fulton 2	C	0.3	O/S	O/S
Long Island Power Authority	Montauk Units #2, #3, #4	K	6.0	O/S	O/S
NRG Power Marketing LLC	Dunkirk 1	A	**96.2**	**O/S**	I/S
NRG Power Marketing LLC	Dunkirk 3	A	**201.4**	**O/S**	I/S
NRG Power Marketing LLC	Dunkirk 4	A	**199.1**	**O/S**	I/S

OWNER / OPERATOR	STATION UNIT	ZONE	CRIS	2016 RNA Status	2014 RNA/CRP Status
ReEnergy Chateaugay LLC	Chateaugay Power	D	18.6	O/S	O/S
Rochester Gas and Electric Corp.	Station 9	B	15.8	O/S	O/S
Syracuse Energy Corporation	Syracuse Energy ST1	C	11.0	O/S	O/S
Syracuse Energy Corporation	Syracuse Energy ST2	C	58.9	O/S	O/S
TC Ravenswood, LLC	Ravenswood 07	J	16.5	O/S	O/S
TC Ravenswood, LLC	Ravenswood 3-3	J	37.7	O/S	O/S
Erie Blvd. Hydro - North Salmon	Hogansburg	D	**0.3**	**O/S**	I/S
Niagara Generation LLC	Niagara Bio-Gen	A	**50.5**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 05	J	**16.0**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 07	J	**15.5**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 12	J	**22.7**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 13	J	**24.0**	**O/S**	I/S
NRG Power Marketing LLC	Dunkirk 2	A	97.2	**O/S**	O/S starting May 2015
NRG Power Marketing LLC	Huntley 67	A	**196.5**	**O/S**	I/S
NRG Power Marketing LLC	Huntley 68	A	**198.0**	**O/S**	I/S
Cayuga Operating Company, LLC	Cayuga 1	C	154.1	O/S starting July 1, 2017	O/S starting July 1, 2017
Cayuga Operating Company, LLC	Cayuga 2	C	154.7	O/S starting July 1, 2017	O/S starting July 1, 2017
Entergy Nuclear Power Marketing LLC	Fitzpatrick 1	C	**858.9**	**O/S**	I/S
R.E. Ginna Nuclear Power Plant, LLC	Ginna	B	**582.0**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 08	J	**15.3**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 10	J	**24.9**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 11	J	**23.6**	**O/S**	I/S
TC Ravenswood, LLC	Ravenswood 04	J	**15.2**	**O/S**	I/S
TC Ravenswood, LLC	Ravenswood 05	J	**15.7**	**O/S**	I/S
TC Ravenswood, LLC	Ravenswood 06	J	**16.7**	**O/S**	I/S
		Total	3,144		
	New deactivations from 2014 RNA		**2,573**		

4.4. Local Transmission Plans

As part of the NYISO's Local Transmission Planning Process (LTPP), Transmission Owners presented their Local Transmission Plans (LTPs) to the NYISO and Stakeholders in the fall of 2015. The NYISO reviewed the LTPs and included them in the 2016 Gold Book. The firm transmission plans included in the 2016 RNA Base Case are reported in **Appendix D.** Assumptions for inclusion in the RNA were based on data as of May 1, 2016.

4.5. Bulk Transmission Projects

Since the 2014 RNA, additional transmission projects have met the inclusion rules and are modeled in the 2016 RNA Base Case. One project, which was included in the 2014 RNA, was removed from the system model because it is no longer proceeding.

The National Grid installation of 1.5% series reactors at Packard on the two Packard – Huntley 230 kV lines (77 and 78) is complete and those serioes reactors will be in-service for all years of the study.

The original Transmission Owners' Transmission Solutions (TOTS) collection of projects included a project for additional cooling capability on the 345 kV cables from Farragut to Gowanus and from Gowanus to Goethals to increase the thermal ratings of these facilities. Due to the subsequent cancellation of the wheel agreement between Con Edison and PSEG, Con Edison is no longer proceeding with the cooling project. As a result, the cooling project, which was included in the 2014 RNA, is not included in the 2016 RNA Base Case.

The O&R North Rockland station tapping the Ladentown - Buchanan South 345 kV line (Y88) is modeled as in-service in the 2016 RNA Base Case starting in 2018. The North Rockland project includes a 345/138 kV transformer that will connect to the existing O&R Lovett substation.

Series compensation of 21% on the Leeds – Hurley Avenue 345 kV (301) line at Hurley Avenue is modeled as in service in the 2016 RNA Base Case starting in 2018. This project is a System Deliverability Upgrade (SDU) associated with the CPV Valley Energy Center generation project, which is also modeled as in-service in the same year.

A Con Edison project to install a new PAR-controlled path between Rainey 345 kV and Corona 138 kV stations is included in the RNA Base Case starting in 2019. The project consists of a 345/138 kV transformer and 138 kV PAR at Rainey with a 138 kV cable to Corona.

4.6. Base Case Peak Load and Resource Ratios

The capacity used for the 2016 RNA's resource adequacy base case peak load and resource ratio is the existing generation adjusted for the unit retirements, mothballing, and proposals to retire/mothball announced as of April 15, 2016, along with the new resource additions that met the base case inclusion rules set forth in Section 3.1 of the RPP Manual. This capacity is summarized in **Table 4-4** below.

Table 4-4: NYCA Peak Load and Resource Ratios 2017 through 2026

	Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Peak Load (MW) - Table I-2a GB 2016											
	NYCA*	33,363	33,404	33,477	33,501	33,555	33,650	33,748	33,833	33,926	34,056
	Zone J*	11,696	11,717	11,756	11,760	11,761	11,785	11,807	11,830	11,851	11,907
	Zone K*	5,381	5,354	5,348	5,340	5,370	5,414	5,464	5,501	5,550	5,595
	Zone G-J	16,181	16,206	16,251	16,255	16,260	16,292	16,324	16,357	16,387	16,459
Resources (MW)											
	Capacity**	36,867	37,644	37,644	37,644	37,644	37,644	37,644	37,644	37,644	37,644
	Net Purchases & Sales	1,849	1,584	1,593	2,255	2,255	2,255	2,255	2,255	2,255	2,255
	SCR	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248
NYCA	Total Resources	**39,965**	**40,476**	**40,485**	**41,147**	**41,147**	**41,147**	**41,147**	**41,147**	**41,147**	**41,147**
	Capacity/Load Ratio	110.5%	112.7%	112.4%	112.4%	112.2%	111.9%	111.5%	111.3%	111.0%	110.5%
	Cap+NetPurch/Load Ratio	116.0%	117.4%	117.2%	119.1%	118.9%	118.6%	118.2%	117.9%	117.6%	117.2%
	Cap+NetPurch+SCR/Load Ratio	119.8%	121.2%	120.9%	122.8%	122.6%	122.3%	121.9%	121.6%	121.3%	120.8%
Zone J	Capacity**	9,554	9,554	9,554	9,554	9,554	9,554	9,554	9,554	9,554	9,554
	Cap+UDR+SCR/Load Ratio	93.3%	93.1%	92.8%	92.8%	92.8%	92.6%	92.4%	92.2%	92.1%	91.7%
Zone K	Capacity**	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287
	Cap+UDR+SCR/Load Ratio	117.9%	118.5%	118.6%	118.8%	118.1%	117.2%	116.1%	115.3%	114.3%	113.4%
Zone G-J	Capacity**	14,659	15,356	15,356	15,356	15,356	15,356	15,356	15,356	15,356	15,356
	Cap+UDR+SCR/Load Ratio	99.5%	103.6%	103.3%	103.3%	103.3%	103.1%	102.9%	102.7%	102.5%	102.0%

*NYCA load values represent baseline coincident summer peak demand. Zones J and K load values represent non-coincident summer peak demand. Aggregate Zones G-J values represent G-J coincident peak, which is non-coincident with NYCA.

**NYCA Capacity values include resources electrically internal to NYCA, additions, reratings, and retirements (including proposed retirements and mothballs). Capacity values reflect the lesser of CRIS and DMNC values. NYCA resources include the net purchases and sales as per the Gold Book. Zonal totals include the awarded UDRs for those capacity zones as the actual MW are considered conficential.

Notes:

- SCR - Forecasted ICAP value based on 2016 Gold Book.
- Wind generator summer capacity is counted as 100% of nameplate rating.
- Behind-the-meter solar PV impacts are reflected back into the load levels shown for proper accounting.

As shown in the **Table 4-4** above, the total NYCA capacity margin (defined as a surplus of capacity above the baseline load forecast) varies between 19.8% in 2017 (year 1), 22.6% in 2021 (year 5), and 20.8 % in 2026 (year 10). For relative comparison purposes, these percentages are significantly above the required 17.5% NYCA Installed Reserve Margin (IRM) for the 2016-2017 Capability Year.

To further demonstrate the impact of the increase in resources, comparing the details of the capacity margin calculation for mid-year 2021 between the 2014 RNA and the 2016 RNA shows that:

1. The NYCA capacity resources are 577 MW more for 2021;
2. The 2016 RNA NYCA baseline load forecast is 2,335 MW lower for 2021; and
3. The NYCA SCRs projection is 59 MW more for 2021.

This increase in net resources contributes to the elimination of the resource adequacy need in the 2016 RNA as compared with those Reliability Needs initially identified in the 2014 RNA.

Table 4-5: Load/Resources Comparison of Year 2021 (MW)

Year 2021	2016 RNA	2014 RNA	Delta
Baseline Load	33,555	35,890	-2,335*
SCR	1,248	1,189	59
Total Capacity without SCRs	39,899	39,322	577
Net Change in Capacity less Load (MW)			**2,971**

*Both the 2014 and 2016 RNA baseline load forecasts included solar PV forecast reductions effects. The 2016 RNA resource adequacy assessment started with the baseline load forecast, added the behind-the-meter solar PV forecast MW back into the baseline load, and then explicitly modeled solar PV MW projections to allow for better probabilistic simulation.

4.7. Methodology for the Determination of Needs

Reliability Needs are defined by the Open Access Transmission Tariff (OATT) in terms of total deficiencies relative to Reliability Criteria determined from the assessments of the BPTF performed for the RNA. There are two steps to analyzing the reliability of the BPTF. The first is to evaluate the security of the transmission system; the second is to evaluate the adequacy of the system, subject to the security constraints. The NYISO planning procedures include both security and adequacy assessments. The transmission adequacy and the resource adequacy assessments are performed together.

Transmission security is the ability of the power system to withstand disturbances, such as short circuits or unanticipated loss of system elements, and continue to supply and deliver electricity. Security is assessed deterministically with potential disturbances being applied without concern for the likelihood of the disturbance in the assessment. These disturbances (single-element and multiple-element contingencies) are categorized as the design criteria contingencies, explicitly defined in the NYSRC Reliability Rules. The impacts when applying these design criteria contingencies are assessed to ensure no thermal loading, voltage, or stability violations will occur. In addition, the NYISO performs a short circuit analysis to determine if the system can clear faulted facilities reliably under short circuit conditions. The NYISO "Guideline for Fault Current Assessment" describes the methodology for that analysis.

The analysis for the transmission security assessment is conducted in accordance with NERC Reliability Standards, NPCC Transmission Design Criteria, and the NYSRC Reliability Rules. AC contingency analysis is performed on the BPTF to evaluate thermal and voltage performance under design contingency conditions using the Siemens PTI PSS®E and PowerGEM TARA programs. Generation is dispatched to match load plus system losses, while respecting transmission security. Scheduled inter-area transfers modeled in the base case between the NYCA and neighboring systems are held constant.

For the RNA, approximately 1,000 design criteria contingencies are evaluated under N-1, N-1-0, and N-1-1 normal transfer criteria conditions to ensure that the system is planned to meet all applicable reliability criteria. To evaluate the impact of a single event from the normal system condition (N-1), all design criteria contingencies are evaluated including: single element, common structure, stuck breaker, generator, bus, and HVDC facilities contingencies. An N-1 violation occurs when the power flow on the monitored facility is greater than the applicable post-contingency rating. N-1-0 and N-1-1 analysis evaluates the ability of the system to meet design criteria after a critical element has already been lost. For N-1-0 and N-1-1 analysis, single element contingencies are evaluated as the first contingency; the second contingency (N-1-1) includes all design criteria contingencies evaluated under N-1 conditions.

The process of N-1-0 and N-1-1 testing allows for corrective actions including generator redispatch, phase angle regulator (PAR) adjustments, and HVDC adjustments between the first and second contingency. These corrective actions prepare the system for the next contingency by reducing the flow to normal rating after the first contingency. An N-1-0 violation occurs when the flow cannot be reduced to below the normal rating following the first contingency. An N-1-1 violation occurs when the facility is reduced to below the normal rating following the first contingency, but the power flow following the second contingency is greater than the applicable post-contingency rating.

Resource adequacy is the ability of the electric systems to supply the aggregate electricity demand and energy requirements of the customers at all times, taking into account scheduled and unscheduled outages of system elements. Resource adequacy considers the transmission systems, generation resources, and other capacity resources, such as demand response. Resource adequacy assessments are performed on a probabilistic basis to capture the random natures of system element outages. If a system has sufficient transmission and generation, the probability of an unplanned disconnection of firm load 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 a 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 events per year. This requirement forms the basis of New York's Installed Reserve Margin (IRM) requirement and is on a statewide basis.

If Reliability Needs are identified, various amounts and locations of compensatory MW required for the NYCA to satisfy those needs are determined to translate the criteria violations to understandable quantities. Compensatory MW amounts are determined by adding generic capacity resources to zones to effectively satisfy the needs. The compensatory MW amounts and locations are based on a review of binding transmission constraints and zonal LOLE determinations in an iterative process to determine various combinations that will result in Reliability Criteria being met. These additions are used to estimate the amount of resources generally needed to satisfy Reliability Needs. The compensatory MW additions are not intended to represent specific proposed solutions. Resource needs could potentially be met by other combinations of resources in other areas including generation, transmission and demand response measures.

Due to the differing natures of supply and demand-side resources and transmission constraints, the amounts and locations of resources necessary to match the level of compensatory MW needs identified will vary. Resource needs could be met in part by transmission system reconfigurations that increase transfer limits, or by changes in operating protocols. Operating protocols could include such actions as using dynamic ratings for certain facilities, invoking operating exceptions, or establishing special protection systems.

The procedure to quantify compensatory MW for BPTF transmission security violations is a separate process from calculating compensatory MW for resource adequacy violations. This quantification is performed by first calculating transfer distribution factors (TDF) on the overloaded facilities. The power transfer used for this calculation is created by injecting power at existing buses within the zone where the violation occurs, and reducing power at an aggregate of existing generators outside of the area.

5. Reliability Needs Assessment

5.1. Overview

Reliability is defined and measured through the use of the concepts of security and adequacy described in **Section 3.** This study evaluates the resource adequacy and transmission system adequacy and security of the New York BPTF over a ten-year study period. Through the RNA, the NYISO identifies Reliability Needs in accordance with applicable Reliability Criteria. Violations of this criteria are translated into MW or MVAR amounts to quantify the Reliablility Need.

5.2. Reliability Needs for Base Case

Below are the principal findings of the 2016 RNA applicable to the Base Case conditions for the 2017-2026 Study Period including: transmission security assessment; short circuit assessment; resource and transmission adequacy assessment; system stability assessments; and scenario analyses.

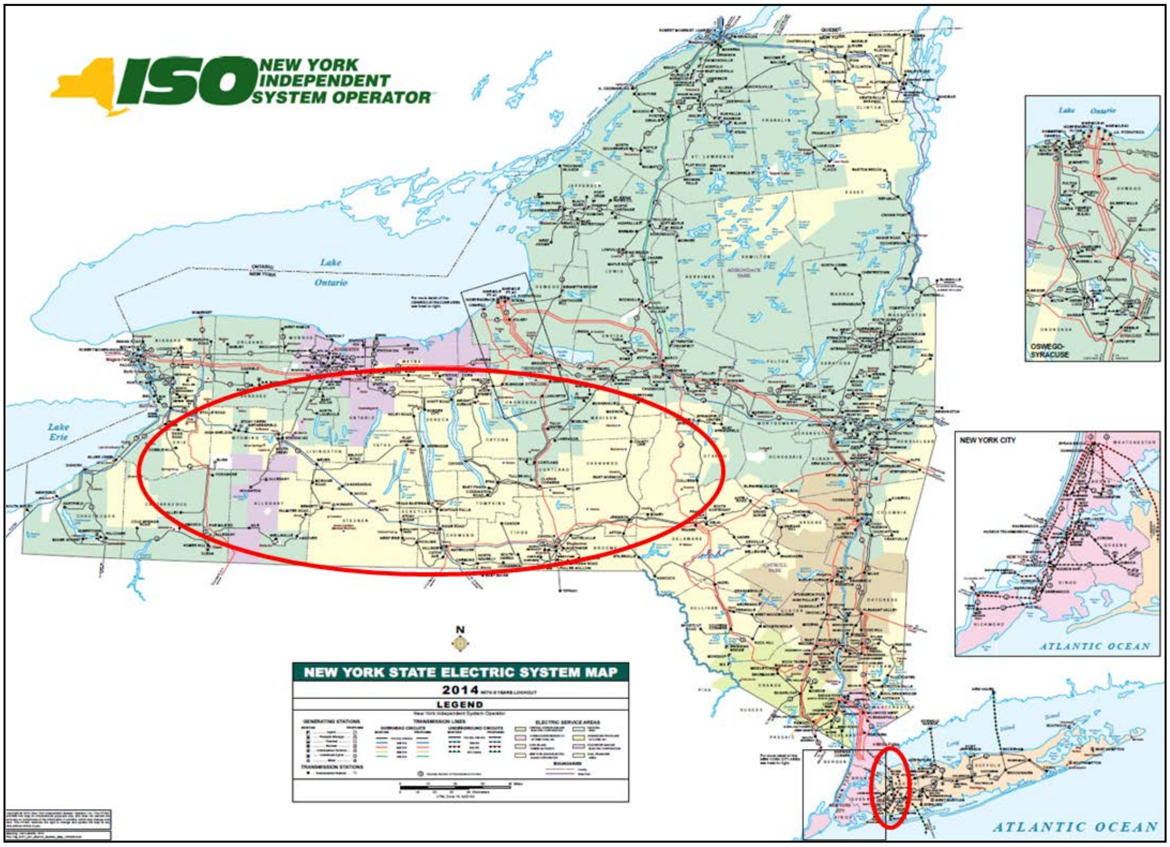
5.2.1. Transmission Security Assessment

The RNA requires analysis of the security of the BPTF throughout the Study Period (years 2017 to 2026). The BPTF, as defined in this assessment, include all of the facilities designated by the NYISO as a Bulk Power System (BPS) element as defined by the NYSRC and NPCC, as well as other transmission facilities that are relevant to planning the New York State transmission system. To assist in the assessment, the NYISO reviewed previously completed transmission security assessments and used the most recent FERC Form 715 power flow cases, which the NYISO filed with FERC on April 1, 2016.

The transmission security analysis identifies thermal violations on the BPTF throughout the Study Period for N-1-1 conditions. Some of the identified violations for the 2016 RNA Base Case are a continuation of the violations identified in the 2014 RNA for which work is ongoing, while others represent new violations resulting from system changes modeled in the base case. Table 4-1 provides a summary of the contingency pairs that result in the highest thermal overload on each overloaded BPTF element under N-1-1 conditions. Table 4-2 provides a summary of the year by which a solution is needed to be in-service to mitigate the transmission security violation. Appendix X provides a summary of all contingency pairs that result in overloads on the BPTF for the study period.

There are two primary regions with Reliability Needs identified in Table 4-1, including: Western & Central New York and Long Island. These Reliability Needs either continue to be generally driven by, or have arisen anew largely due to, recent and proposed generator retirements/mothballs. **Figure 5-1** geographically depicts the two regions where the loads may be impacted by transmission security constraints.

Figure 5-1: Approximate Locations of Transmission Security Needs



Western & Central New York

The transmission security analysis identifies a number of thermal violations on the BPTF in the Western and Central New York regions resulting from a lack of transmission and generating resources to serve load and support voltage in the area.

The 230 kV system between Niagara and Gardenville includes two parallel 230 kV transmission lines from Niagara to Packard to Huntley to Gardenville, including a number of taps to serve load in the Buffalo area. A third parallel 230 kV transmission line also runs from Niagara to Robinson Rd. to Stolle Rd. to Gardenville. The N-1-1 analysis shows that in 2017, Stolle-Gardenville (#66) 230 kV overloads for loss of Packard-Gardenville (#182) 115 kV followed by the loss of the two parallel Packard-Huntley (#77) and (#78) 230 kV lines which share a common tower. The overload occurs due to a lack of generation and transmission sources in the Buffalo area following the deactivation of the Dunkirk and Huntley generation plants in recent years.

The 345 kV system between Western and Central New York consists of two parallel lines between Syracuse and Rochester (Clay-Pannell 345 kV). The N-1-1 analysis shows that starting in 2017, these lines are overloaded for the loss of Stolle-Gardenville (#66) 230 kV followed by loss of the other parallel Clay-Pannell 345 kV line. Similarly, starting in 2017, Packard-Huntley (#77) 230 kV is overloaded for the loss of Stolle-Gardenville (#66) 230 kV followed by a stuck breaker at Packard 230 kV. The upcoming expiration of the Ginna Reliability Support Service Agreement (RSSA) will remove a significant amount of generation from the underlying system in the Rochester area and will drive an increased loading on the BPTF to serve load. Additionally, while the load forecast for the state has decreased overall, the load forecast in the west has increased from prior years. The combination of an overall lack of generation resources in Western and Central New York and the increased load in that area is largely responsible for the Clay-Pannell and Packard-Huntley overloads. The magnitude of the Clay-Pannell 345 kV and Packard-Huntley 230 kV overloads is directly proportional to the level of Niagara generation output. The N-1-1 analysis shows the Clay-Pannell (#2) 345 kV line loaded at 1,240 MVA in 2017, while Packard-Huntley (#77) 230 kV line is loaded at 646 MVA. Increasing the Niagara 230 kV generators by 100 MW would reduce the loading on the Clay-Pannell 345 kV lines by approximately 40 MW, while increasing the loading of the Packard-Huntley (#77) 230 kV line by approximately 10 MW.

The Oakdale 345/230/115 kV station serves the Binghamton area. Starting in 2017, the N-1-1 analysis shows the Oakdale 345/115 kV #2 transformer is overloaded for the loss of the Packard-Huntley (#77) 230 kV line followed by a stuck breaker at Oakdale 345 kV. Niagara generation is required to back down following the loss of the Packard-Huntley (#77) 230 kV line, significantly reducing flow from Western New York into the Central region and increasing the loading on this source into the underlying 115 kV system. The stuck breaker at Oakdale 345 kV removes additional sources into the Binghamton area by removing a 345 kV line into Oakdale as well as a parallel 345/115 kV transformer. The loading on this facility is aggravated by the deactivation of Cayuga, scheduled to occur following the expiration of the Cayuga RSSA on June 30, 2017.

National Grid's Elbridge 345/115 kV station includes one 345/115 kV transformer that serves the Oswego and Syracuse area and the northern Finger Lakes area. Starting in 2022, the N-1-1 analysis shows an overload on the Elbridge 345/115 kV transformer for loss of the Pannell-Clay (#1) 345 kV line followed by a stuck breaker at Clay 345 kV. This overload is primarily due to power flowing east-to-west to serve load in Central New York and is exacerbated by the deactivation of the Ginna and Cayuga plants.

National Grid's Clay 345/115 kV station includes eight 115 kV transmission connections and two 345/115 kV transformers that serve the Oswego and Syracuse areas. Starting in 2017, the N-1-1 analysis shows overloads in this area on the Clay-Teall (#10) 115 kV line and the Clay-Dewitt (#3) 115 kV line. The 2014 RNA identified transmission security violations on both of these facilities. The overloads on the Clay-Teall (#10) 115 kV line and the Clay-Dewitt (#3) 115 kV line are mitigated by the solutions identified in the 2014 CRP starting in 2018, as described in Section X.X of this report. Starting in 2022, the N-1-1 analysis shows an overload in this area on the Clay-Woodard (#17) 115 kV line. Similarly, starting in 2025, the N-1-1 analysis shows an overload on the Clay-Lockheed Martin (#14) 115 kV line. The overloads in this area are primarily due to power flowing from east-to-west on the 115 kV system to serve load in Central New York after the loss of a north-to-south 345 kV path and are exacerbated by the deactivation of the Ginna and Cayuga plants.

National Grid's Porter 345/230/115 kV station includes eight 115 kV transmission connections and two 345/115 kV transformers that serve the Utica and Syracuse areas. The N-1-1 analysis shows the Porter-Yahnundasis (#3) 115 kV line overloaded starting in 2017 for the loss of Stolle-Gardenville (#66) 230 kV followed by the loss of a Porter 115 kV bus; additionally, the N-1-1 analysis shows the Porter-Oneida (#7) 115 kV line overloaded starting in 2017 for loss of Porter-Yahnundasis (#3) 115 kV followed by a stuck breaker at Oswego 345 kV. These overloaded facilities were identified in the 2014 RNA and solutions were identified in the 2014 CRP starting in 2018, as described in Section X.X of this report. These overloads are due to power flowing from east to west on the 115 kV system to serve load in the Utica, Syracuse, and Finger Lakes area and are exacerbated by the deactivation of the Ginna and Cayuga plants.

Long Island

The transmission security analysis identifies one thermal violation on the BPTF in Long Island. This overload is primarily driven by load growth.

LIPA's Valley Stream 138 kV station is in southwestern Long Island and includes three 138 kV transmission connections and one phase angle regulator (PAR) that ties into Con Edison's 138 kV system. Starting in 2017, the East Garden City-Valley Stream (#262) 138 kV line is overloaded for the loss of the Barrett-Valley Stream (#292) 138 kV line followed by the loss of the Barrett-Valley Stream (#291) 138 kV line.

Table 5-1: 2016 RNA Transmission Security Thermal Violations

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	2017 Flow (MVA)	2021 Flow (MVA)	2026 Flow (MVA)	First Contingency	Second Contingency
A	NYSEG	Stolle-Gardenville (#66) 230	474	478	478	509	515	520	Packard-Gardenville (#182) 115	TWR Packard-Huntley 230
A	N. Grid	Packard-Huntley (#77) 230	556	644	746	646	646	646	Stolle-Gardenville (#66) 230	SB Packard 230
C/B	NYPA, RG&E, N. Grid	Clay-Pannell (#1) 345	1195	1195	1195	1238	1245	1264	Stolle-Gardenville (#66) 230	SB Clay 345
C/B	NYPA, RG&E, N. Grid	Clay-Pannell (#2) 345	1195	1195	1195	1240	1247	1266	Stolle-Gardenville (#66) 230	SB Clay 345
C	NYSGE	Oakdale 345/115 2TR	428	556	600	565	586	613	Packard-Huntley (#77) 230	SB Oakdale 345
C	N. Grid	Elbridge 345/115 1TR	470	557	717			569	Pannell-Clay	SB Clay 345

									(#1) 345	
C	N. Grid	Clay-Lockheed Martin (#14) 115 (Clay-Wetzel)	220	252	280			255	Clay-Woodard (#17) 115	SB Lafayette 345
C	N. Grid	Clay-Woodard (#17) 115 (Clay-Euclid)	220	252	280			256	Clay-Lockheed Martin (#14) 115	SB Lafayette 345
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	126			Clay-Teall (#11) 115	SB Dewitt 345
C	N. Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116 220	120 252	145 280	131			Clay-Dewitt (#13) 345	Oswego-Lafayette (#17) 345
E	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	116	120	145	138			Stolle-Gardenville (#66) 230	Porter Bus D 115
E	N. Grid	Porter-Oneida (#7) 115 (Power-W. Utica)	116	120	145	125			Porter-Yahnundasis (#3) 115	SB Oswego 345
K	LIPA	East Garden City-Valley Stream (#262) 138	211	291	504	293	302	316	Barrett-Valley Stream (#292) 138	Barrett-Valley Stream (#291) 138

Table 5-2: 2016 RNA Transmission Security Reliability Need Year

Zone	Owner	Monitored Element	Year of Need
A	NYSEG	Stolle-Gardenville (#66) 230	2017
A	N. Grid	Packard-Huntley (#77) 230	2017
C/B	NYPA, RG&E, N. Grid	Clay-Pannell (#1) 345	2017
C/B	NYPA, RG&E, N. Grid	Clay-Pannell (#2) 345	2017
C	NYSGE	Oakdale 345/115 2TR	2017
C	N. Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	2017
C	N. Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	2017
E	N. Grid	Porter-Yahnundasis (#3) 115 (Port-Kelsey)	2017
E	N. Grid	Porter-Oneida (#7) 115 (Power-W. Utica)	2017
K	LIPA	East Garden City-Valley Stream (#262) 138	2017
C	N. Grid	Elbridge 345/115 1TR	2022
C	N. Grid	Clay-Woodard (#17) 115 (Clay-Euclid)	2022
C	N. Grid	Clay-Lockheed Martin (#14) 115 (Clay-Wetzel)	2025

5.2.2. Short Circuit Assessment

Performance of a transmission security assessment includes the calculation of symmetrical short circuit current to ascertain whether the circuit breakers in the system could be subject to fault current levels in excess of their rated interrupting capability. The analysis was performed for the year 2021 reflecting the study conditions outlined in **Section 3**. The calculated fault levels would be constant over the second five years because no new generation or transmission is modeled in the RNA for the second five years, and the methodology for fault duty calculation is not sensitive to load growth. The detailed results are presented in **Appendix D** of this report. No overdutied circuit breakers were identified.

5.2.3. System Stability Assessment

The 2015 NYISO Comprehensive Area Transmission Review (CATR), which was completed in June 2016 and evaluated the year 2020, is the most recent CATR. The stability analyses conducted, as part of the 2015 CATR, in conformance with the applicable NERC standards, NPCC criteria, and NYSRC Reliability Rules found no stability issues (criteria violations) for summer peak load and light load conditions. Stability analysis was also performed using the 2015 CATR stability cases to determine any reliability impacts due to the generation retirements. No reliability impacts were found.

5.2.4. Transmission and Resource Adequacy Assessment

The NYISO conducts its resource adequacy analysis with GE MARS software package, which performs a probabilistic simulation of outages of capacity and transmission resources. The transmission system in MARS is modeled using interface transfer limits.

The emergency transfer limits were developed using the 2016 RNA power flow base case. Tables 5-4, 5-5, and 5-6 below provide the thermal and voltage emergency transfer limits for the major NYCA interfaces. For comparison purposes, the 2014 RNA transfer limits are also presented.

Table 5-4: Transmission System Thermal Emergency Transfer Limits

Interface	2016 RNA study						2014 RNA study		
	2017	2018	2019	2020	2021	2026	2017	2018	2019
Dysinger East	1700	*1700*	*1700*	*1700*	1700	same as 2021	850 - 2850*	825 - 2825*	800 - 2800*
Central East MARS	4425	*4475*	*4475*	*4475*	4475	same as 2021	4500	4500	4500
E to G (Marcy South)	2150	*2275*	*2275*	*2275*	2275	same as 2021	2150	2150	2150
F to G	3475	*3475*	*3475*	*3475*	3475	same as 2021	3475	3475	3475
UPNY-SENY MARS	5500	*5600*	*5600*	*5600*	5600	same as 2021	5600	5600	5600
I to J	4400	*4400*	*4400*	*4400*	4400	same as 2021	4400	4400	4400
I to K (Y49/Y50)	1293	*1293*	*1293*	*1293*	1293	same as 2021	1290	1290	1290

* Dynamic limit table based on status of Huntley and Dunkirk units

Limit was not calculated

Table 5-5: Transmission System Voltage Emergency Transfer Limits

Interface	2016 RNA study						2014 RNA study		
	2017	2018	2019	2020	2021	2026	2017	2018	2019
Dysinger East	2125	*2125*	*2125*	*2800*	2800	Same as 2021	*2975*	*2975*	2975
Central East MARS	3050	*3050*	*3050*	*3050*	3050	Same as 2021	3100	3100	3100
Central East Group	4925	*4925*	*4925*	*4925*	4925	Same as 2021	5000	5000	5000
UPNY-ConEd	5600	*5750*	*5750*	*5750*	5750	Same as 2021	5210	5210	5210
I to J & K	5400	*5600*	*5600*	*5600*	5600	Same as 2021	5160	5160	5160

Limit was not calculated

Table 5-6: Transmission System Base Case Emergency Transfer Limits

Interface	2016 RNA study											2014 RNA study					
	2017		2018		2019		2020		2021		2026	2017		2018		2019	
Dysinger East	1700	T	*1700*	*T*	*1700*	*T*	*1700*	*T*	1700	T	Same as 2021	850 - 2850*	T	825 - 2825*	T	800 - 2800*	T
Central East MARS	3050	V	*3050*	*V*	*3050*	*V*	*3050*	*V*	3050	V	Same as 2021	3100	V	3100	V	3100	V
Central East Group	4925	V	*4925*	*V*	*4925*	*V*	*4925*	*V*	4925	V	Same as 2021	5000	V	5000	V	5000	V
E to G (Marcy South)	2150	T	*2275*	*T*	*2275*	*T*	*2275*	*T*	2275	T	Same as 2021	2150	T	2150	T	2150	T
F to G	3475	T	*3475*	*T*	*3475*	*T*	*3475*	*T*	3475	T	Same as 2021	3475	T	3475	T	3475	T
UPNY-SENY MARS	5500	T	*5600*	*T*	*5600*	*T*	*5600*	*T*	5600	T	Same as 2021	5600	T	5600	T	5600	T

I to J	4400	T	*4400*	*T*	*4400*	*T*	*4400*	*T*	4400	T	Same as 2021	4400	T	4400	T	4400	T
I to K (Y49/Y50)	1293	T	*1293*	*T*	*1293*	*T*	*1293*	*T*	1293	T	Same as 2021	1290	T	1290	T	1290	T
I to J & K	5400	C	*5600*	*C*	*5600*	*C*	*5600*	*C*	5600	C	Same as 2021	5160	C	5160	C	5160	C

* Dynamic limit table based on status of Huntley and Dunkirk units
T - Thermal, V - Voltage, C – Combined
Limit was not calculated

The **Dysinger East** limit used in the 2014 RNA was based on dynamic limit tables that reduced the limit when Huntley and Dunkirk units were unavailable. For the 2016 RNA, a single limit is used because the Huntley and Dunkirk units are all modeled as retired. The increase in the limit from the lowest values is a result of the installation of series reactors on the Packard – Huntley 230 kV circuits, which are the facilities limiting the power transfer.

The **Central East** MARS and Central East Group interfaces reductions of 50 and 75 MW are the result of the retirement of the FitzPatrick unit.

When comparing the **UPNY-SENY** MARS limits for year 2017 to the previous RNA, there is a reduction of 100 MW. This reduction is caused by the change in the modeling of the Con Ed/PSEG wheel schedule. For the 2014 RNA, 1,000 MW was modeled flowing to PJM on the S. Mahwah to Waldwick ties, and 1,000 MW to New York was modeled on the A, B, and C ties. In the 2016 RNA, due to the cancellation of the Con Ed/PSEG agreement to wheel that power, 0 MW is modeled on all of these ties. The modeling change resulted in a 100 MW decrease in the UPNY-SENY MARS limit. This limit is then increased to 5,600 MW in the 2016 RNA in year 2018 when the Leeds – Hurley series compensation project goes into service.

The modeling change of the ConEd/PSEG wheel in the 2016 RNA also results in an increase in the **UPNY-ConEd** and the I to J & K interface limits. No longer modeling the 1,000 MW withdrawal of power from Zone G to supply the wheel reduces the reactive power losses in SENY and increases voltage constrained transfer limits in that area. The reduction in load growth and increase in behind-the-meter solar PV installations also impacts these transfer limits. For year 2017, the UPNY-ConEd limit increases by 390 MW and the I to J & K transfer limit increases by 240 MW when compared to the previous RNA. These limits increase again in year 2018 by 150 MW and 200 MW respectively, once CPV Valley Energy Center is assumed as in-service.

TOPOLOGY DIAGRAM TO BE ADDED HERE

The results of the 2016 RNA base case resource adequacy studies show that the LOLE for the NYCA does not exceed 0.1 criterion throughout the 10-year Study Period. The LOLE results for the entire 10-year RNA base case are presented in **Table 5-1**.

Table 5-1: NYCA Resource Adequacy Measure (in LOLE)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
NYCA	0.037	0.031	0.034	0.018	0.021	0.022	0.028	0.031	0.033	0.042
NYCA Free Flow	0.035	0.029	0.033	0.017	0.020	0.021	0.026	0.028	0.031	0.038

The decrease in LOLE from 2017 to 2018 is the result of CPV Valley Energy Center entering into service, while the drop in the LOLE from 2019 to 2020 is the result of the capacity sales to New England assumed to be returning to the New York market. The very small difference in the LOLE between the base case and free flow case indicates a lack of binding interfaces in NYCA.

Table 5-x: Compensatory MW Additions for Transmission Security Violations

To be developed for the "Second Pass"

6. Scenarios

To be completed at a later time

7. Impacts of Environmental Regulations

7.1. Regulations Reviewed for Impacts on NYCA Generators

The 2014 RNA identified new environmental regulatory programs that could impact the operation of the BTPF. These state and federal regulatory initiatives, taken together, may require considerable investment by the owners of New York's existing thermal power plants in order to comply. The following programs are reviewed in the 2016 RNA:

To be completed at a later time

7.2. Summary of Environmental Regulation Impacts

To be completed at a later time

Appendices