2018 Reliability Needs Assessment

A Report by the
New York Independent System Operator

DRAFT for July 19, 2018 ESPWG/TPAS

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Executive Summary

This 2018 Reliability Needs Assessment (RNA) assesses the transmission and resource adequacy and the transmission security of the New York Control Area (NYCA) bulk power transmission system from year 2019 through 2028, the Study Period of this RNA.

This 2018 Reliability Needs Assessment finds that transmission and resource adequacy and transmission security criteria are met throughout the Study Period.

The Reliability Needs Assessment is the first step of the NYISO Reliability Planning Process. As a product of this step, the NYISO documents the Reliability Needs in the Reliability Needs Assessment report, which ultimately is presented to the NYISO Board of Directors for approval.

Following NYISO Board approval, the NYISO initiates the next step, which starts by requesting Local Transmission Owner Plans (LTPs) updates. As part of this step, the NYISO will consider updates to Local Transmission Owner Plans and, if necessary, solicit market-based solutions, regulated backstop solutions, and alternative regulated solutions to the identified Reliability Needs. The NYISO then proceeds to assess the viability and sufficiency of each of the possible solutions, leading to the development of the Comprehensive Reliability Plan (CRP).

The Comprehensive Reliability Plan provides documentation of the solutions determined to be viable and sufficient to meet the identified Reliability Needs and, if appropriate, ranks any regulated transmission solutions submitted for the Board to consider for selection of the more efficient or cost effective transmission project. If built, the selected transmission project would be eligible for cost allocation and recovery under the NYISO's tariff.

Summary of Transmission and Resource Adequacy Results

From the transmission and resource adequacy perspective, the New York Control Area is within the Loss of Load Expectation (LOLE) criterion (one day in 10 years, or 0.1 events per year) throughout the Study Period. The trend of load decrease continues; for example, the summer peak baseline load forecast is 1,464 MW lower in 2023 as compared with the 2016 Reliability Needs Assessment. When recent and planned capacity deactivations were included in the calculation for comparison, the net statewide surplus increased by 1,817 MW as compared with the 2016 Reliability Needs Assessment (see below

Figure 1).

Figure 1: 2018 RNA Load and Capacity Comparison with the 2016 RNA

Year 2023	2018 RNA	2016 RNA	Delta
Baseline* Load	32,284	33,748	-1,464
Total Resources**	41,500	41,147	353
Net Margin: Change in (net capacity - net load)			1,817

Notes:

*includes the reductions due to projected energy efficiency programs, building codes and standards, distribution energy resources and behind-the-meter solar photovoltaic power; it also reflects expected impacts (increases) from projected electric vehicle usage.

**includes the total Special Case Resources (SCR), and net capacity purchases and sales from the Gold Book 2018 (also shown in

Figure 16)

Summary of Transmission Security Results

The 2018 RNA preliminary findings identified a transmission security Reliability Need on a BPTF facility in eastern Long Island. The Brookhaven to Riverhead 138 kV line could not be secured to normal system conditions when Wildwood to Riverhead 138 kV line is out-of-service (also known as an "N-1-0" condition) (Figure 2). The overload on this facility is driven by LIPA load growth in eastern Long Island and insufficient generating resources within eastern Long Island. The identified N-1-0 condition which is where the system is restored to normal limits following and event. The overload was approximately 1% over the normal rating of the line. At the June 28th ESPWG meeting, PSEG-LIPA presented a LTP update to replace the limiting bus work on this line. With this LTP update, the overload is eliminated and no Reliability Need is identified.

Figure 2: Areas of the Transmission Security Related Reliability Needs

Summary of Scenario Results

Placeholder for future

Introduction

This report sets forth the NYISO's 2018 Reliability Needs Assessment (RNA) and scenario findings for the Study Period (years 2019 through 2028).

The RNA is developed by the NYISO in conjunction with Market Participants and all interested parties as the first step in the Reliability Planning Process (RPP). 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 resource adequacy and transmission security and 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) in a location that would resolve that need. After NYISO Board 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 (TOs) to develop a regulated backstop solution to address each identified Reliability Need.

The CRP details the NYISO plan for continued reliability of the Bulk Power Transmission Facilities (BPTF) during the Study Period and identifies additional resources, or combinations of resources, that resolve any identified criteria violations in the RNA. New or proposed resources included in the CRP may be provided by market-based solutions developed in response to market forces and any request for solutions following the approval of an RNA. If the market does not adequately respond, reliability will be maintained by either regulated solutions 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 long-term reliability of the BPTF, 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 RPP is also designed to provide information that is both informative and of value to the New York wholesale electricity marketplace and federal and state policy makers.

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 changes to the RPP that were implemented since the 2016. Next, this report summarizes the prior RPP findings and 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. Detailed analyses, data and results, and the underlying modeling assumptions are contained in the appendices.

For informational purposes, this RNA report reviews activities related to environmental regulatory programs and other relevant developments. Also for informational purposes, this RNA report also provides the latest historical information available for the past five years of congestion via a link to the NYISO's website. The 2018 RPP will serve as the foundation for the 2019 Congestion Assessment and Resource Integration Study (CARIS), which will present more detailed evaluation of system congestion.

Overview of RPP Changes

The current RPP 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 RPP is contained in the Reliability Planning Process Manual (RPP Manual).

One of the changes to the RPP, which was first implemented in the 2016 RNA, is that the process now provides preliminary ("1st pass") RNA results to stakeholders sometime in June of the first year of the biennial planning process. The Stakeholders can provide project updates focused on mitigating the 1st pass Reliability Needs, if any are identified. The NYISO then incorporates system changes that may impact the preliminary results and that had occurred since the initial lock down date of the RNA assumptions matrix into the Base Case before finalizing the results. The NYISO considered the following updates:

- Changes in BPTFs
- Change in resources such as generating unit status, load forecast, or demand response that may impact the preliminary Reliability Needs, and
- Updates to previously submitted Local Transmission Owner 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

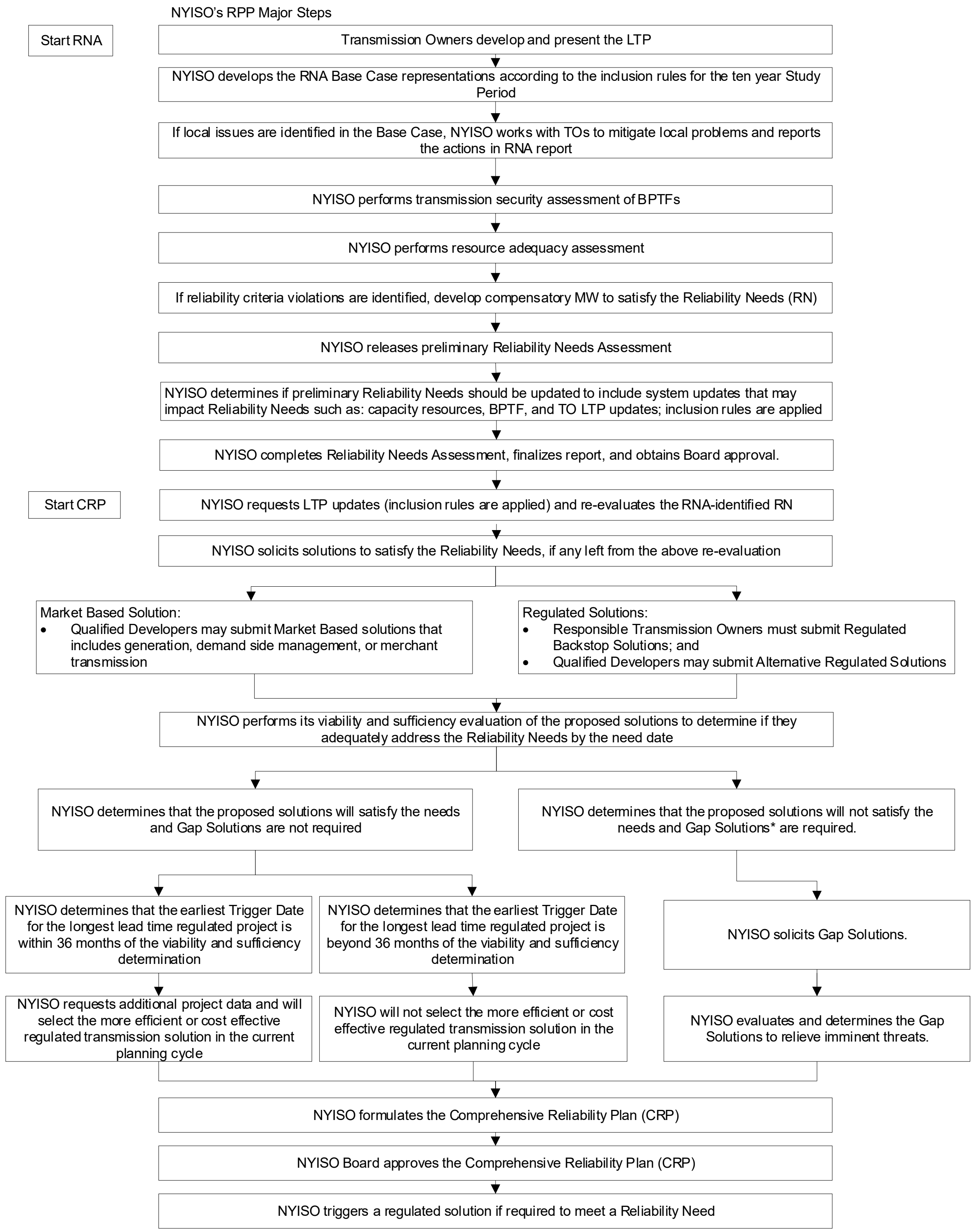
If the NYISO determines that an update does not meet the inclusion rules and/or does not impact the preliminary Reliability Need, then the NYISO does not incorporate the change into the final RNA Base Case.

After the NYISO Board of Directors approves the RNA Report, the NYISO will request updates to the Transmission Owners' LTPs and NYPA transmission plans before issuing a request for regulated backstop, market-based, and alternative regulated solutions to meet the Reliability Needs identified in the final RNA. Prior to responding to the RNA, the Responsible TOs 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 Transmission Owners' LTPs. The NYISO will then request solutions to the Reliability Needs, if necessary, after incorporating the updates to the Transmission Owners' LTPs and NYPA transmission plans and their impacts on the Reliability Needs.

Additionally, the 2018 version of the Manual 26 reflects a change in the *Section 3: RNA Base Case Development Process*, mainly related to the Base Case inclusion rules applicable to proposed projects, and also to the treatment of generation deactivations in the RNA Base Case.

Further details of the RPP, including the CRP and RNA processes, are contained in **Appendix B** of this report, and also in the RPP Manual located on the NYISO website. An overview of the RPP, including the updated RNA process, is illustrated in Figure 3 below, and also in the RPP Manual 26.

Figure 3: NYISO Reliability Planning Process (RPP)



Notes:
* If an immediate threat to the reliability of the power system is identified, a Gap Solution outside of the normal RPP cycle may be requested by the NYISO Board.

Summary of Prior CRPs

This is the ninth RNA since the NYISO's Comprehensive System Planning Process (CSPP) was approved by FERC in December 2004. The first three RNA reports identified Reliability Needs and the first three CRPs (2005-2007) evaluated the market-based and regulated backstop solutions submitted in response to those identified needs. The 2009 RNA and the 2010 RNA indicated that the system did not exhibit any violations of applicable Reliability Criteria, hence there was no need for the NYISO to solicit solutions under the CRP process. The 2012 RNA identified Reliability Needs and the 2012 CRP evaluated market-based and regulated solutions in response to those needs.

The 2014 RNA identified both resource adequacy and transmission security related Reliability Needs, which were subsequently eliminated by the system updates received during the 2014 CRP process.

The 2016 RNA identified two transmission security Reliability Needs beginning in 2017: the New York State Electric & Gas Corp. (NYSEG) Oakdale 345/115 kV transformer, and the Long Island Power Authority (LIPA) East Garden City to Valley Stream 138 kV line. Subsequent to the October 2016 approval of the RNA, and prior to the start of the CRP (as described in the Manual 26), NYSEG and LIPA provided updates to their LTPs. With these updates the two identified Reliability Needs were resolved, and there was no solicitation of solutions under the 2016 RPP cycle.

The NYISO has not previously triggered any regulated backstop solutions to meet previously identified Reliability Needs due to changes in system conditions and sufficiency of projects coming into service.

Figure 4 presents the market solutions and TOs' plans that were submitted in response to previous requests for solutions.

Figure 4: Current Status of Tracked Market-Based Solutions & TOs' Plans

Queue #	Project	Submitted	Zone	Nameplate (MW)	CRIS (MW)	Summer (MW)	Proposal Type	Current Status	Included in the 2018 RNA Base Case
339	Station 255	CRP2012	B	N/A	N/A	N/A	TO's Plans	Q4 2020	Yes
-	Clay-Teall #10 115kV	CRP2012	C	N/A	N/A	N/A	TO's Plans National Grid	Q4 2019	Yes

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 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 ESPWG and TPAS and are shown in **Appendix D**. The Study Period analyzed in this 2018 RNA is from year 2019 (year 1) through 2028 (year 10).

This section highlights the key assumptions and modeling data updates for the RNA. These include: the load forecast model, the forecasted level of Special Case Resources, the change in generation resource status, LTPs, and Bulk Power 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 2018 Gold Book (2018 GB). The baseline forecast from the 2018 GB includes the load-reducing impacts of energy efficiency programs, building codes and standards, distributed energy generation, and behind-the-meter solar PV power, along with expected impacts (load-increasing) of electric vehicle usage. The econometric forecast incorporates only the growth due to the economy and does not account for the load-reducing impacts of the aforementioned programs. For the resource adequacy study, the baseline load forecast was modified by removing the behind-the-meter solar PV impacts in order to model the solar PV explicitly as a generation resource to account for the intermittent nature of its availability.

The RNA Base Case was 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 (MPs) and TOs. The changes in resources were included in the RNA Base Case using the NYISO 2018 FERC 715 filing as a starting point, adding and removing resources consistent with the base case inclusion screening process provided in Section 3.3 of the RPP Manual (Manual 26). For the resource adequacy study, resources in the NYCA that choose to participate in markets outside of New York are modeled using the MARS contracts modeling feature, whereby their capacity is removed from the NYCA for the years of the transaction 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 transmission planning coordination conducted under the NPCC and ERAG MMWG processes, and pursuant to the Northeast ISO/RTO Planning Coordination Protocol.

Annual Energy and Summer Peak Demand Forecasts

This section reports the baseline forecast, the topline (formerly known as econometric) forecast, the behind-the-meter solar PV forecast, and the baseline forecast with projected behind-the-meter solar PV added back. These forecasts are fully detailed in the 2018 Gold Book. The baseline forecast includes the impacts of energy efficiency, distributed energy resources, and behind-the-meter solar PV. The topline forecast does not include those impacts. The baseline forecast, which already reflects the solar PV behind-the-meter reductions, was modified to add back those impacts; 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 2018 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, distributed generation, and electric vehicles. 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, electric vehicles, and other demand-side management impacts over the Study Period. The factors considered in developing the 2018 RNA base case forecast are included in Appendix C.

The assumptions for the 2018 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 2018. The ESPWG and TPAS reviewed and discussed the assumptions used in the 2018 RNA base case forecast in accordance with procedures established for the RNA.

The annual average energy growth rate of the baseline forecast in the 2018 Gold Book decreased by 0.14% as compared to a 0.16% reduction in the 2016 Gold Book. The 2018 Gold Book's annual average baseline summer peak demand declined by 0.13% as compared to 0.21% growth in the 2016 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.

Figure 5 below summarizes the three forecasts used in the 2018 RNA. Figure 6 shows a comparison of the baseline forecasts and energy efficiency program impacts contained in the 2016 RNA and the 2018 RNA. Figure 7 and Figure 8 present actual, weather-normalized forecasts of annual energy and summer peak demand for the 2018 RNA. Figure 9 and Figure 10 present the NYISO's projections of annual energy and summer peak demand in the 2018 RNA for energy efficiency, distributed generation, and behind-the-meter solar PV.

Figure 5: 2018 RNA Load and Energy Forecast: Econometric, Baseline, and Baseline with SPV Forecasts Added Back In

Topline, Baseline and Adjusted Energy Forecasts

Annual GWh	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2018 Topline[1]	160,320	162,836	164,449	165,478	166,332	167,530	168,485	170,054	171,596	172,753	173,586
2018 Gold Book Baseline	156,120	156,649	155,567	154,567	153,898	153,593	153,476	153,454	153,504	153,691	153,926
+ 2018 Solar PV	1,768	2,301	2,803	3,179	3,477	3,686	3,875	4,033	4,165	4,302	4,420
2018 RNA Base Case[3]	157,888	158,950	158,370	157,746	157,375	157,279	157,351	157,487	157,669	157,993	158,346

Energy Impacts of Energy Efficiency, Distributed Resources & Solar PV

Cumulative GWh	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Solar PV	1,768	2,301	2,803	3,179	3,477	3,686	3,875	4,033	4,165	4,302	4,420
EE & Distributed Generation	2,432	3,886	6,079	7,732	8,957	10,251	11,134	12,567	13,927	14,760	15,240
Total	4,200	6,187	8,882	10,911	12,434	13,937	15,009	16,600	18,092	19,062	19,660

Econometric, Baseline and Adjusted Summer Peak Forecast

Annual MW	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2018 Topline[1]	33,763	34,099	34,367	34,554	34,727	34,946	35,132	35,442	35,750	35,982	36,154
2018 Gold Book Baseline[2]	32,904	32,857	32,629	32,451	32,339	32,284	32,276	32,299	32,343	32,403	32,469
+ 2018 Solar PV (MW AC)	440	566	689	774	843	889	928	963	989	1,017	1,038
2018 RNA Base Case[3]	33,344	33,423	33,318	33,225	33,182	33,173	33,204	33,262	33,332	33,420	33,507

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

Cumulative MW	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Solar PV (MW AC)	440	566	689	774	843	889	928	963	989	1,017	1,038
EE & Distributed Generation	419	676	1,049	1,329	1,545	1,773	1,928	2,180	2,418	2,562	2,647
Total	859	1,242	1,738	2,103	2,388	2,662	2,856	3,143	3,407	3,579	3,685

[1] The topline forecast will be used for the resource adequacy scenario.

[2] The transmission security power flow RNA base cases use this Gold Book baseline forecast.

[3] For the resource adequacy study, the Gold Book baseline load forecast was modified by removing the behind-the-meter solar PV impacts in order to model the solar PV explicitly as a generation resource to account for the intermittent nature of its availability.

Figure 6: Comparison of 2016 RNA & 2018 Baseline Forecasts

Comparison of Base Case Energy Forecasts - 2016 & 2018 RNA (GWh)

Annual GWh	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2016 RNA Base Case[1]	160,198	160,166	160,055	159,535	159,667	159,919	160,134	160,291	160,438		
2018 RNA Base Case[1]	157,888	158,950	158,370	157,746	157,375	157,279	157,351	157,487	157,669	157,993	158,346
Change from 2016 RNA	-2,310	-1,216	-1,685	-1,789	-2,292	-2,640	-2,783	-2,804	-2,769	NA	NA

Comparison of Base Case Peak Forecasts - 2016 & 2018 RNA (MW)

Annual MW	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2016 RNA Base Case[1]	33,825	33,948	34,019	34,120	34,256	34,393	34,515	34,646	34,803		
2018 RNA Base Case[1]	33,344	33,423	33,318	33,225	33,182	33,173	33,204	33,262	33,332	33,420	33,507
Change from 2016 RNA	-481	-525	-701	-895	-1,074	-1,220	-1,311	-1,384	-1,471	NA	NA

Comparison of Energy Impacts from Statewide Energy Efficiency & Distributed Generation - 2016 RNA & 2018 RNA (GWh)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2016 RNA Base Case[1,2]	1,586	2,894	4,094	5,230	6,226	7,198	8,140	9,070	10,010		
2018 RNA Base Case[1]	2,432	3,886	6,079	7,732	8,957	10,251	11,134	12,567	13,927	14,760	15,240
Change from 2016 RNA	846	992	1,985	2,502	2,731	3,053	2,994	3,497	3,917	NA	NA

Comparison of Peak Impacts from Statewide Energy Efficiency & Distributed Energy - 2016 RNA & 2018 RNA (MW)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2016 RNA Base Case[1,2]	290	488	661	820	942	1,061	1,175	1,292	1,408		
2018 RNA Base Case[1]	419	676	1,049	1,329	1,545	1,773	1,928	2,180	2,418	2,562	2,647
Change from 2016 RNA	129	188	388	509	603	712	753	888	1,010	NA	NA

[1] For the resource adequacy study, the Gold Book baseline load forecast was modified by removing the behind-the-meter solar PV impacts in order to model the solar PV explicitly as a generation resource to account for the intermittent nature of its availability.

[2] 2016 Gold Book values have been adjusted to include only those impacts from 2018 forward, so as to compare directly to the 2018 Gold Book values.

Figure 7: 2018 Topline and Baseline with SPV Energy Forecasts

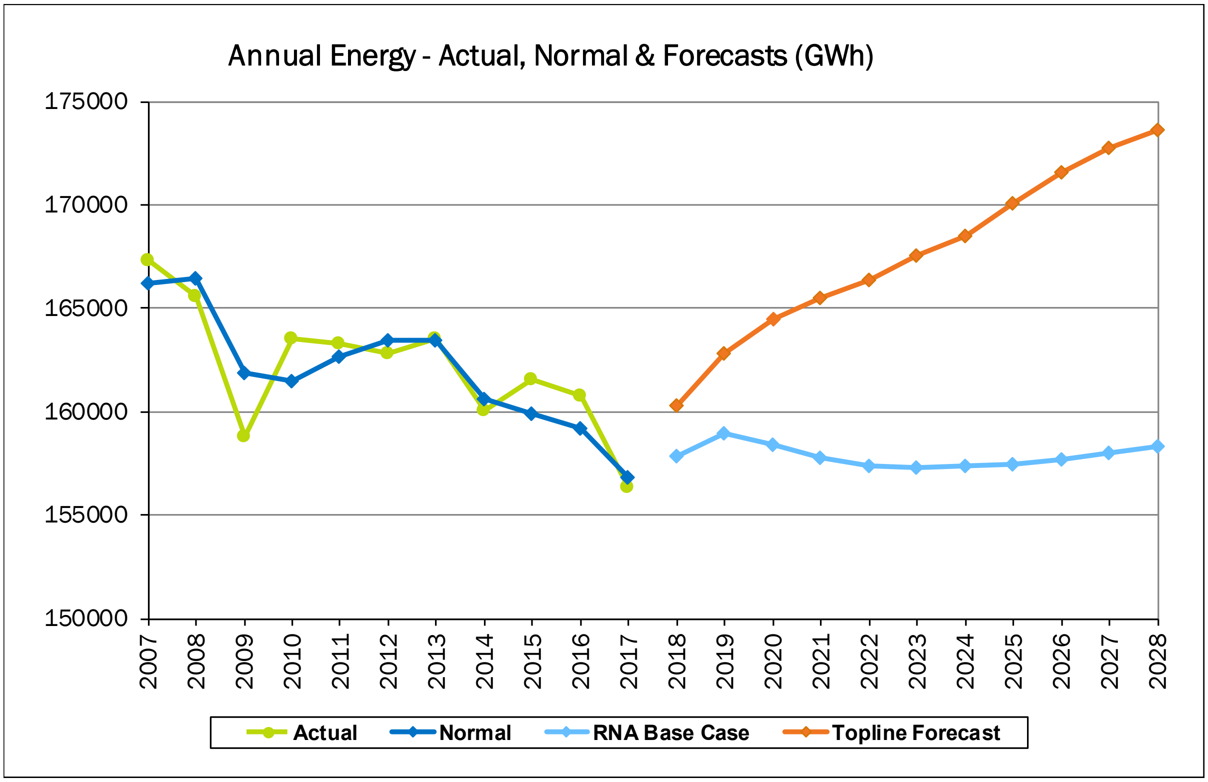


Figure 8: 2018 Topline and Baseline with SPV Summer Peak Demand Forecast

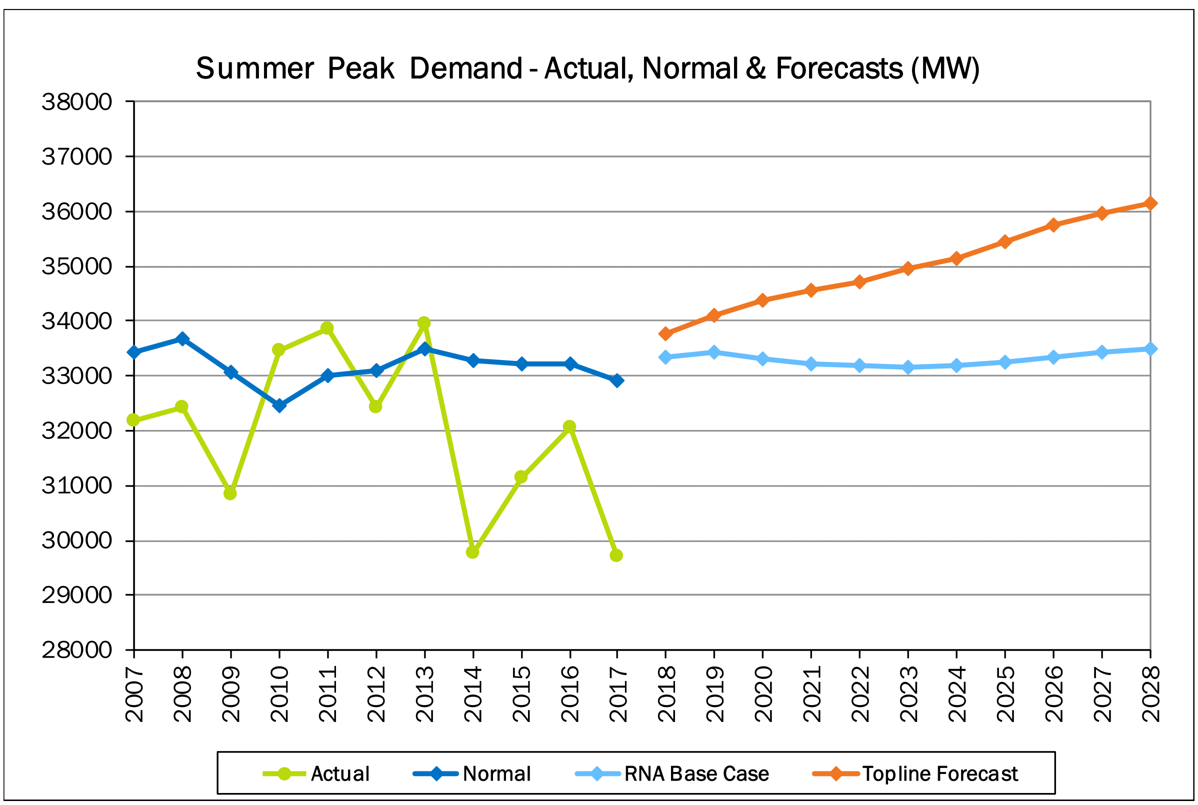


Figure 9: 2018 Energy Efficiency, Distributed Generation and Behind-the-Meter Solar PV – Annual Energy Forecast

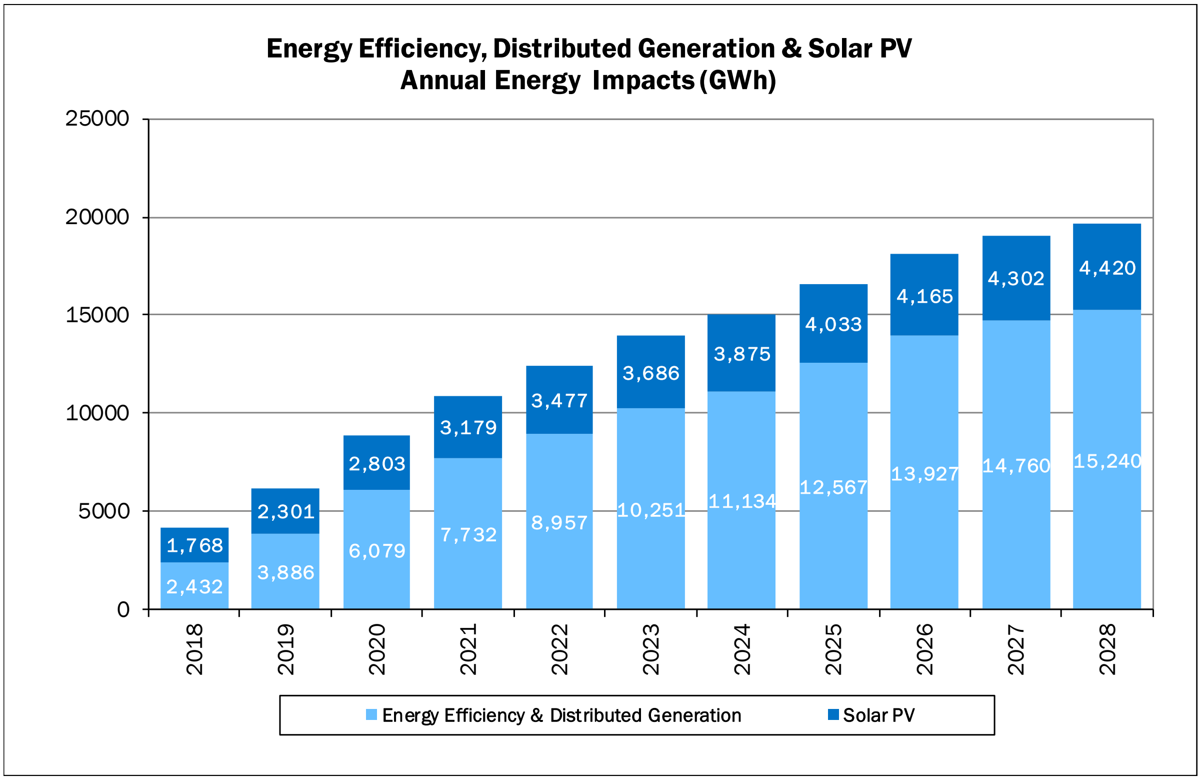
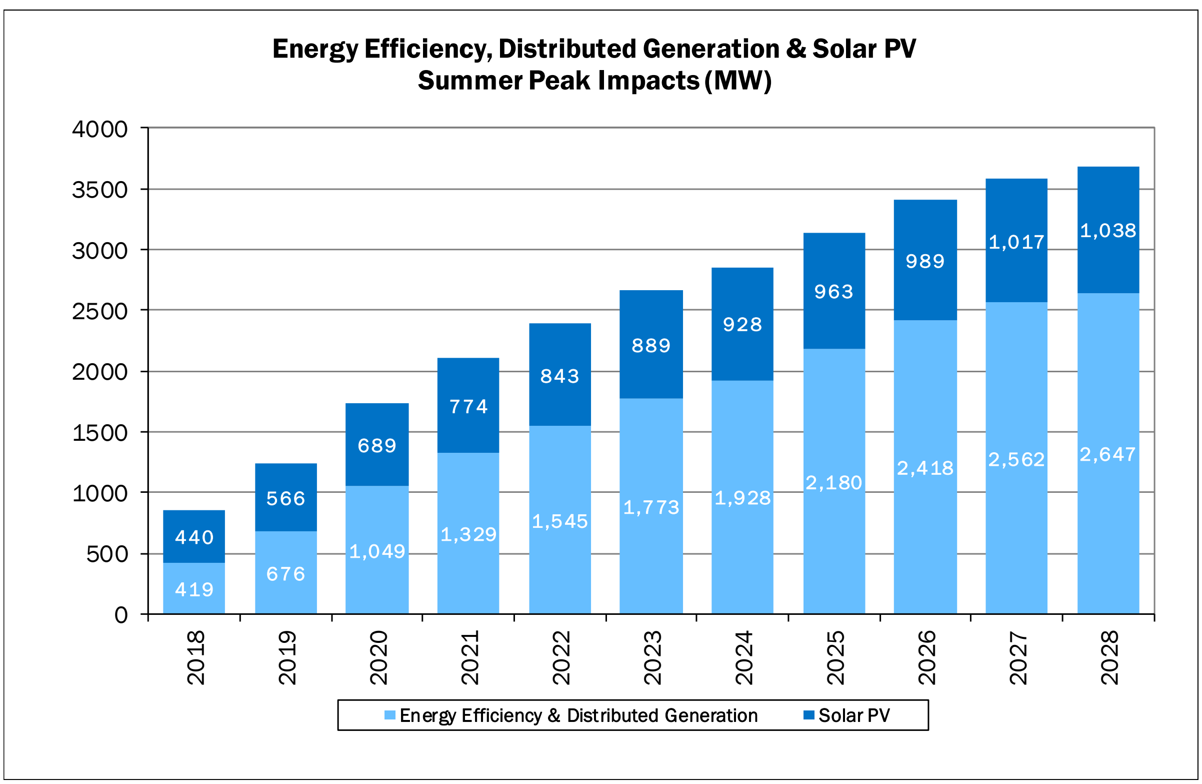


Figure 10: 2018 Energy Efficiency, Distributed Generation and Behind-the-Meter Solar PV – Summer Peak Forecast



In the 2018 RNA, the baseline forecast with behind-the-meter solar PV added back in is used as the load forecast for the resource adequacy base case. The purpose of using that baseline forecast 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 the historic shape to a shape that meets the forecasted criteria of zonal peak, NYCA peak, G-J Locality peak, and NYCA Energy Forecast.

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 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. To model the behind-the-meter forecasted solar PV in the MARS model, 8,760 hourly shapes are created by using NREL's PV Watt[1] tool. The shapes are applied during the load adjustment to account for their impact on both on-peak and off-peak hours. MARS will randomly select a daily shape from the current month for each day of each month of each replication.

Figure 11: Forecast of Solar PV BTM Reductions in Coincident Summer Peak Demand (MW)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2018	23	17	41	3	25	58	75	8	12	54	124	440
2019	30	25	57	4	34	69	99	10	15	68	155	566
2020	39	33	75	6	45	80	122	11	17	81	180	689
2021	46	38	88	7	52	87	140	12	18	91	195	774
2022	52	42	99	8	58	93	155	12	20	100	204	843
2023	56	45	106	9	62	98	167	13	21	107	205	889
2024	60	47	113	9	66	102	178	13	22	112	206	928
2025	63	50	118	10	69	106	186	14	23	117	207	963
2026	65	51	122	10	72	108	194	14	23	121	209	989
2027	68	53	126	11	74	111	201	15	24	124	210	1,017
2028	70	54	130	11	76	113	207	15	24	127	211	1,038

Forecast of Special Case Resources

The 2018 RNA Special Case Resource[2] (SCR) MW levels are based on the 2018 Gold Book value of 1,219 MW, adjusted for their performance for the resource adequacy evaluations. Transmission security analysis, which evaluates normal transfer criteria, does not consider SCRs.

[1] NREL's PVWatts Calculator, credit of the U.S. Department of Energy (DOE)/NREL/Alliance (Alliance for Sustainable Energy, LLC).

[2] SCR (*Section 2.19 of Market Services Tariff*): Demand Side Resources whose Load is capable of being interrupted upon demand at the direction of the ISO, and/or Demand Side Resources that have a Local Generator, which is not visible to the ISO's Market Information System and is rated 100 kW or higher, that can be operated to reduce Load from the NYS Transmission System or the distribution system at the direction of the ISO. Special Case Resources are subject to special rules, set forth in Section 5.12.11.1 of the ISO Services Tariff and related ISO Procedures, in order to facilitate their participation in the Installed Capacity market as Installed Capacity Suppliers.

Resource Additions and Removals

Since the 2016 RNA assumptions, 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 from the 2018 RNA preliminary Base Case:

- A total of approximately 1,600 MW has been added to the 2018 RNA Base Case as proposed generation as compared with the 2016 RNA.
- A total of approximately 3,000 MW has been removed as compared with the 2016 RNA Base Case because these units are currently in a deactivation state (*e.g.,* retired, mothballed, or in ICAP-Ineligible Forced Outage, or proposed to retire or mothball).

The comparison of generation status between the 2016 RNA and 2018 RNA is detailed in Figure 12 and Figure 13 below. The MW values represent the Capacity Resources Interconnection Service (CRIS) MW values from the 2018 Gold Book.

In addition to the projects that met the 2018 RNA inclusion rules (listed in Figure 12), a number of other projects are progressing through the NYISO's interconnection process: some of these additional generation resources have either accepted their cost allocation as part of a prior Class Year Facilities Study process, or are included in the currently ongoing 2017 Class Year Facilities Study, or are candidates for future interconnection facilities studies. These projects are listed in the Gold Book 2018 and also in Figure 14 and Figure 15 below.

Figure 12: Proposed Projects Included in the 2018 RNA Base Case

Queue #	Project Name	Zone	CRIS Request	SP MW	Interconnection Status	Included in RNA Base Case From Beginning of
Proposed Transmission Additions, other than Local Transmission Owner Plans (LTPs)						
530	Western NY PPTPP Empire State Line	Regulated Transmission Solutions	n/a/	n/a	TIP Facility Study	S2022
SDU	Leeds-Hurley SDU	System Deliverability Upgrades (SDU)	n/a	n/a	SDU triggered for construction in CY11	S2020
Proposed Generation Additions						
251	CPV Valley Energy Center	G	680.0	677.6	CY11	Study Year 1
349	Taylor Biomass	G	19.0	19.0	CY11	Study Year 3
395	Copenhagen Wind	E	79.9	79.9	CY15	Study Year 1
403	Bethlehem Energy Center Uprate	F	78.1	72.0	CY15	Study Year 1
387	Cassadaga Wind	A	126.0	126.0	CY17	Study Year 2
421	Arkwright Summit	A	78.4	78.0	CY17	Study Year 1
444	Cricket Valley Energy Center II	G	1020.0	1020.0	CY17	Study Year 2
461	East River 1 Uprate	J	n/a	2.0	CY17	Study Year 1
462	East River 2 Uprate	J	n/a	2.0	CY17	Study Year 1
467	Shoreham Solar	K	24.9	25.0	CY17	Study Year 1
510	Bayonne Energy Center II	J	120.4	120.4	CY17	Study Year 1
511	Ogdensburg	E	79.0	79.0	CY17	Study Year 1
N/A	Nine Mile Point 2	C	63.4	63.4	CY17 (CRIS only)	Study Year 1
N/A	East River 6	J	8.0	N/A	CY17 (CRIS only)	Study Year 1
		MW additions from 2016 RNA	1,598	1,588		
		Total MW gen. additions	2,377	2,364		

Also included in the 2016 RNA

Figure 13: 2018 RNA Generation Deactivations Assumptions

Owner/Operator	Plant Name	Zone	CRIS	2018 RNA Base Case	2016 RNA Base Case
Helix Ravenswood LLC	Ravenswood 04	J	15.2	out	out
	Ravenswood 05	J	15.7	out	out
	Ravenswood 06	J	16.7	out	out
International Paper Company	Ticonderoga	F	7.6	out	in
Niagara Generation LLC	Niagara Bio-Gen	A	50.5	out	out
NRG Power Marketing LLC	Dunkirk 2	A	97.2	out	out
	Huntley 67	A	196.5	out	out
	Huntley 68	A	198.0	out	out
	Astoria GT 05	J	16.0	out	out
	Astoria GT 07	J	15.5	out	out
	Astoria GT 08	J	15.3	out	out
	Astoria GT 10	J	24.9	out	out
	Astoria GT 11	J	23.6	out	out
	Astoria GT 12	J	22.7	out	out
	Astoria GT 13	J	24.0	out	out
ReEnergy Black River LLC	Fort Drum	E	55.6	out	in
	Chateaugay Power	D	18.6	out	out
Binghamton BOP, LLC	Binghamton	C	43.8	out	in
Helix Ravenswood, LLC	Ravenswood 09	J	21.7	out	in
Entergy Nuclear Power Marketing, LLC	Indian Point 2	H	1027.0	out	in
	Indian Point 3	H	1040.0	out	in
Selkirk Cogen Partners, LP	Selkirk 1	F	82.1	out	in
	Selkirk 2	F	291.3	out	in
J- Power USA Generation, LP Edgewood Energy, LLC	PPL Pilgrim ST GT1	K	45.6	out	in
	PPL Pilgrim ST GT2	K	46.2		
Helix Ravenswood, LLC	Ravenswood 2-1	J	40.4	out	in
	Ravenswood 2-2	J	37.6		
	Ravenswood 2-3	J	39.2		
	Ravenswood 2-4	J	39.8		
	Ravenswood 3-1	J	40.5		
	Ravenswood 3-2	J	38.1		
	Ravenswood 3-4	J	35.8		
Lyonsdale Biomass, LLC	Lyonsdale (Burrows)	E	20.2	out	in
R.E. Ginna Nuclear Power Plant, LLC	Ginna	B	582.0	in	out
Cayuga Operating Company, LLC	Cayuga 1	C	154.1	in	out
	Cayuga 2	C	154.7	in	out
Entergy Nuclear Power Marketing LLC	Fitzpatrick 1	C	858.9	in	out
change in status	Changes in deactivations since 2016 RPP		1,203		
	Total 2018 RNA MW assumed as deactivated		3,703		

Figure 14: Additional Proposed Generation Projects from the 2018 Gold Book

Queue	Owner/Operator	Proposed Generation Project Name	Zone	Proposed Date*	Requested CRIS (MW)	Summer (MW)
Completed Class Year Facilities Study						
251	CPV Valley, LLC	CPV Valley Energy Center	G	Feb-18	680.0	677.6
395	Copenhagen Wind Farm, LLC	Copenhagen Wind	E	Nov-18	79.9	79.9
349	Taylor Biomass Energy Montgomery, LLC	Taylor Biomass	G	Apr-21	19.0	19.0
Class Year 2017						
511	AG Energy, LP	Ogdensburg	E	May-18	79.0	79.0
467	Shoreham Solar Commons LLC	Shoreham Solar	K	Jun-18	24.9	25.0
421	EDP Renewables North America	Arkwright Summit	A	Oct-18	78.4	78.4
422	NextEra Energy Resources, LLC	Eight Point Wind Energy Center	B	Dec-18	101.2	101.2
505	RES America Development Inc.	Ball Hill Wind	A	Dec-18	100.0	100.0
387	Cassadaga Wind, LLC	Cassadaga Wind	A	Dec-19	126.0	126.0
396	Baron Winds, LLC	Baron Winds	C	Dec-19	300.0	300.0
468	Apex Clean Energy LLC	Galloo Island Wind	C	Dec-19	108.9	110.4
444	Cricket Valley Energy Center, LLC	Cricket Valley Energy Center II	G	Jan-20	1020.0	1020.0
523	Dunkirk Power, LLC	Dunkirk Unit 2	A	Apr-20	85.0	75.0
524	Dunkirk Power, LLC	Dunkirk Unit 3 & 4	A	Apr-20	370.0	370.0
496	Renovo Energy Center, LLC	Renovo Energy Center	C	Jun-20	480.0	480.0
494	Alabama Ledge Wind Farm LLC	Alabama Ledge Wind	A	Oct-20	79.8	79.8
498	ESC Tioga County Power, LLC	Tioga County Power	C	May-21	550.0	550.0
393	NRG Berrians East Development, LLC	Berrians East Replacement	J	Jun-22	508.0	508.0
Class Year 2017 CRIS Requests						
430	HQUS	Cedar Rapids Transmission Upgrade	D	N/A	80.0	N/A
	LI Energy Storage System, LLC	Montauk Battery Storage	K	N/A	5.0	N/A
	LI Energy Storage System, LLC	East Hampton Battery Storage	K	N/A	5.0	N/A
	ConEd	East River 6	J	fall 2017 (target end CY17)	8.0	N/A
477	Riverhead Solar Farm, LLC	Riverhead Solar	K	N/A	20.0	N/A
	Nine Mile Point Nuclear Station, LLC	Nine Mile Point Unit 2	C	fall 2017 (target end CY17)	63.4	N/A
	East Coast Power, LLC	Linden Cogen	J	N/A	37.2	N/A
Other Non Class Year Generators						
513	Stoney Creek Energy, LLC	Orangeville	C	Mar-18	0.0	20.0
477	Riverhead Solar Farm, LLC	Riverhead Solar	K	Oct-18	N/A	20.0
N/A	Cubit Power One Inc.	Arthur Kill Cogen	J	Apr-18	N/A	11.1
Future Class Year Candidates						
276	Air Energie TCI, Inc.	Crown City Wind	C	Dec-18	TBD	90.0
495	Mohawk Solar LLC	Mohawk Solar	F	Dec-18	TBD	98.0
514	RES America Developments Inc.	Empire Wind	F	Oct-19	TBD	120.0
449	Stockbridge Wind, LLC	Stockbridge Wind	E	Dec-19	TBD	72.6
347	Franklin Wind Farm, LLC	Franklin Wind	E	Dec-19	TBD	50.4
519	Canisteo Wind Energy LLC	Canisteo Wind	C	Dec-19	TBD	290.7
531	Invenergy Wind Development LLC	Number 3 Wind	E	Dec-19	TBD	105.8
382	Astoria Generating Co.	South Pier Improvement	J	Jun-20	TBD	91.2

Queue	Owner/Operator	Proposed Generation Project Name	Zone	Proposed Date*	Requested CRIS (MW)	Summer (MW)
Future Class Year Candidates						
445	Lighthouse Wind, LLC	Lighthouse Wind	A	Dec-20	TBD	201.3
372	Dry Lots Wind, LLC	Dry Lots Wind	E	Dec-20	TBD	33.0
371	South Mountain Wind, LLC	South Mountain Wind	E	Dec-20	TBD	18.0
526	Atlantic Wind, LLC	North Ridge Wind	E	Dec-20	TBD	100.0
361	US PowerGen Co.	Luyster Creek Energy	J	Jun-21	TBD	401.0
474	EDP Renewables North America	North Slope Wind	D	Oct-21	TBD	200.0
466	Atlantic Wind, LLC	Bone Run Wind	A	Dec-21	TBD	132.0
383	NRG Energy, Inc.	Bowline Gen. Station Unit #3	G	Jun-22	TBD	775.0
Proposed Generation Re-ratings - Incremental MW Capability						
461	Consolidated Edison Co. of NY, Inc.	East River 1 Uprate	J	IS	0.0	2.0
462	Consolidated Edison Co. of NY, Inc.	East River 2 Uprate	J	IS	0.0	2.0
403	PSEG Power New York	Bethlehem Energy Center	F	2017-2019	78.1	72.0
510	Bayonne Energy Center	Bayonne Energy Center II	J	2018/03	TBD	120.4
512	Northbrook Lyons Falls	Lyons Falls Mill Hydro	E	2018/03	0.0	2.5
338	Rochester Gas & Electric Corp	Station 2	B	2018/09	0.0	6.3
401	Caithness Long Island II, LLC	Caithness Long Island II	K	2019/05	TBD	599.0
516	East Coast Power LLC	Linden Cogen Uprate	J	2020/05	TBD	234.4
in 2018 RNA		Total Gold Book[2] MW not incuded in the 2018 RNA Base Case				6,336
in 2016 RNA						

* at the time of the study

Figure 15: Additional Proposed Transmission Projects from the 2018 Gold Book

Queue	Owner	Terminals	
Proposed Merchant Transmission Projects			
358	West Point Partners	Leeds 345kV	Buchanan North 345kV
458	Transmission Developers Inc.	Hertel 735kV (Quebec)	Astoria Annex 345kV
363	Poseidon Transmission , LLC	Deans 500kV (PJM)	Ruland Road 138kV
Proposed TIP Projects (included in FERC 715 Base Case)			
430	H.Q. Energy Services U.S. Inc.	Alcoa 115kV	Dennison 115kV
545A	Empire State Line Project	Dysinger & East Stolle Stations	summer 2022
in the 2018 RNA			

Local Transmission Plans

As part of the NYISO's Local Transmission Planning Process (LTPP), TOs present their LTPs to the NYISO and stakeholders during ESPWG and TPAS meetings. The firm transmission plans presented in the TO LTPs and that were reported as firm in the 2018 Gold Book are included in the 2018 RNA Base Case. A summary of these projects are reported in Appendix D. LIPA presented a firm LTP update to address the Reliability Need that was found in Year 10 at the June 28 joint ESPWG/TPAS meeting. The LTP increases the ratings on the Brookhaven to Riverhead 138 kV line.

Bulk Transmission Projects

The notable bulk transmission project that met the inclusion rules and is modeled in the 2018 RNA Base Case is the Western New York Public Policy Project – Empire State Line Project. The proposed in service date for this project is Summer 2022.

Base Case Peak Load and Resources Summaries

The 2018 RNA's resource adequacy base case modeled as resources the existing generation adjusted for the unit retirements, mothballing, and proposals to retire or mothball announced as of April 4, 2018, along with the new resource additions that met the base case inclusion rules set forth in Section 3 of the RPP Manual. This capacity is summarized in

Figure 16 below, along with the baseline peak load, capacity net purchases and the SCRs.

Figure 16: NYCA Peak Load and Resources 2019 through 2028

Year		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
		Peak Load (MW) -Gold Book 2018 NYCA Baseline									
	NYCA*	32,857	32,629	32,451	32,339	32,284	32,276	32,299	32,343	32,403	32,469
	Zone J*	11,474	11,410	11,363	11,336	11,328	11,335	11,350	11,372	11,399	11,429
	Zone K*	5,323	5,278	5,246	5,231	5,229	5,237	5,251	5,268	5,287	5,306
	Zone G-J*	15,815	15,715	15,639	15,594	15,574	15,576	15,591	15,616	15,648	15,685
		Resources (MW)									
NYCA	Capacity**	39,230	39,358	38,339	38,339	38,339	38,339	38,339	38,339	38,339	38,339
	Net Purchases & Sales	1,279	1,785	1,800	1,942	1,942	1,942	1,942	1,942	1,942	1,942
	SCR	1,219	1,219	1,219	1,219	1,219	1,219	1,219	1,219	1,219	1,219
	Total Resources	41,728	42,362	41,358	41,500	41,500	41,500	41,500	41,500	41,500	41,500
	Capacity/Load Ratio	119.4%	120.6%	118.1%	118.6%	118.8%	118.8%	118.7%	118.5%	118.3%	118.1%
	Cap+NetPurch/Load Ratio	123.3%	126.1%	123.7%	124.6%	124.8%	124.8%	124.7%	124.5%	124.3%	124.1%
	Cap+NetPurch+SCR/Load Ratio	127.0%	129.8%	127.4%	128.3%	128.5%	128.6%	128.5%	128.3%	128.1%	127.8%
Zone J	Capacity**	9,562	9,562	9,562	9,562	9,562	9,562	9,562	9,562	9,562	9,562
	Cap+UDR+SCR/Load Ratio	95.2%	95.8%	96.2%	96.4%	96.5%	96.4%	96.3%	96.1%	95.9%	95.6%
Zone K	Capacity**	5,220	5,220	5,220	5,220	5,220	5,220	5,220	5,220	5,220	5,220
	Cap+UDR+SCR/Load Ratio	117.6%	118.6%	119.3%	119.6%	119.7%	119.5%	119.2%	118.8%	118.4%	117.9%
Zone G-J	Capacity**	15,371	15,373	14,354	14,354	14,354	14,354	14,354	14,354	14,354	14,354
	Cap+UDR+SCR/Load Ratio	106.4%	107.1%	101.1%	101.3%	101.5%	101.5%	101.4%	101.2%	101.0%	100.8%

Legend:

*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, re-ratings, 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 reflect the awarded UDRs for those capacity zones.

Notes:

- SCR: forecasted MW ICAP value from the 2018 Gold Book.
- Wind generator summer capacity is counted as 100% of nameplate rating.
- The MW load in this table is the Gold Book baseline load (*e.g.*, reflects expected reduction related with the projected behind-the-meter solar photovoltaic, energy efficiency programs, building codes and standards, distributed energy resources).

As shown in the

Figure 16 above, the total NYCA capacity margin (defined as capacity above the baseline load forecast) varies between 27.0 % in 2019 (year 1), 28.5 % in 2023 (year 5), and 27.8 % in 2028 (year 10). For relative comparison purposes, these percentages are significantly above the required 18.2 % NYCA Installed Reserve Margin (IRM) for the 2018-2019 Capability Year.

Figure 17 below shows in a different way the relative increase in the capacity margin, by comparing the details of the capacity margins for year 5 (2023) between the 2018 RNA and the 2016 RNA:

1. The 2018 RNA NYCA baseline load forecast is 1,464 MW lower;
2. The NYCA capacity resources are 353 MW higher.
3. This increase in net resources contributes to an 1,817 MW increase in the net margin as compared with the 2016 RNA.

Figure 17: Load and Resources Comparison of Year 2023 (MW)

Year 2023	2018 RNA	2016 RNA	Delta
Baseline Load	32,284	33,748	-1,464
Total Resources*	41,500	41,147	353
Net Margin: Change in (netCapacity - netLoad)			1,817

Note: * Total Resources include net purchases and sales and the Special Case Resources as shown in Figure 17.

Methodology for the Determination of Needs

The OATT defines Reliability Needs in terms of total deficiencies relative to Reliability Criteria determined from the assessments of the BPTF performed in 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 transmission adequacy and the resource adequacy assessments are performed together.

Transmission security is the ability of the power system to withstand disturbances, such as electric short circuits or unanticipated loss of system elements, and continue to supply and deliver electricity. Transmission 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 Reliability Criteria. The impacts when applying these design criteria contingencies are assessed to determine that 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's "Guideline for Fault Current Assessment[3]" 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. 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, over 1,000 design criteria contingencies are evaluated under N-1, N-1-0, and N-1-1 normal transfer criteria conditions to provide 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 applicable 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 re-dispatch, 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 exceeds the applicable post-contingency rating.

Resource adequacy is the ability of the electric systems to supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account scheduled and reasonably expected 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

[3] Attachment I of Transmission, Expansion and Interconnection Manual

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 an LOLE that, at any given point in time, is less than or equal to an involuntary firm 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 different types of supply and demand-side resources and also due to transmission constraints, the amounts and locations of resources necessary to match the level of compensatory MW needs identified will vary. Reliability 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 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.

Reliability Needs Assessment

Overview

Reliability is defined and measured through the use of the concepts of security and adequacy described in Section RNA Base Case Assumptions, Drivers, and Methodology. 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 criterion are translated into MW or MVAR amounts to quantify the Reliability Need.

Reliability Needs for Base Case

Below are the principal findings of the 2018 RNA applicable to the Base Case conditions for the Study Period including: transmission security assessment (steady state, stability and short circuit assessment); resource and transmission adequacy assessment; system stability assessments; and scenario analyses.

Transmission Security Assessment

The RNA requires analysis of the security of the BPTF throughout the Study Period. 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 No. 715 power flow cases, which the NYISO filed with FERC on April 1, 2018.

For the 2018 RNA transmission security assessment, the preliminary transmission security analysis only identified one transmission security violation (*i.e.* Reliability Need) for the Study Period. The Reliability Need identified was in eastern Long Island. This Reliability Need is generally driven by LIPA load growth in eastern Long Island under the identified N-1-0 condition which is where the system is restored to normal limits following an event. The Year of Need is Year 10 and the eastern Long Island overload is approximately 1%. Figure 18 depicts the region impacted by the transmission security constraint. The red X in the Figure 18 shows the contingency and the yellow highlight shows overload. At the June 28th ESPWG/TPAS meeting, LIPA presented a firm LTP update to address this Reliability Need. The LTP increases the ratings on the Brookhaven to Riverhead 138 kV line. With this increase in rating, the overload is resolved and no Reliability Need is identified.

Figure 18: Approximate Area of Preliminary Transmission Security Need

The transmission security assessment also observed thermal violations in Year 1 (2019); however, these overloads are not considered Reliability Needs since responsible TOs have LTPs identified in the 2018 Gold Book and will use interim operating procedures to maintain the security of the system until the LTP is placed in-service. Details of the 2019 thermal violations are provided below:

Starting in 2019 (Year 1), the N-1-1 analysis show overloads in Central New York on the National Grid (NGrid) Clay-Teall (#10) 115 kV and Clay-Dewitt (#3) 115 kV lines. These overloads were also identified in the 2016 RNA. The National Grid LTPs to reconductor these circuits are planned to be in-service by Winter 2020. In the interim, operating procedures will be used to maintain the security of the system.

Starting in 2019 (Year 1), the N-1-1 analysis shows an overload on the Orange and Rockland Utilities (O&R) West Haverstraw 345/138 kV transformer. O&R has a LTP to install a new transformer source (Lovett 345kV/138kV station) which is planned to be in-service by Summer 2021. In the interim, operating procedures will be used to maintain the security of the system.

Short Circuit Assessment

The required performance of the short circuit assessment in the RNA includes the calculation of symmetrical short circuit current to ascertain whether the circuit breakers at stations connecting the BPTF could be subject to fault current levels in excess of their rated interrupting capability. The analysis was performed for 2023 (Year 5), reflecting the study conditions outlined in this Section RNA Base Case

Assumptions, Drivers, and Methodology. The calculated fault levels will not change significantly after Year 5 in the Study Period as no new generation or transmission changes are modeled in the RNA, and the methodology for fault duty calculation is not sensitive to load growth. For this assessment no over-dutied circuit breakers were identified. The detailed results of the short circuit assessment are provided in Appendix D of this report.

System Stability Assessment

The 2016 NYISO Intermediate Area Transmission Review, which evaluated 2021, and the 2017 NYISO Interim Area Transmission Review, which evaluated 2022, include stability assessments. Additionally, the Indian Point Generator Deactivation Assessment, which was completed in December 2017, evaluated stability for year 2023. The stability analyses were all conducted in conformance with the applicable NERC standards, NPCC criteria, and NYSRC Reliability Rules. These analyses found no stability criteria violations.

Transmission and Resource Adequacy Assessment

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

The emergency criteria transfer limits used in the MARS model were developed from an assessment of analysis of the 2018 RNA power flow base case, and analysis performed for other studies. Figure 19, Figure 20 and Figure 21 below provide the thermal and voltage emergency transfer limits for the major NYCA interfaces. The 2016 RNA transfer limits are presented for comparison purposes.

Figure 19: Transmission System Thermal Emergency Transfer Limits

Interface	2018 RNA study						2016 RNA study		
	2019	2020	2021	2022	2023	2028	2019	2020	2021
Dysinger East	*1700*	*1700*	*1700*	*2300*	2300	same as 2023	1700	1700	1700
Central East MARS	*4450*	*4450*	*4450*	*4450*	4450	same as 2023	4475	4475	4475
E to G (Marcy South)	*2275*	*2275*	*2275*	*2275*	2275	same as 2023	2275	2275	2275
F to G	*3475*	*3475*	*3475*	*3475*	3475	same as 2023	3475	3475	3475
UPNY-SENY MARS	*5500*	*5600*	*5600*	*5600*	5600	same as 2023	5600	5600	5600
I to J	*4400*	*4400*	*4400*	*4400*	4400	same as 2023	4400	4400	4400
I to K (Y49/Y50)	*1293*	*1293*	*1293*	*1293*	1293	same as 2023	1190	1190	1190

Notes:

Grey italic font: Limit was not calculated

Figure 20: Transmission System Voltage Emergency Transfer Limits

Interface	2018 RNA study						2016 RNA study		
	2019	2020	2021	2022	2023	2028	2019	2020	2021
Dysinger East	*2125*	*2125*	*2800*	*2900*	2900	same as 2023	2125	2800	2800
Central East MARS	*3100*	*3100*	*3100*	*3100*	3100	same as 2023	3050	3050	3050
Central East Group	*5000*	*5000*	*5000*	*5000*	5000	same as 2023	4925	4925	4925
UPNY-ConEd	*5750*	*5750*	*6250*	*6250*	6250	same as 2023	5750	5750	5750
I to J & K	*5600*	*5600*	*5600*	*5600*	5600	same as 2023	5600	5600	5600

Note:

Grey italic font: Limit was not calculated

Figure 21: Transmission System Base Case Emergency Transfer Limits

Interface	2018 RNA study											2016 RNA study					
	2019		2020		2021		2022		2023		2028	2019		2020		2021	
Dysinger East	*1700*	*T*	*1700*	*T*	*1700*	*T*	*2300*	*T*	2300	T	same as 2023	1700	T	1700	T	1700	T
Central East MARS	*3100*	*V*	*3100*	*V*	*3100*	*V*	*3100*	*V*	3100	V	same as 2023	3050	V	3050	V	3050	V
Central East Group	*5000*	*V*	*5000*	*V*	*5000*	*V*	*5000*	*V*	5000	V	same as 2023	4925	V	4925	V	4925	V
E to G (Marcy South)	*2275*	*T*	*2275*	*T*	*2275*	*T*	*2275*	*T*	2275	T	same as 2023	2275	T	2275	T	2275	T
F to G	*3475*	*T*	*3475*	*T*	*3475*	*T*	*3475*	*T*	3475	T	same as 2023	3475	T	3475	T	3475	T
UPNY-SENY MARS	*5500*	*T*	*5600*	*T*	*5600*	*T*	*5600*	*T*	5600	T	same as 2023	5600	T	5600	T	5600	T
I to J	*4400*	*T*	*4400*	*T*	*4400*	*T*	*4400*	*T*	4400	T	same as 2023	4400	T	4400	T	4400	T
I to K (Y49/Y50)	*1293*	*T*	*1293*	*T*	*1293*	*T*	*1293*	*T*	1293	T	same as 2023	1190	T	1190	T	1190	T
I to J & K	*5600*	*C*	*5600*	*C*	*5600*	*C*	*5600*	*C*	5600	C	same as 2023	5590	T	5590	T	5590	T

Notes:

T - Thermal, V - Voltage, C – Combined

Limit was not calculated

The Dysinger East limit increases by 600 MW in study year 2022 for the 2018 RNA. The primary cause for increasing the limit is the inclusion of the Western NY Public Policy Transmission Project in the planned system.

The Dysinger East voltage limit increases significantly in 2021. The primary cause is the addition of the Station 255 project in Zone B, which includes two new 345/115 kV transformers and a new 345 kV line section from Station 255 to Station 80. However, this increase in the voltage limit does not impact the MARS topology since the thermal transfer limit is more constraining throughout the Study Period.

The Central East MARS and Central East Group interfaces increased 50 MW and 75 MW, respectively, as a result from the cancellation of the proposed retirement of the FitzPatrick unit, which was modeled in the 2016 RNA.

Beginning in study year 2020 a series of dynamic limit tables is used to control flow on the UPNY-SENY interface. In study year 2019 the NYISO implemented the same formulaic model that was used in the 2016 RNA. Replacing the formulaic model for UPNY-SENY is necessary to capture the impact that the Cricket Valley project, which is planned to enter into service by 2020, will have on the UPNY-SENY transfer limit.

The model was developed to respect the unique impacts that three generation plants (Athens, CPV Valley, Cricket Valley) have on the UPNY-SENY transfer limit. The dynamic limits table feature in MARS allows for the application of a specific transfer limit based on specific commitment statuses of the generators at those plants. A table of the limits used in the new model can be found **Figure 12 of Appendix D**.

The UPNY-Con Ed voltage limit increases by 500 MW in year 2021 of the 2018 RNA. The primary cause of this increase is the retirement of the Indian Point Energy Center.

The I to K (Y49/Y50) interface limit increased by 103 MW from the previous RNA. This increase was the result of a change in the rating of the facility that was limiting in the 2016 RNA, Shore Road – Glenwood South 138 kV.

The topology used in the MARS model for the 2018 RNA Base Case is represented in Figure 22,

Figure 23, Figure 24 and Figure 25 below. Figure 22 represents RNA topology for Study Year 2019.

Figure 23 represents RNA topology for the Study Year 2020 when Cricket Valley Energy Center was assumed in service. Figure 24 represents RNA topology for Study Year 2021 when Indian Point Energy Center Units 2 and 3 are assumed fully retired. Figure 25 represents RNA topology for Study Years starting 2022 through 2028 when the Western New York Public Policy Transmission Project is assumed in service. The modeled internal transfer limits are summer period emergency transfer criteria transfer limits developed from analysis of the RNA power flow cases. The external transfer limits are derived from the NPCC CP-8 Summer Assessment MARS database with changes based upon the RNA Base Case assumptions.

Figure 22: 2018 RNA Preliminary Topology Year 1 (2019)

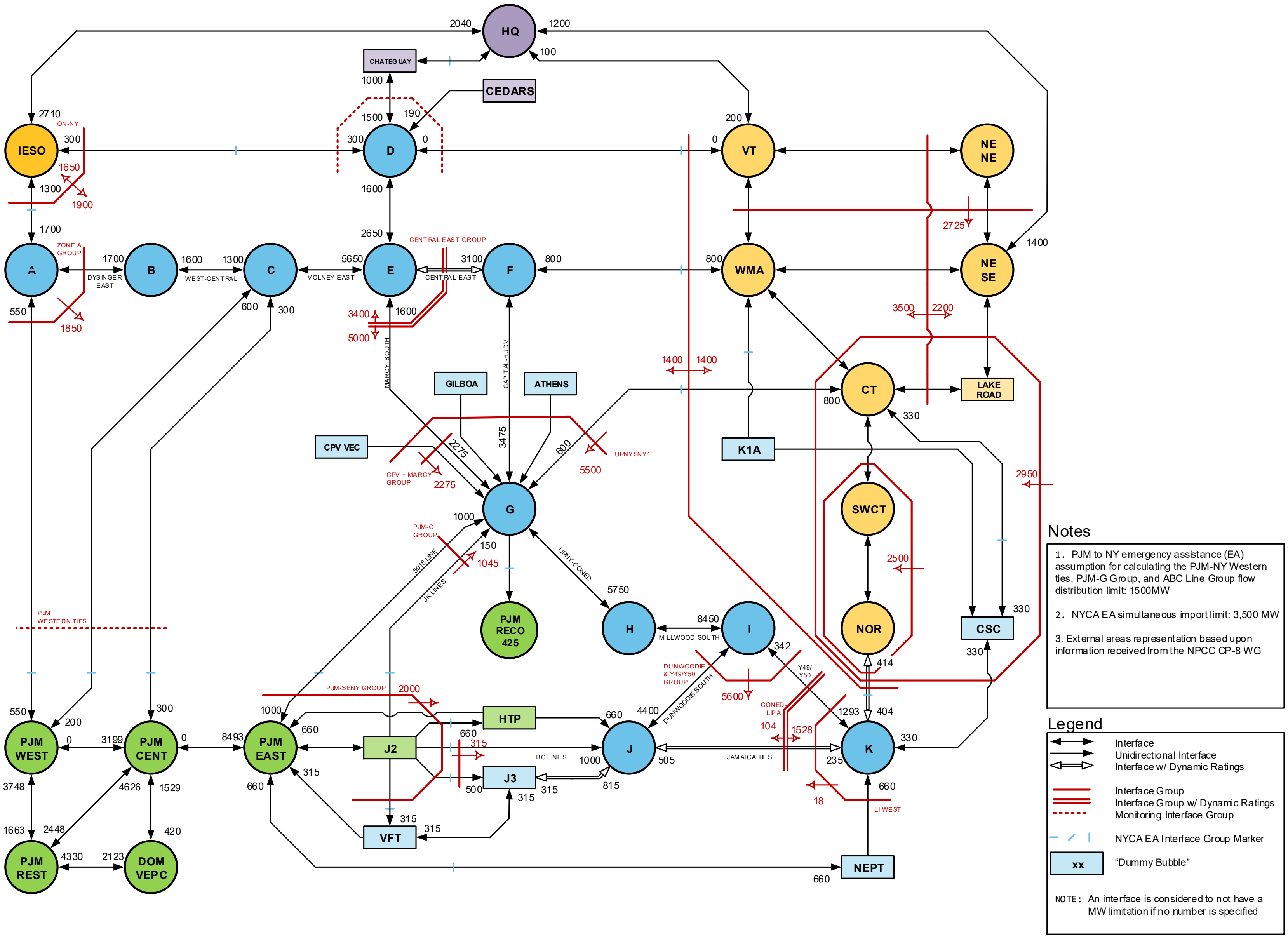
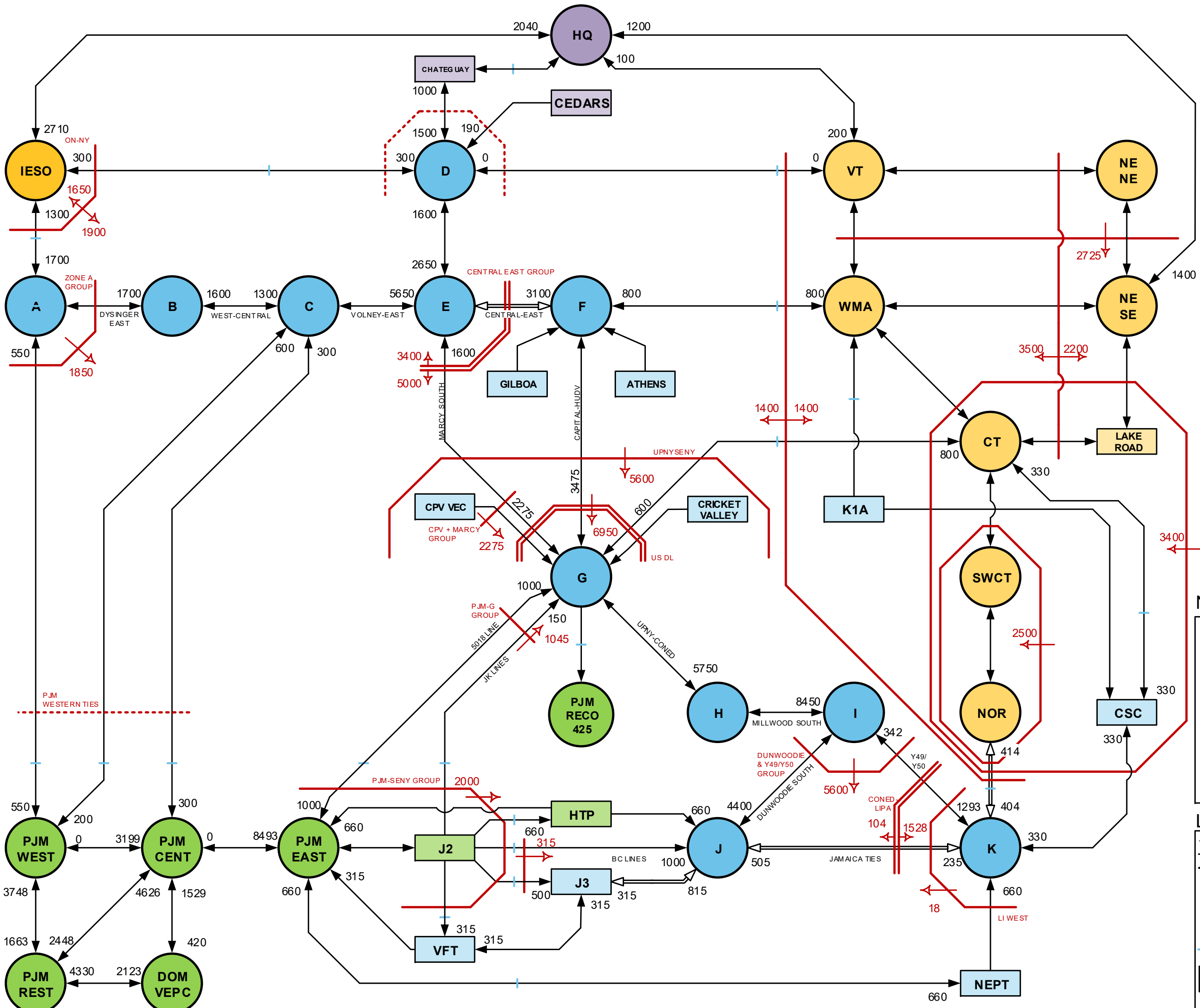


Figure 23: 2018 RNA Preliminary Topology Year 2 (2020)



Notes

1. PJM to NY emergency assistance (EA) assumption for calculating the PJM-NY Western ties, PJM-G Group, and ABC Line Group flow distribution limit: 1500MW

2. NYCA EA simultaneous import limit: 3,500 MW

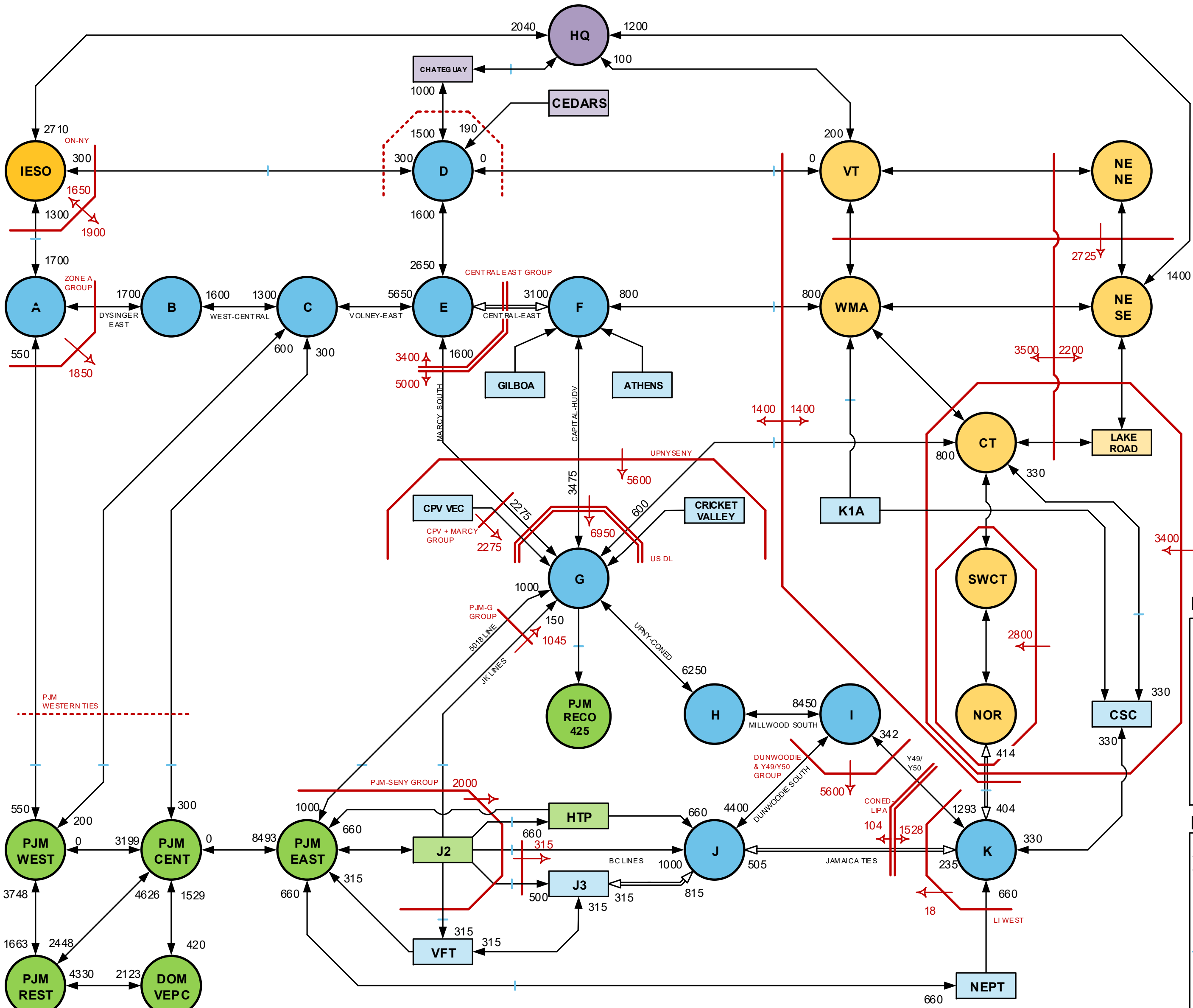
3. External areas representation based upon information received from the NPCC CP-8 WG

Legend

- Interface
- Unidirectional Interface
- Interface w/ Dynamic Ratings
- Interface Group
- Interface Group w/ Dynamic Ratings
- Monitoring Interface Group
- NYCA EA Interface Group Marker
- xx "Dummy Bubble"

NOTE: An interface is considered to not have a MW limitation if no number is specified

Figure 24: 2018 RNA Preliminary Topology Year 3 (2021)



Notes

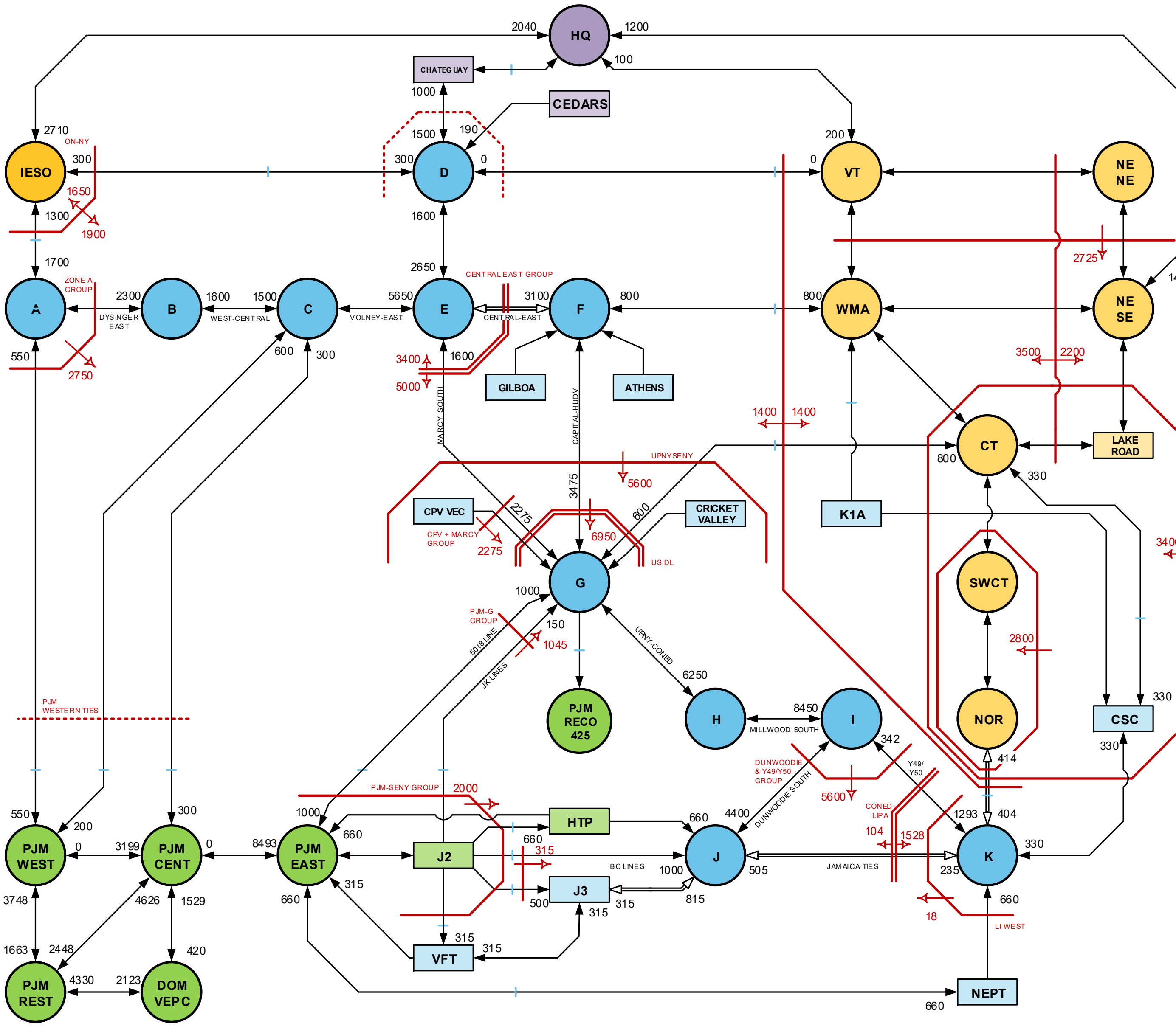
1. PJM to NY emergency assistance (EA) assumption for calculating the PJM-NY Western ties, PJM-G Group, and ABC Line Group flow distribution limit: 1500MW
2. NYCA EA simultaneous import limit: 3,500 MW
3. External areas representation based upon information received from the NPCC CP-8 WG

Legend

- Interface
- Unidirectional Interface
- Interface w/ Dynamic Ratings
- Interface Group
- Interface Group w/ Dynamic Ratings
- Monitoring Interface Group
- NYCA EA Interface Group Marker
- xx "Dummy Bubble"

NOTE: An interface is considered to not have a MW limitation if no number is specified

Figure 25: 2018 RNA Preliminary Topology Year 4 through 10 (2022 - 28)



Notes

1. PJM to NY emergency assistance (EA) assumption for calculating the PJM-NY Western ties, PJM-G Group, and ABC Line Group flow distribution limit: 1500MW

2. NYCA EA simultaneous import limit: 3,500 MW

3. External areas representation based upon information received from the NPCC CP-8 WG

Legend

- Interface
- Unidirectional Interface
- Interface w/ Dynamic Ratings
- Interface Group
- Interface Group w/ Dynamic Ratings
- Monitoring Interface Group
- NYCA EA Interface Group Marker
- xx "Dummy Bubble"

NOTE: An interface is considered to not have a MW limitation if no number is specified

The results of the 2018 RNA Base Case resource adequacy studies show that the LOLE for the NYCA does not exceed the criterion of 0.1 days per year throughout the ten-year Study Period. The NYCA LOLE results are presented in Figure 26.

Figure 26: NYCA Resource Adequacy Measure (in LOLE)

Preliminary Base Case Result	
Year	NYCA LOLE
2019	0.01
2020	0.00
2021	0.01
2022	0.01
2023	0.01
2024	0.01
2025	0.01
2026	0.01
2027	0.01
2028	0.01

The decrease in NYCA LOLE from 2019 to 2020 is mainly the result of the addition of the Cricket Valley Energy Center, while the increase from 2020 to 2021 is mainly the result of Indian Point assumed deactivation.

Scenarios

Placeholder for future

Environmental Regulations Activities

Placeholder for future

Historic Congestion

Appendix A of Attachment Y of the OATT states: *"As part of its CSPP, the ISO will prepare summaries and detailed analysis of historic and projected congestion across the NYS Transmission System. This will include analysis to identify the significant causes of historic congestion in an effort to help Market Participants and other interested parties distinguish persistent and addressable congestion from congestion that results from onetime events or transient adjustments in operating procedures that may or may not recur. This information will assist Market Participants and other stakeholders to make appropriately informed decisions."*

The detailed analysis of historic congestion can be found on the NYISO website: http://www.nyiso.com/public/markets_operations/services/planning/documents/index.jsp

Observations and Recommendations

Placeholder for future

Appendices

Placeholder for future