



# 2022 Reliability Needs Assessment (RNA)

**A Report from the New York  
Independent System Operator**

**Draft Report**  
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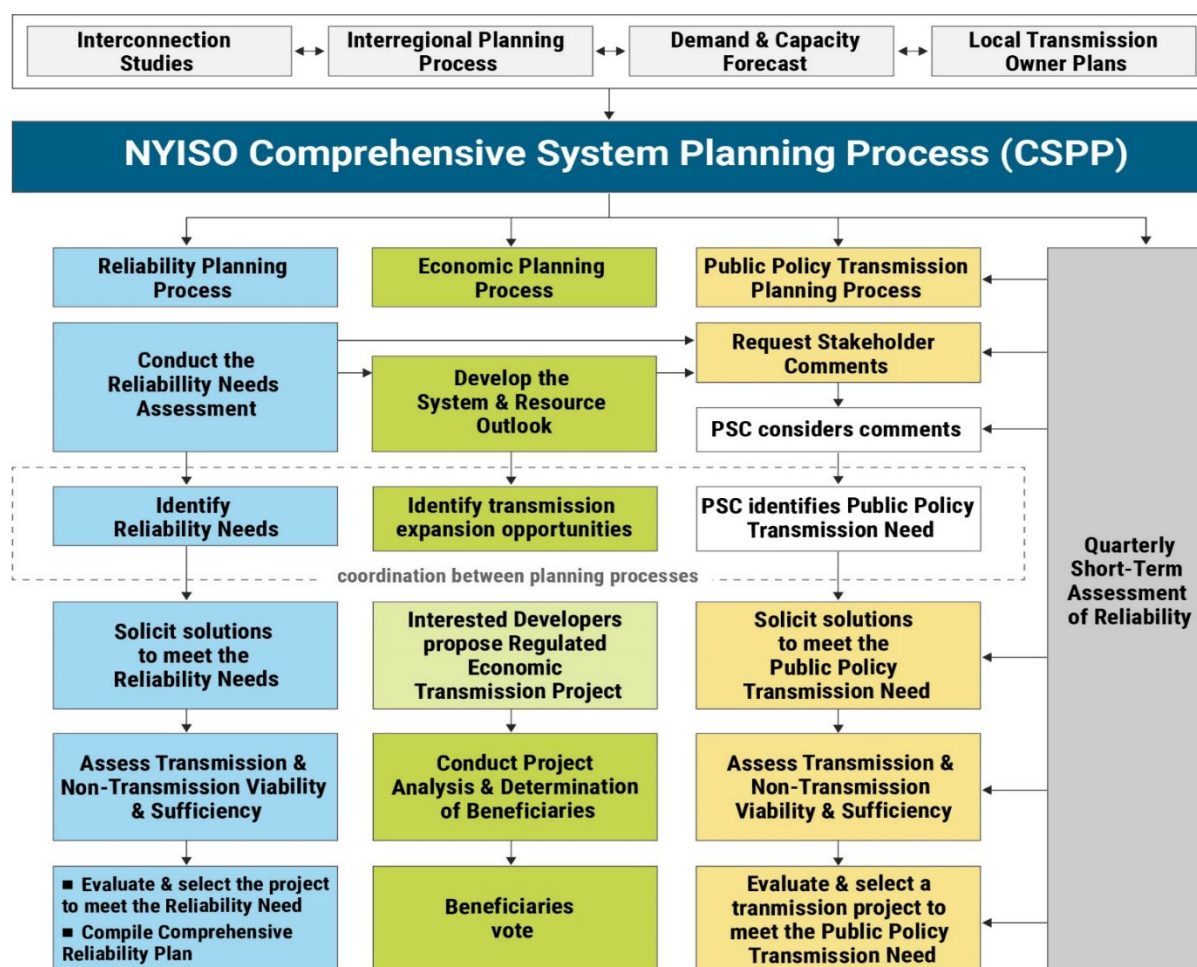
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## Executive Summary – place holder

# 1. Introduction

This report sets forth the NYISO’s 2022 RNA and scenario findings for the newly redefined Study Period of years 4 through 10 (*i.e.*, years 2026 through 2032). The RNA is the first of two main components of the Reliability Planning Process, which is one of the three processes that comprise the NYISO’s Comprehensive System Planning Process (see Figure 1). The RNA is performed to evaluate electric system reliability according to resource adequacy and transmission security criteria over the Study Period.

**Figure 1: The NYISO’s Comprehensive System Planning Process (CSPP)**



The RNA is developed by the NYISO in conjunction with stakeholders and all interested parties as the first step in the Reliability Planning Process. The RNA assesses the reliability of the New York Bulk Power Transmission Facilities (BPTFs) as the foundation study used in the development of the NYISO Comprehensive Reliability Plan (CRP). Two major study types are performed: resource adequacy and transmission security, over the RNA Study Period (*i.e.*, year 4 through year 10, 2026-2032). If the RNA

identifies any violation of reliability criteria<sup>1</sup> for BPTFs, the NYISO will report a Reliability Need quantified by an amount of compensatory megawatts (MW) in a location that would resolve that need. After the NYISO's Board approval of the RNA and if any Reliability Needs are left after the post-RNA Base Case updates process, the NYISO will solicit market-based solutions, designate one or more Responsible Transmission Owners (TOs) to develop regulated backstop solutions to address each identified Reliability Need, and solicit alternative regulated solutions from interested parties.

The CRP details the NYISO's plan for continued reliability of the BPTFs 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 by the request for solutions. If the market does not adequately respond, reliability will be maintained by either regulated backstop solutions developed by the Responsible TOs, which are obligated to provide reliable service to their customers, or alternative regulated solutions being developed by Other Developers. To maintain the long-term reliability of the BPTFs, these additional resources must be readily available or in development at the appropriate time to address the identified need.

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 by highlighting the changes to the Reliability Planning Process recently implemented in the NYISO's tariffs and procedures. Next, this report summarizes the prior Reliability Planning Process findings and reliability plans. The report continues with a summary of the load and resource forecast for the RNA Study Period, 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.

Along with addressing reliability, the Reliability Planning Process is also designed to provide information that is both informative and of value to the New York wholesale electricity marketplace and

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<sup>1</sup> A condition identified by the NYISO in the RNA as a violation or potential violation of Reliability Criteria as defined by the OATT.



federal and state policymakers. For informational purposes, this RNA report reviews activities related to environmental regulatory programs and other relevant developments. The RNA report also provides the latest historical information for the past five years of congestion, and related data is posted on the NYISO's website.

An overview of the Reliability Planning Process is illustrated in Figure 2 in **Appendix B** and is described in the Reliability Planning Process Manual.

## 2. Summary of 2021-2030 Comprehensive Reliability Plan<sup>2</sup>

The 2020 RNA identified reliability criteria violations and system deficiencies constituting actionable reliability needs primarily driven by a combination of forecasted peak demand and the assumed unavailability of 1,500 MW of generation in New York City affected by the New York State Department of Environmental Conservation (DEC) “Peaker Rule.” The Peaker Rule limits nitrogen oxides (NO<sub>x</sub>) emissions from simple-cycle combustion turbines in a phased implementation from 2023 to 2025. After the RNA was published and before pursuing a solicitation for solutions, the NYISO considered subsequent updates to system plans. These updates included a reduced demand forecast to account for economic and societal effects from the COVID-19 pandemic, and new local transmission plans and operating procedures by Con Edison for the New York City service territory. With these updates, there were no remaining violations of reliability design criteria at the end of the 2020-2021 Reliability Planning Process (RPP) cycle.

## 3. Regulatory Policy Activities

New York’s climate goals continue to impact the electric system in profound ways. State and local requirements have created what are arguably the most aggressive energy and environmental policies in the nation. The question of how to maintain system reliability on the road to meeting the state’s decarbonization goals has become a central issue.

This past year alone featured several announcements and developments that are reshaping the grid. In late 2021, the Climate Action Council (CAC), created under the CLCPA, released a Draft Scoping Plan to guide the state in reaching the CLCPA’s requirements. In addition to addressing the clean energy objectives of the CLCPA, the Draft Scoping Plan calls for eliminating the use of fossil fuels in any new home construction by 2025, and for multi-family or commercial buildings by 2030. In addition, Governor Kathy Hochul announced the results of the state’s competitive Tier 4 Clean Energy Standard solicitations, which sought proposals to deliver additional renewable energy into New York City. Two proposed transmission projects have since been awarded Tier 4 Renewable Energy Credit (REC) contracts. Further, on February 25, 2022, the U.S. Department of the Interior announced the results of the New York Bight offshore lease rights sale. The lease sale offered over 488,000 acres in the New York Bight for potential wind energy development. On January 12, 2022, the federal government, New York, and New Jersey announced a shared vision for developing a robust offshore wind energy domestic supply chain that will deliver benefits to residents of New York, New Jersey, and the surrounding region, including under-served communities.

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<sup>2</sup> Reliability planning study reports are here: <https://www.nyiso.com/library>

The federal government has also been focused on steps to transition the nation's electric energy production to renewable energy supply technologies. The Infrastructure Investment and Jobs Act invests \$11 billion to enhance grid resilience, \$2.5 billion for the U.S. Department of Energy to help develop "nationally significant transmission lines, increase resilience by connecting regions of the country, and improve access to cheaper clean energy sources,"<sup>i</sup> and \$3 billion for a Smart Grid Investment Matching Grant Program.

FERC is also actively exploring ways to facilitate greater investment in transmission. The Commission issued an Advanced Notice of Proposed Rulemaking (ANOPR) in 2021 to seek input on potential reforms designed to expand investment in transmission. FERC is also actively engaged with state regulatory commissions through the Joint Federal-State Task Force on Electric Transmission. As an initial step to address the issues raised in the ANOPR, on April 21, 2022, FERC issued a Notice of Proposed Rulemaking (NOPR) seeking comment on proposed reforms to the Commission's existing regional transmission planning and cost allocation requirements.

**Figure 2: Summary Table of Key Environmental Regulations and Energy Policies**

PUBLIC POLICY INITIATIVE	POLICYMAKING ENTITIES	PUBLIC POLICY GOALS	PUBLIC POLICY IMPLICATIONS
<b>Climate Leadership and Community Protection Act (CLCPA)</b>	NY PSC, New York State Energy Research and Development Authority (NYSERDA), DEC, CAC	<b>10,000 MW</b> of distributed solar installed by 2030; <b>185 trillion</b> BTU reduction in total energy consumption, including electrification to reduce fossil fuel use in buildings by 2025; <b>3,000 MW</b> of storage installed by 2030, with a Gov. Hochul-announced goal of 6,000 MW by 2030; 70% of load supplied by renewable resources by 2030; <b>9,000 MW</b> of offshore wind installed by 2035; and 100% of load supplied by zero-emissions resources by 2040. Reduce New York's greenhouse gas emissions by 85% of 1990 levels by 2050.	Transformation of the power grid, necessitating examination of market structures, planning processes, flexible load, and investment in bulk power system infrastructure.
<b>"Peaker Rule" Ozone Season Oxides of Nitrogen (NO<sub>x</sub>) Emissions Limits for Simple Cycle and Regenerative Combustion Turbines</b>	DEC	Reduce ozone-contributing pollutants associated with New York State-based peaking unit generation. Compliance obligations phased in between <b>2023</b> and <b>2025</b> .	DEC rule impacts approximately <b>3,300 MW</b> of peaking unit capacity in New York State. The NYISO analyzes compliance plans through its Reliability Planning Process (RPP) to determine whether the plans trigger reliability needs that must be addressed with solutions to maintain system reliability.
<b>NYS Accelerated Renewable Energy Growth and Community Benefit Act</b>	Office of Renewable Energy Siting (ORES) within the NYS Department of State, NY PSC, NYSERDA	Provides for an accelerated path for the permitting and construction of renewable energy projects other than the Article 10 power plant siting law, calls for a comprehensive study to identify cost-effective distribution, local and bulk electric system upgrades to support the state's climate goals, and to file the study with the New York State Public Service Commission. Calls for use of the NYISO's competitive Public Policy Process to meet transmission needs to meet CLCPA goals.	Intended to help accelerate siting of <b>eligible renewable resources</b> in support of state policy goals. Intended to establish new transmission investment priorities to facilitate the achievement of state policies.
<b>New York City Residual Oil Elimination</b>	City of New York	Eliminate combustion of fuel oil numbers 6 and 4 in New York City by <b>2020</b> and <b>2025</b> , respectively.	<b>2,946 MW</b> of installed capacity affected

## New York City Local Law 97

New York City

Requires reduced building greenhouse gas emissions by 40% by **2030**, with compliance starting in **2024**, and 80% by **2050**.

Mandate applies to any building in NYC 25,000 square feet or larger; the law was updated in 2020 to include buildings in which up to 35% of units are rent regulated, starting in 2026. Officials estimate the law would **apply to roughly 50,000** of the city's more than one million buildings.

## Discussion of Key Environmental Regulations and Energy Policies

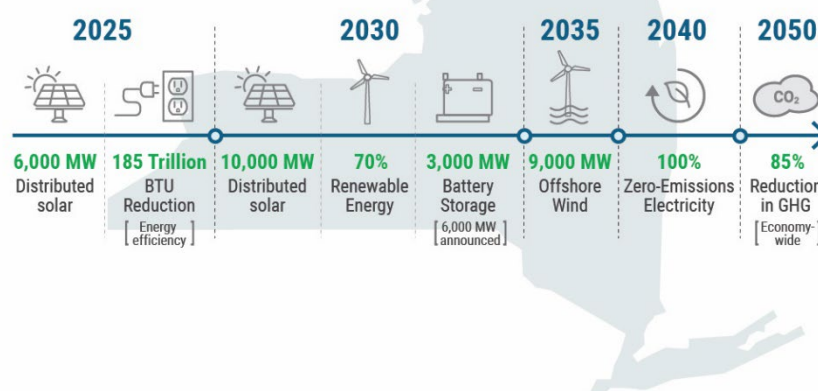
### Climate Leadership and Community Protection Act (CLCPA)

The Climate Action Council, created under the CLCPA, established six advisory panels, including a Power Generation Advisory Panel that included NYISO representation. The CAC also approved the formation of a Just Transition Working Group and a Climate Justice Working Group.

The CAC is expected to issue a final Scoping Plan by the end of 2022 outlining recommendations for the state to achieve the emissions reductions called for by the CLCPA.

Starting 2020 the NYISO has been performing CLCPA scenarios in both its reliability and economic planning processes.

### State energy policy goals



### Peaker Rule: Ozone Season Oxides of Nitrogen (NOx) Emission Limits for Simple Cycle and Regenerative Combustion Turbines

In December 2019, the DEC issued requirements to reduce emissions of nitrogen oxides, which are smog-forming pollutants, from peaking generation units.

The Peaker Rule, which phases in compliance obligations between 2023 and 2025, will affect approximately 3,300 MW of simple-cycle turbines located mainly in the lower Hudson Valley, New York City, and Long Island. While some of these units will be capable of complying with the rule's stricter emissions limits, approximately 1,600 MW of capability will be unavailable during the summer of 2025 based on filed compliance plans. Approximately 950 MW of that capability becomes unavailable starting

May 2023. Importantly, the Peaker Rule allows the NYISO to designate resources that are needed to sustain reliability and continue operation on a temporary basis beyond 2023 and 2025.

The NYISO is actively assessing the implications of these compliance plans in its Reliability Planning Process, particularly via the *2022 Reliability Needs Assessment* (RNA) and ongoing quarterly *Short-Term Assessments of Reliability* reports.

#### **NYS Accelerated Renewable Energy Growth and Community Benefit Act**

The Accelerated Renewable Energy Growth and Community Benefit Act seeks to accelerate siting and construction of large-scale clean energy projects by establishing the Office of Renewable Energy Siting (ORES) within the New York State Department of State to oversee permitting approval for renewable generators larger than 25 MW. Under regulations issued by ORES, it must act on applications in the siting process within one year, or six months if the applicant is seeking to locate on certain former commercial or industrial sites.

The Act also authorized the New York Power Authority (NYPA) to undertake the development of transmission investments needed to achieve CLCPA targets. The NYPSC utilized this authority to authorize NYPA to pursue construction of its “Smart Path Connect” transmission expansion project in northern New York. NYPA, in partnership with National Grid, submitted its application to the NYPSC’s Article VII transmission permitting process, which entails public participation prior to a final determination from the NYPSC before construction can begin. The project is expected to increase the capacity of transmission lines in northern New York, where significant wind and hydro capacity exists and constraints on existing lines contribute to curtailment of these resources.

The Act also directed the New York State Department of Public Service (DPS), in consultation with the New York State Energy Research and Development Authority (NYSERDA), NYPA, the Long Island Power Authority (LIPA), the investor-owned utilities, and the NYISO to conduct a comprehensive study to identify cost-effective distribution and local and bulk power system upgrades to support the state’s climate and clean energy policies.

The initial Power Grid Study, delivered by the DPS and NYSERDA in January 2021, concluded that the public policy transmission projects already approved by the NYISO and the NYPSC, together with the NYPA priority projects, position the state to achieve the 70 percent by 2030 renewable energy requirement of the CLCPA. The report indicated that additional transmission would be needed to move toward the goal of a zero-emission electric system by 2040. Finally, the report indicated that transmission upgrades would be needed to facilitate delivery of land-based renewable resources, and of the 9,000 MW of offshore wind capacity called for in the CLCPA.

As projects advance in their development process, they will be included in the reliability studies base cases.

#### **New York City Residual Oil Elimination**

New York City passed legislation in December 2017 prohibiting the combustion of fuel oil number 6 beginning in 2020 and fuel oil number 4 beginning in 2025. After 2025, only fuel oil number 2 may be combusted within New York City based generation. The rule is expected to impact 2,946 MW of generation in New York City, which previously used fuel oil number 6, or continue to use fuel oil number 4. Many generators in New York City that are connected to the local gas distribution network are required to maintain alternative fuel combustion capabilities. In addition, the NYSRC has a minimum oil-burn requirement rule that is intended to maintain electric system reliability in the event of gas supply interruptions.

Generators have taken steps to convert their facilities to comply with the law. While oil accounts for a relatively small percentage of the total electricity production in New York State, it is often called upon to fuel generation during critical periods, such as when severe cold weather limits access to natural gas. Dual-fuel capability serves as both an important tool in meeting reliability and an effective economic hedge against high natural gas prices during periods of high demand for natural gas.

#### **New York City Local Law 97**

The New York City Council passed Local Law 97 in 2019, which mandates that any building 25,000 square feet or larger reduce its greenhouse gas emissions by 40% by 2030, and 80% by 2050, with compliance starting in 2024. One expected approach to compliance is the electrification of building systems currently reliant on fossil fuels, expected to significantly increase the demand for electricity. Officials estimate the law applies to roughly 50,000 of New York City's more than one million buildings.

## 4. Base Case Assumptions

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 Reliability Planning Process procedures are designed to allow planning activities to be performed in an open and transparent manner. The Reliability Planning Process is conducted under a defined set of rules that are aligned and coordinated with the related planning 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** of this report.

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 TOs:

- For the transmission security evaluations, the power flow RNA Base Case uses the NYISO 2022 FERC 715 filing as a starting point, adding and removing resources consistent with the base case inclusion screening process provided in Section 3 of the Reliability Planning Process Manual. Representations of neighboring systems are derived from interregional transmission planning coordination conducted under the Northeast Power Coordinating Council (NPCC) and the Eastern Interconnection Reliability Assessment Group (ERAG) Multiregional Modeling Working Group (MMWG) processes, and pursuant to the Northeast ISO/RTO Planning Coordination Protocol.
- For the resource adequacy evaluations, the models are developed starting with prior resource adequacy models and are updated with information from the *2022 Gold Book* and historical data, with the application of the inclusion rules. Information on modeling of neighboring systems is based on the input received from the NPCC CP-8 working group.

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. As described above, the newly defined RNA Study Period is from 2026 (year 4) through 2032 (year 10).

### Load Forecast

The RNA Base Cases use a peak demand and energy forecast originating from the baseline forecast reported in the *2022 Gold Book*. The baseline forecast from the *2022 Gold Book* is derived from energy and peak models that are built based on projections of end-use intensities and economic variables. End-use



intensities modeled include those for lighting, refrigeration, cooking, heating, cooling, and other plug loads. The baseline forecast includes the projected impacts of energy efficiency programs, building codes and standards, distributed energy resources, behind-the-meter energy storage, behind-the-meter solar photovoltaic power, electric vehicle usage, and electrification of heating and other end uses. Economic variables considered include gross state product (GSP), households, population, and commercial and industrial employment. For the resource adequacy study, the baseline load forecast was modified by adding back the projected behind-the-meter solar PV impacts and explicitly modeling the solar generation. The factors considered in developing the 2022 RNA Base Case forecast are included in **Appendix C** of this report.

The demand-side management impacts included or accounted for in the 2022 Base Case forecast derive from actual and projected spending levels and realization rates for state-sponsored programs such as the Climate Leadership and Community Protection Act (CLCPA), Clean Energy Standard (CES), the Clean Energy Fund (CEF), the NY-SUN initiative, the energy storage initiative, and earlier programs developed as part of the Reforming the Energy Vision (REV) proceedings.

The baseline energy forecast for the 2022 RNA is generally higher than the 2020 RNA baseline forecast<sup>3</sup>, with a 2.2% increase in 2030. The baseline peak forecast for the 2022 RNA is generally lower than the 2020 RNA baseline forecast, including a 1.0% decline in 2030. The higher energy forecasts are primarily attributed to increasing impacts of electric vehicle charging and heating electrification. The lower peak forecasts are largely driven by the peak-reducing impacts of energy efficiency and growth in behind-the-meter solar PV capacity.

Figure 3 summarizes the baseline forecasts, Figure 4 summarizes the high load scenario, and Figure 5 shows a comparison of the between the 2020 RNA and 2022 RNA baseline forecasts and energy efficiency program impacts. Figure 6 and Figure 7 present actual, weather-normalized, and forecast values of annual energy and summer peak demand for the 2022 RNA. Figure 8 and Figure 9 present the NYISO's projections of annual energy and summer peak demand in the 2022 RNA for energy efficiency, distributed generation, and behind-the-meter solar PV.

For the 2022 RNA resource adequacy assessments, the NYISO uses behind-the-meter (BtM) solar PV production data. For General Electric's Multi Area Reliability Simulations (GE-MARS) modeling, the BtM solar PV component is added back in the baseline forecast in order to explicitly model the BtM solar PV as generation resources. The load shapes used in the study were adjusted from the historic shapes to a shape

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<sup>3</sup> Note that the 2021-2030 Comprehensive Reliability Plan utilized an updated forecast (relative to the 2020 Gold Book and RNA), included in this [presentation](#) (forecast values shown on slides 22, 23, and 34).

that meets the forecasted zonal peak, NYCA peak, Zones G through J Locality peak, and NYCA energy forecast. Discretely modeling BtM solar PV as a resource provides for flexibility to adjust the amount of resource available across the system.

**Figure 3: 2022 RNA Load and Energy Forecast: Baseline Forecast, and Baseline with BtM Solar PV Forecasts Added Back**

**Baseline and Adjusted Baseline Energy Forecasts**

Annual GWh	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
<b>2022 Econometric Energy Forecast</b>	159,065	162,750	164,563	165,064	166,282	167,490	168,320	169,296	170,130	171,242	171,863
-- Energy Efficiency and Codes & Standards	2,616	5,458	8,557	11,862	15,218	18,466	21,545	24,447	27,186	29,735	31,883
-- BTM Solar PV	4,635	5,605	6,616	7,559	8,532	9,462	10,298	11,016	11,538	11,853	12,108
-- BTM Non-Solar Distributed Generation	1,656	1,739	1,840	1,900	1,964	2,019	2,068	2,118	2,171	2,224	2,263
+ Storage Net Energy Consumption	47	70	117	184	275	383	510	645	786	891	980
+ Electric Vehicle Energy	567	868	1,263	1,795	2,523	3,503	4,762	6,313	8,151	10,240	12,518
+ Building Electrification	488	1,234	2,110	3,038	4,184	5,541	7,109	8,867	10,848	13,029	15,413
<b>2022 Gold Book Baseline Forecast</b>	151,260	152,120	151,040	148,760	147,550	146,970	146,790	147,540	149,020	151,590	154,520
+ BTM Solar PV	4,635	5,605	6,616	7,559	8,532	9,462	10,298	11,016	11,538	11,853	12,108
<b>2022 RNA Base Case Forecast<sup>1</sup></b>	155,895	157,725	157,656	156,319	156,082	156,432	157,088	158,556	160,558	163,443	166,628

**Baseline and Adjusted Baseline Summer Peak Forecasts**

Peak MW	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
<b>2022 Econometric Peak Demand Forecast</b>	33,461	34,295	34,669	34,946	35,308	35,715	36,115	36,577	36,997	37,377	37,691
-- Energy Efficiency and Codes & Standards	365	769	1,213	1,696	2,197	2,687	3,160	3,610	4,044	4,451	4,786
-- BTM Solar PV (Net Peak Hour)	985	1,113	1,216	1,314	1,386	1,421	1,423	1,416	1,379	1,315	1,261
-- BTM Non-Solar Distributed Generation	288	304	319	330	342	352	359	369	376	386	394
-- BTM Storage Peak Reductions	148	244	365	416	469	528	583	640	697	755	812
+ Electric Vehicle Peak Demand	58	96	139	193	269	359	471	610	801	1,025	1,246
+ Building Electrification	32	57	83	122	156	206	256	316	382	451	530
<b>2022 Gold Book Baseline Forecast<sup>2</sup></b>	31,765	32,018	31,778	31,505	31,339	31,292	31,317	31,468	31,684	31,946	32,214
+ BTM Solar PV	985	1,113	1,216	1,314	1,386	1,421	1,423	1,416	1,379	1,315	1,261
<b>2022 RNA Base Case Forecast<sup>1</sup></b>	32,750	33,131	32,994	32,819	32,725	32,713	32,740	32,884	33,063	33,261	33,475

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

<sup>2</sup> The transmission security power flow RNA base cases use this Gold Book baseline forecast.

**Figure 4: 2022 RNA Load and Energy for High Load Scenario: High Load Scenario Forecast, and High Load Scenario Forecast with BtM Solar PV Added Back**

**High Load Scenario and Adjusted High Load Scenario Energy Forecasts**

Annual GWh	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
2022 High Load Econometric Energy Forecast	160,378	164,754	166,463	167,637	168,937	170,221	171,100	172,158	173,090	174,306	175,075
-- Energy Efficiency and Codes & Standards	1,829	3,816	5,979	8,285	10,625	12,892	15,043	17,069	18,984	20,766	22,266
-- BTM Solar PV	4,441	5,154	5,879	6,616	7,462	8,352	9,239	10,028	10,689	11,183	11,552
-- BTM Non-Solar Distributed Generation	1,656	1,739	1,840	1,900	1,964	2,019	2,068	2,118	2,171	2,224	2,263
+ Storage Net Energy Consumption	42	58	92	141	201	273	351	427	502	573	635
+ Electric Vehicle Energy	569	884	1,326	1,978	2,931	4,275	6,042	8,199	10,717	13,538	16,548
+ Building Electrification	597	1,433	2,387	3,475	4,762	6,274	8,007	9,931	12,105	14,526	17,233
2022 Gold Book High Load Scenario	153,660	156,420	156,570	156,430	156,780	157,780	159,150	161,500	164,570	168,770	173,410
+ BTM Solar PV	4,441	5,154	5,879	6,616	7,462	8,352	9,239	10,028	10,689	11,183	11,552
2022 RNA High Load Scenario <sup>3</sup>	158,101	161,574	162,449	163,046	164,242	166,132	168,389	171,528	175,259	179,953	184,962

**High Load Scenario and Adjusted High Load Scenario Summer Peak Forecasts**

Peak MW	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
2022 High Load Scenario Econometric Peak Demand	33,689	34,666	35,126	35,454	35,839	36,235	36,688	37,119	37,535	37,920	38,258
-- Energy Efficiency and Codes & Standards	257	538	847	1,185	1,535	1,877	2,210	2,523	2,827	3,111	3,347
-- BTM Solar PV	944	1,023	1,082	1,151	1,212	1,254	1,277	1,288	1,278	1,240	1,202
-- BTM Non-Solar Distributed Generation	288	304	319	330	342	352	359	369	376	386	394
-- BTM Storage Peak Reductions	125	198	289	318	346	377	400	423	445	485	527
+ Electric Vehicle Peak Demand	68	114	168	253	371	536	743	1,056	1,453	1,890	2,330
+ Building Electrification	36	63	92	131	171	222	279	343	413	492	580
2022 Gold Book High Load Scenario	32,179	32,780	32,849	32,854	32,946	33,133	33,464	33,915	34,475	35,080	35,698
+ BTM Solar PV	944	1,023	1,082	1,151	1,212	1,254	1,277	1,288	1,278	1,240	1,202
2022 RNA High Load Scenario <sup>3</sup>	33,123	33,803	33,931	34,005	34,158	34,387	34,741	35,203	35,753	36,320	36,900

<sup>3</sup> The high load scenario forecast will be used for the high load resource adequacy scenario.

**Figure 5: Comparison of 2020 RNA & 2022 Base Case Forecasts**

**Comparison of Base Case Energy Forecasts - 2020 & 2022 RNA (GWh)**

Annual GWh	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
2020 RNA Base Case Forecast	156,013	155,107	155,097	154,905	154,932	155,139	155,676	156,313	157,063		
2022 RNA Base Case Forecast	155,895	157,725	157,656	156,319	156,082	156,432	157,088	158,556	160,558	163,443	166,628
Change from 2020 RNA	-118	2,618	2,559	1,414	1,150	1,293	1,412	2,243	3,495	NA	NA

**Comparison of Base Case Summer Peak Forecasts - 2020 & 2022 RNA (MW)**

Peak MW	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
2020 RNA Base Case Forecast	32,969	32,904	32,940	32,915	32,957	33,024	33,148	33,276	33,403		
2022 RNA Base Case Forecast	32,750	33,131	32,994	32,819	32,725	32,713	32,740	32,884	33,063	33,261	33,475
Change from 2020 RNA	-219	227	54	-96	-232	-311	-408	-392	-340	NA	NA

**Comparison of Energy Efficiency and Codes & Standards and BTM Non-Solar Distributed Generation Energy Impacts - 2020 & 2022 RNA (GWh)**

Annual GWh	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
2020 RNA Base Case Impacts	3,300	5,580	7,940	10,475	12,855	14,998	16,893	18,560	20,030		
2022 RNA Base Case Impacts	4,272	7,197	10,397	13,762	17,182	20,485	23,613	26,565	29,357	31,959	34,146
Change from 2020 RNA	972	1,617	2,457	3,287	4,327	5,487	6,720	8,005	9,327	NA	NA

**Comparison of Energy Efficiency and Codes & Standards and BTM Non-Solar Distributed Generation Summer Peak Impacts - 2020 & 2022 RNA (MW)**

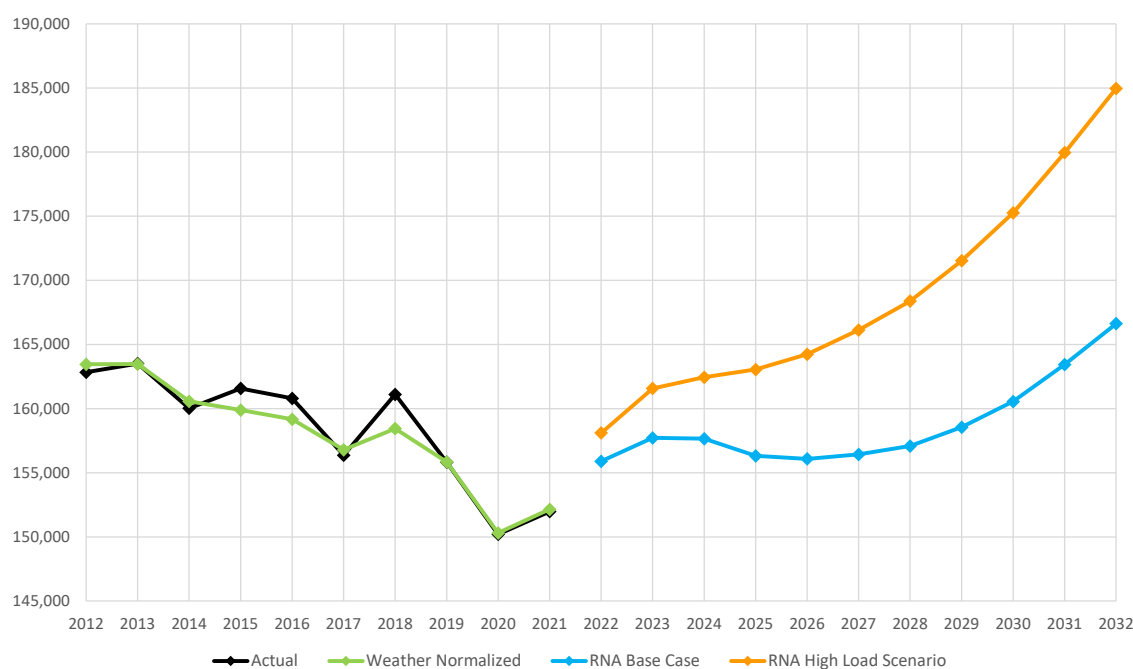
Peak MW	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
2020 RNA Base Case Impacts	541	900	1,266	1,671	2,055	2,398	2,695	2,943	3,165		
2022 RNA Base Case Impacts	653	1,073	1,532	2,026	2,539	3,039	3,519	3,979	4,420	4,837	5,180
Change from 2020 RNA	112	173	266	355	484	641	824	1,036	1,255	NA	NA

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

<sup>2</sup> 2020 Gold Book values have been adjusted to include only those impacts from 2022 forward, so as to compare directly to the 2022 Gold Book values.

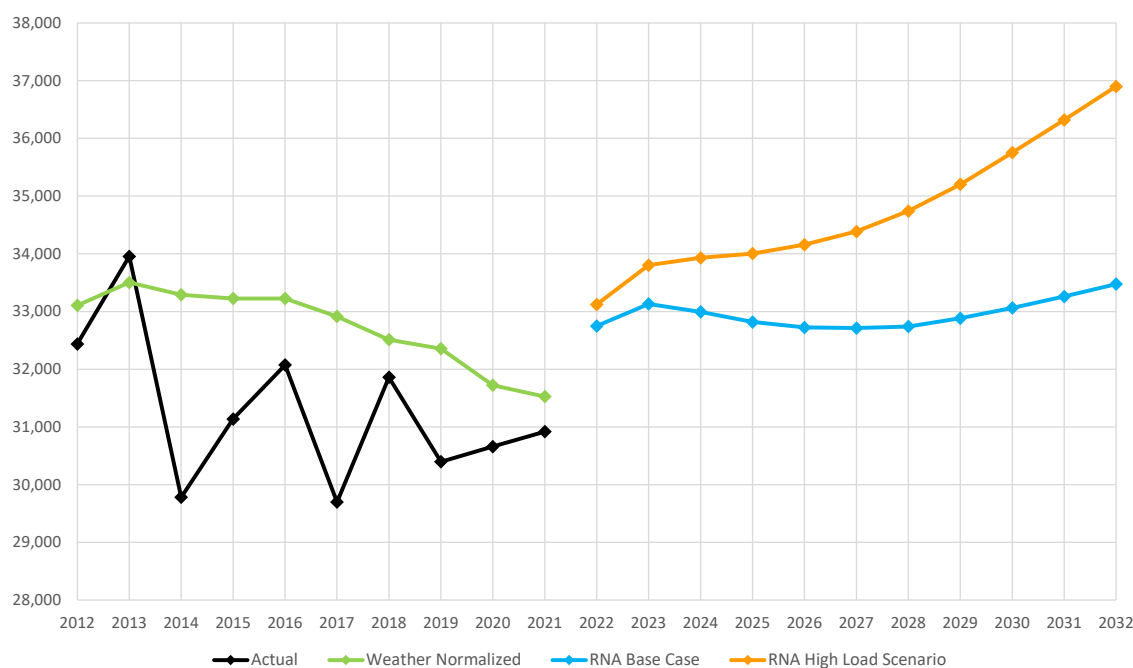
**Note:** The 2021-2030 Comprehensive Reliability Plan utilized an updated forecast (relative to the 2020 Gold Book and RNA), included in this [presentation](#) (forecast values shown on slides 22, 23, and 34).

**Figure 6: 2022 Baseline and High Load Scenario Energy Forecasts with Solar PV Added Back**



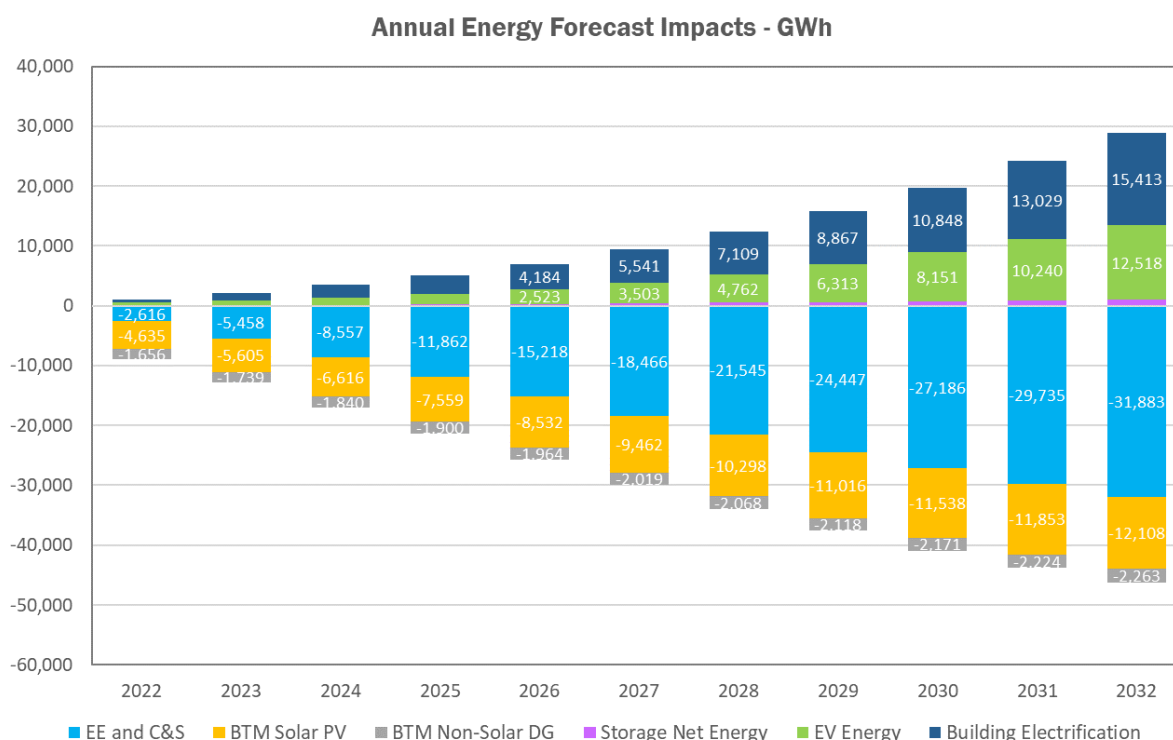
Note: Historical actual and weather normalized values reflect loads as found, with no add back of BTM solar generation. RNA forecast values include projected BTM solar generation added back.

**Figure 7: 2022 Baseline and High Load Energy Scenario Summer Peak Demand Forecasts with Solar PV Added Back**

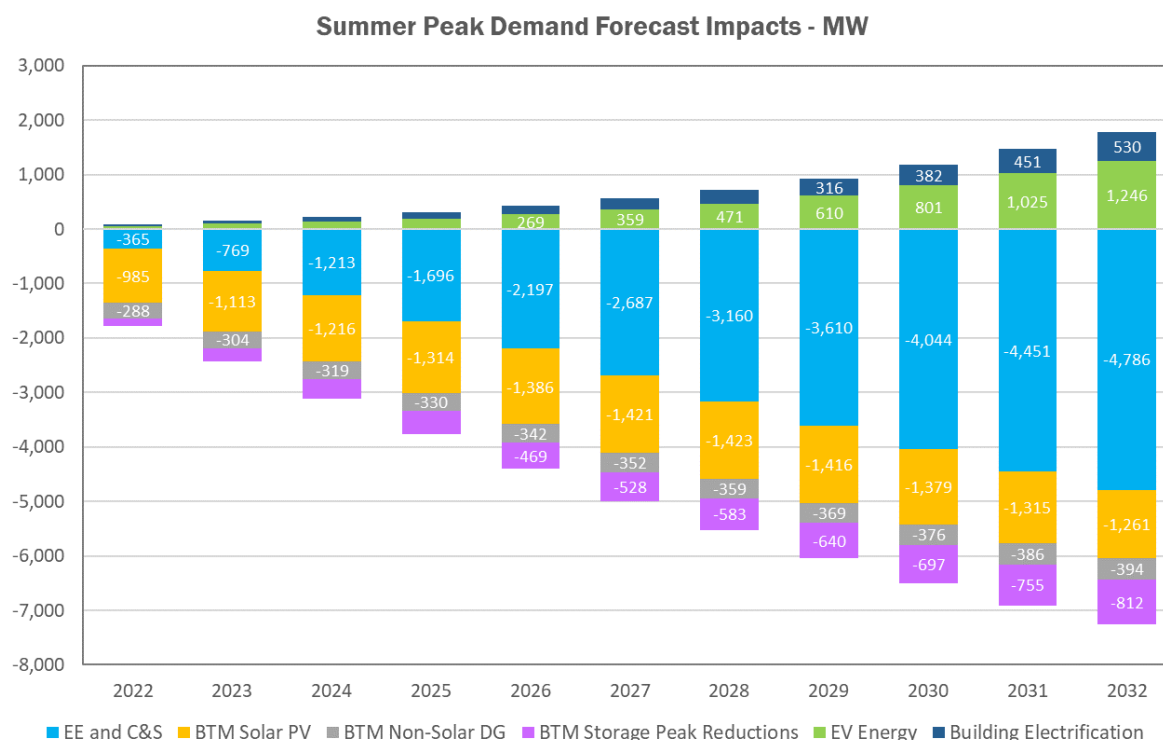


Note: Historical actual and weather normalized values reflect loads as found, with no add back of BTM solar generation. RNA forecast values include projected BTM solar generation added back.

**Figure 8: 2022 Baseline Annual Energy Forecast Impacts**



**Figure 9: 2022 Baseline Summer Peak Demand Forecast Impacts**



The NYISO uses behind-the meter (BtM) solar PV production data in RNA resource adequacy assessments. For General Electric’s Multi Area Reliability Simulations (GE-MARS) modeling, the BtM solar PV component is added back in the baseline forecast in order to explicitly model the BtM solar PV as generation resources. The load shapes used in the study were adjusted from the historic shapes to a shape that meets the forecasted zonal peak, NYCA peak, Zones G through J Locality peak, and NYCA energy forecast. Discretely modeling BtM solar PV as a resource provides for flexibility to adjust the amount of resource available across the system.

For the 2022 RNA resource adequacy assessments, gross peak load forecasts were developed, representing zonal load during the maximum system-wide gross demand hour (net load plus BtM solar). With BtM solar modeled as a resource, these values represent the maximum annual load needed to be served by BtM solar and other resources. The system gross peak load hour typically occurs earlier in the afternoon relative to the system net peak hour reported in the Gold Book.

**Figure 10: Base Case Gross Peak Load Hour Forecast (Net Load Plus BtM Solar) - MW**

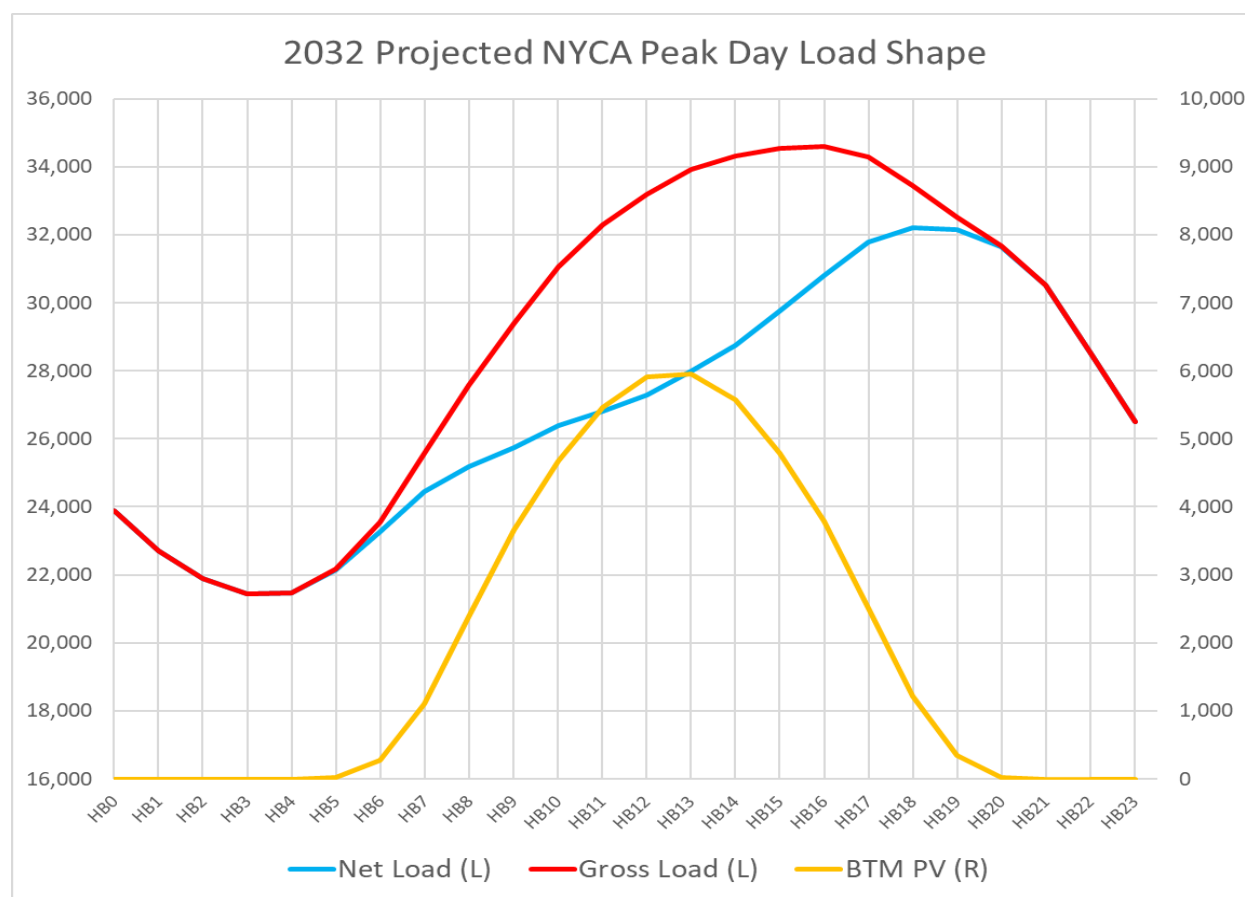
Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2023	2,920	2,216	3,009	707	1,489	2,633	2,391	649	1,409	10,979	5,241	33,643
2024	2,959	2,231	3,013	709	1,496	2,640	2,398	648	1,406	10,972	5,174	33,646
2025	2,981	2,244	3,010	711	1,500	2,651	2,414	647	1,404	10,936	5,112	33,610
2026	2,985	2,246	2,984	710	1,489	2,643	2,413	647	1,401	10,934	5,081	33,533
2027	2,985	2,248	2,956	707	1,478	2,635	2,412	647	1,403	10,963	5,104	33,538
2028	2,980	2,249	2,929	705	1,469	2,631	2,413	650	1,409	11,031	5,144	33,610
2029	2,985	2,245	2,910	702	1,466	2,636	2,420	654	1,421	11,159	5,198	33,796
2030	2,990	2,244	2,897	701	1,464	2,645	2,431	661	1,435	11,318	5,253	34,039
2031	2,999	2,249	2,893	698	1,469	2,658	2,448	668	1,451	11,483	5,307	34,323
2032	3,014	2,257	2,899	696	1,475	2,675	2,467	674	1,465	11,622	5,362	34,606

Figure 10 shows additional detail representative of the gross peak forecast<sup>4</sup>. Projected net load, BtM solar generation, and gross load shapes reflecting the 2032 NYCA summer peak day are plotted. Net load is projected to peak during the 6 PM hour at 32,214 MW, reflective of the coincident peak forecast from the 2022 Gold Book. Per the Gold Book, BtM solar generation during the net peak hour is 1,202 MW, resulting in a 2032 gross load RNA Base Case forecast of 33,475 MW (as shown in Figure 3). This value is reflective of the gross load during the net peak hour. Due to the increasing impacts of BtM solar, the net peak hour shifts later into the afternoon and early evening. The maximum gross load of 34,606 MW (shown in Figure 11) occurs earlier in the day during the 4 PM hour.

<sup>4</sup> Additional information on the methodology and calculation of the gross peak forecast is included in this Load Forecasting Task Force [presentation](#).

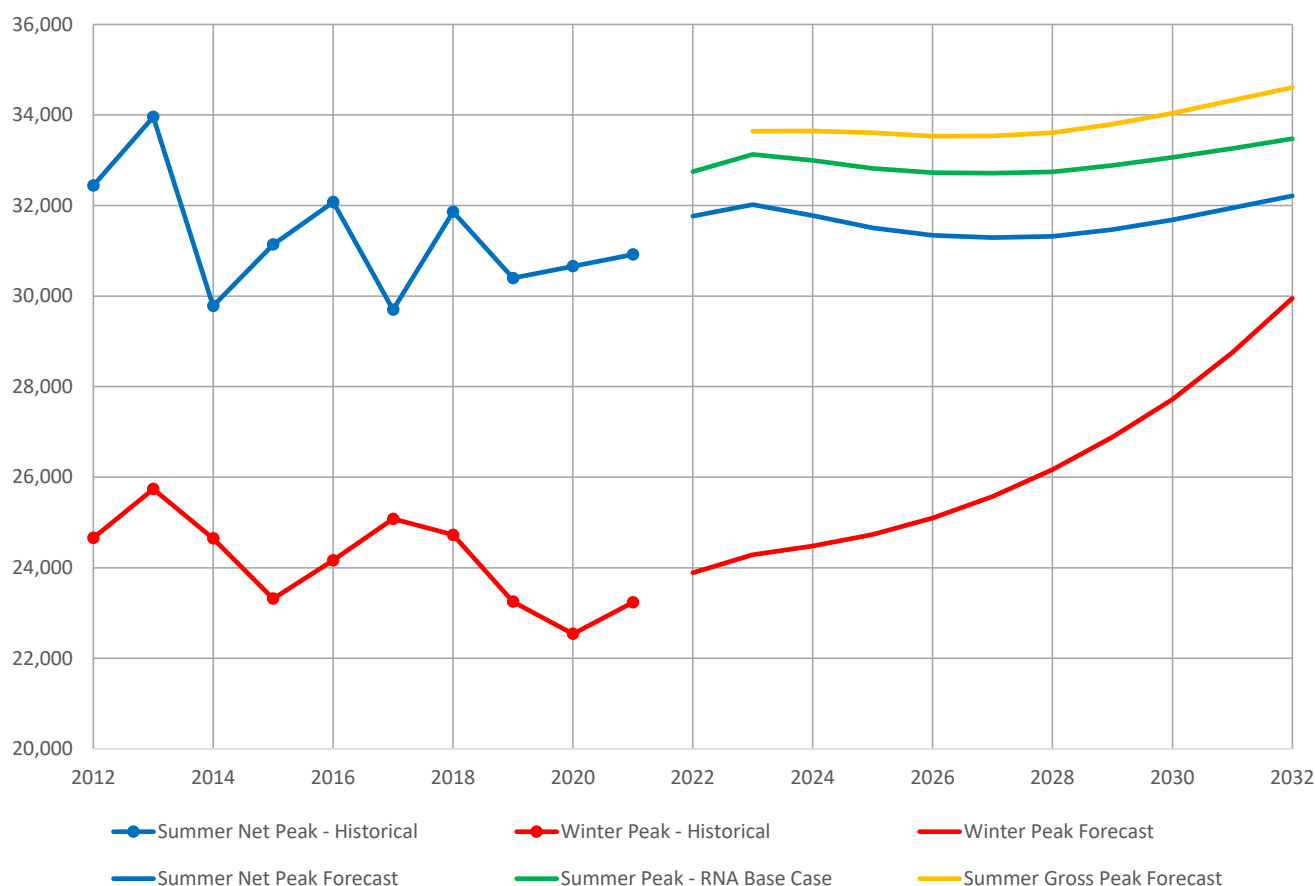


**Figure 11: NYCA Peak Day Net, Gross, and BtM Solar Shapes**



The NYCA is projected to become a winter-peaking system in the mid-2030s, primarily driven by electrification of space heating through heat pumps and other potential electric heating systems. Figure 12 compares the NYCA winter peak forecast to the various baseline summer peak forecasts through 2032. Growth in heating load is such that the winter peak forecast draws considerably closer to the summer peak forecast during the later years of the RNA horizon on a statewide basis. However, several of the upstate zones become winter peaking within the time period of this RNA. Summer peak forecasts presented include the Gold Book baseline forecast reflective of the net peak, the RNA Base Case forecast reflective of the gross load during the net peak hour, and RNA Gross Peak forecast reflective of the maximum gross load hour. There is one winter peak forecast reflective of the Gold Book forecast, as the net and gross winter peak hours are the same since gross peak demand occurs after sunset.

**Figure 12: Summer and Winter Peak Forecast Comparison (MW)**



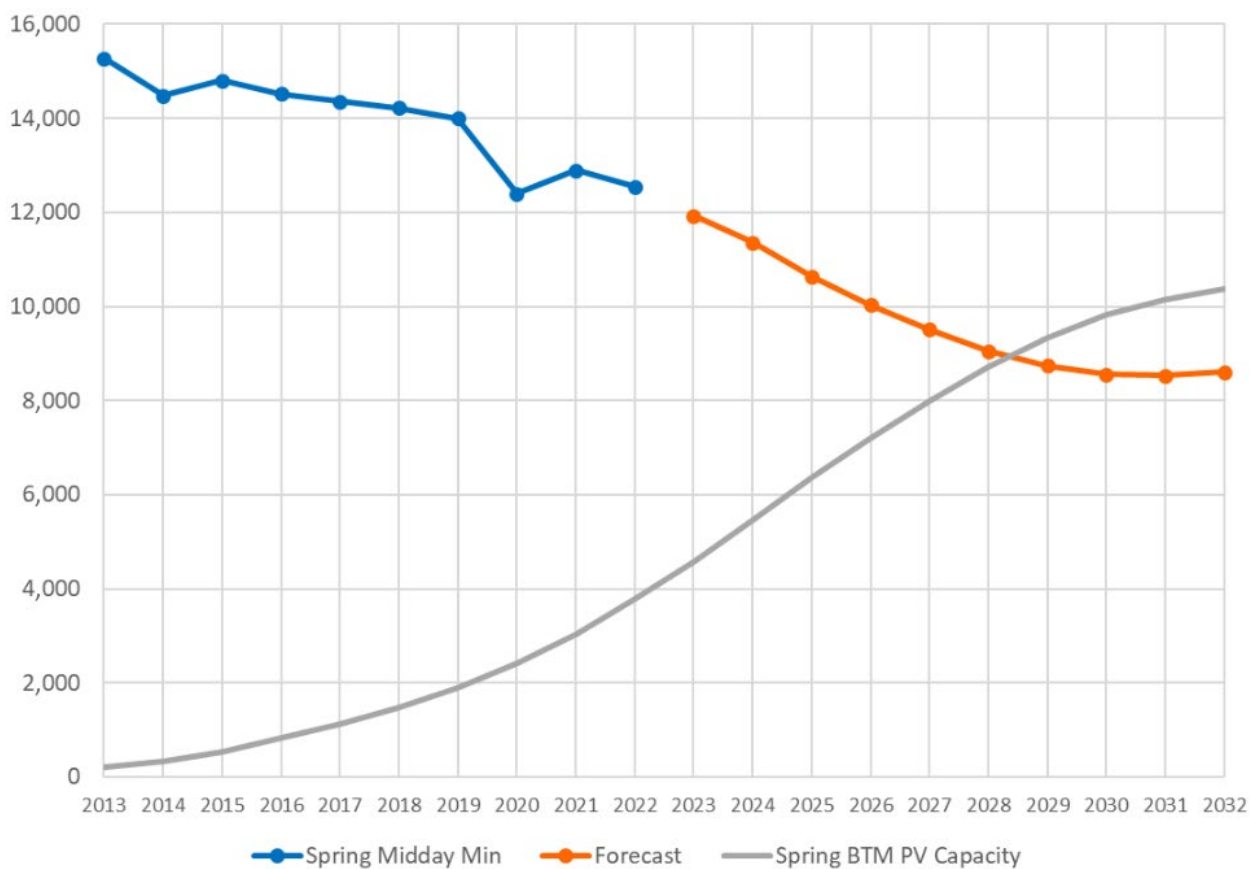
Notes: Net refers to net of BtM solar. RNA Base Case forecast reflects gross load during net peak hour.

A light load forecast was developed for the 2022 RNA for use in transmission security analyses<sup>5</sup>. The forecast reflects a low midday net load hour with high BtM solar generation, approaching or equal to the overall NYCA annual minimum load hour. The forecast is set on a spring weekend day during the noon hour. As BTM solar capacity and generation increases over time, minimum net loads during midday hours decrease significantly in later forecast years. Figure 13 lists the NYCA-coincident midday minimum load forecast by zone. Figure 14 shows historical and forecast midday minimum load trends at the system level, including its relationship with BtM solar capacity. Figure 15 displays the evolving daily load pattern on the light load day for upstate New York (zones A through F). In later forecast years, the relative concentration of BTM solar (relative to load) is generally greatest in the upstate zones.

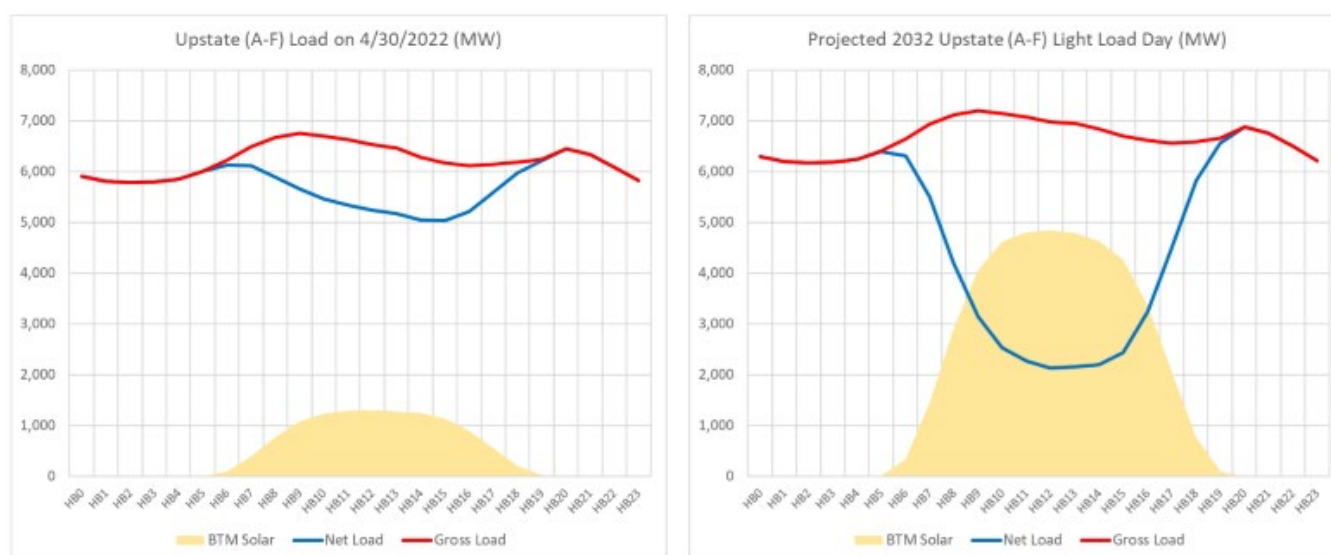
<sup>5</sup> Additional information on the methodology and calculation of the light load forecast is included in this Load Forecasting Task Force [presentation](#).

**Figure 13: NYCA Midday Light Load Forecast – Net Load (MW)**

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2023	1,230	765	1,122	638	407	758	491	252	478	4,619	1,172	11,932
2024	1,088	717	1,016	624	311	667	440	253	477	4,644	1,122	11,359
2025	935	670	898	613	214	567	385	246	463	4,605	1,045	10,641
2026	834	632	797	598	133	476	322	242	452	4,578	963	10,027
2027	740	600	707	586	60	393	275	239	441	4,564	906	9,511
2028	649	569	625	575	-7	319	234	236	432	4,562	859	9,053
2029	577	547	560	565	-57	263	211	236	432	4,585	824	8,743
2030	523	532	516	557	-96	222	202	240	433	4,625	800	8,554
2031	499	527	498	551	-114	205	207	245	438	4,684	794	8,534
2032	489	528	489	544	-119	201	211	246	445	4,760	809	8,603

**Figure 14: System Light Load Trends (MW)**


**Figure 15: Upstate Light Load Day Shapes**



### Resource Additions and Removals

Since the 2021-2030 CRP assumptions were finalized, new resources have been added to the system, some deactivation notices have been withdrawn and the associated facilities have returned to the system, and some other resources have been removed from the 2022 RNA Base Case, as shown in Figure 16 below:

- An additional 2,815 MW of proposed resources have been included in the 2022 RNA base case compared with the 2021-2030 CRP bringing the total proposed resources to 3,382 MW. This is made up of approximately 2,132 MW of proposed generation (mostly wind and solar) and 1,250 MW of HVDC from Quebec to New York City;
- An additional 304 MW of generation has been removed from the 2022 RNA base case compared with the 2021-2030 CRP bring the total generation removed to approximately 4,870 MW (some of the units are only out of service in the May through October ozone season only);
  - Their removal is due to being in a deactivated state (*e.g.*, retired, mothballed, or in an ICAP-Ineligible Forced Outage (IIFO), or proposed to retire or mothball), or as operationally impacted by the DEC Peaker Rule.

**Figure 16: Total Summer Capability MW of Proposed Projects Included in the 2022 RNA Base Case**

	Additions	Deactivations
Changes since CRP	2,815	304
Total MW	3,382	4,870

The comparison of generation status between the 2021 – 2030 CRP and 2022 RNA is detailed in Figure 17, Figure 18, and Figure 19. The MW values represent the summer capability MW values from the 2022 Gold Book.

**Figure 17: Proposed Projects Included in the 2022 RNA Base Case**

Queue #	Project Name/(Owner)	Zone	Point of Interconnection	Type	COD or I/S Date	Summer Peak MW	Included Starting
Proposed Transmission Additions, other than Local Transmission Owner Plans							
0545A	Empire State Line	A	Dysinger - Stolle 345kV	AC Transmission (WNYPP)	I/S July 2022	n/a	2018-2019 RPP
0543	Segment B Knickerbocker-Pleasant Valley 345 kV	F,G	Greenbush - Pleasant Valley 345kV	AC Transmission (ACPPTP)	12/2023	n/a	2020-2021 RPP
0556	Segment A Double Circuit	E, F	Edic - New Scotland 345kV		12/2023	n/a	
0430	Cedar Rapids Transmission Upgrade	D	Dennison - Alcoa 115kV	AC Transmission	I/S	+80	
0631	NS Power Express	J	Hertel 735kV (Quebec)-Astoria Annex 345kV (NYC)	HVDC Transmission	12/2025	1000	
0887	CH Uprade					250	
1125	Northern New York Priority Transmission Project (NNYTP)	D, E	Moses/Adirondack/Porter Path	AC Transmission	12/2025	n/a	
Proposed Large Generation (LG) Additions							
396	Baron Winds	C	Hillside - Meyer 230kV	W	Dec-23	238.4	2020-2021 RPP
422	Eight Point Wind Eneyr Center	B	Bennett 115kV	W	Sep-22	101.8	
495	Mohawk Solar	F	St. Johnsville - Marshville 115kV	W	Nov-24	90.5	2022 RNA
505	Ball Hill Wind	A	Dunkirk - Gardenville 230kV	W	Nov-22	100.0	2020-2021 RPP
531	Number 3 Wind Energy	E	Taylorville - Boonville 115kV	W	Oct-22	103.9	2021 Q3 STAR
579	Bluestone Wind	E	Afton - Stilesville 115kV	W	Oct-22	111.8	2022 RNA
612	South Fork Wind Farm	K	East Hampton 69kV	OW	Aug-23	96.0	
617	Watkins Glen Solar	C	Bath - Montour Falls 115kV	S	Nov-23	50.0	
618	High River Solar	F	Inghams - Rotterdam 115kV	S	Nov-22	90.0	
619	East Point Solar	F	Cobleskill - Marshville 69kV	S	Nov-22	50.0	
637	Flint Mine Solar	G	LaFarge - Pleasant Valley 115kV, Feura Bush - North Catskill 115kV	S	Sep-23	100.0	
678	Calverton Solar Energy Center	K	Edwards Substation 138kV	S	Jun-22	22.9	2020-2021 RPP
695	South Fork Wind Farm II	K	East Hampton 69kV	OW	Aug-23	40.0	2022 RNA
720	Trelina Solar Energy Center	C	Border City - Station 168 115 KV	S	Nov-23	80.0	
721	Excelsior Energy Center	A	N. Rochester - Niagara 345 kV	S	Nov-22	280.0	
758	Independence GS1 to GS4 +9MW ERIS only	C	Scriba 345 kV	Gas	I/S	9.0	

Queue #	Project Name/(Owner)	Zone	Point of Interconnection	Type	COD or I/S Date	Summer Peak MW	Included Starting
<b>Proposed Small Generation (SG) Additions</b>							
545	Sky High Solar* (Sky High Solar, LLC)	C	Tilden - Tully Center 115kV	S	06/2023	20	2021 Q3 STAR
565	Tayandenega Solar* (Tayandenega Solar, LLC)	F	St. Johnsville - Inghams 115kV	S	10/2022	20	
570	Albany County 1* (Hecate Energy Albany 1 LLC)	F	Long Lane - Lafarge 115kV	S	12/2022	20	
572	Greene County 1* (Hecate Energy Greene 1 LLC)	G	Coxsackie - North Catskill 69kV	S	01/2023	20	
573	Greene County 2* (Hecate Energy Greene 2 LLC)	G	Coxsackie Substation 13.8kV	S	03/2023	10	
584	Dog Corners Solar* (SED NY Holdings LLC)	C	Aurora Substation 34.5kV	S	05/2022	20	
586	Watkins Road Solar* (SED NY Holdings LLC)	E	Watkins Rd - Ilion 115kV	S	06/2023	20	
590	Scipio Solar (Duke Energy Renewables Solar, LLC)	C	Scipio 34.5kV Substation	S	05/2023	18	
592	Niagara Solar (Duke Energy Renewables Solar, LLC)	B	Bennington 34.5kV Substation	S	05/2023	20	
598	Albany County 2* (Hecate Energy Albany 2 LLC)	F	Long Lane - Lafarge 115kV	S	12/2022	20	
638	Pattersonville* (Pattersonville Solar Facility, LLC)	F	Rotterdam - Meco 115kV	S	12/2022	20	
666	Martin Solar* (Martin Solar LLC)	A	Arcade - Five Mile 115kV	S	10/2022	20	
667	Bakerstand Solar* (Bakerstand Solar LLC)	A	Machias - Maplehurst 34.5kV	S	10/2022	20	2021 Q3 STAR
682	Grissom Solar* (Grissom Solar, LLC)	F	Ephratah - Florida 115kV	S	06/2022	20	
730	Darby Solar* (Darby Solar, LLC)	F	Mohican - Schaghticoke 115kV	S	12/2022	20	
731	Branscomb Solar* (Branscomb Solar, LLC)	F	Battenkill - Eastover 115kV	S	I/S	20	
735	ELP Stillwater Solar (ELP Stillwater Solar LLC)	F	Luther Forest - Mohican 115kV	S	09/2022	20	
748	Regan Solar* (Regan Solar, LLC)	F	Market Hill - Johnstown 69kV	S	06/2022	20	
768	Janis Solar* (Janis Solar, LLC)	C	Willet 34.5kV	S	04/2022	20	
775	Puckett Solar* (Puckett Solar, LLC)	E	Chenango Forks Substation 34.5kV	S	04/2022	20	
564	Rock District Solar* (Rock District Solar, LLC)	F	Sharon - Cobleskill 69kV	S	12/2022	20	
670	Skyline Solar* (SunEast Skyline Solar LLC)	E	Campus Rd - Clinton 46kV	S	04/2022	20	
581	Hills Solar (SunEast Hills Solar LLC)	E	Fairfield - Inghams 115kV	S	08/2023	20	2022 RNA
734	Ticonderoga Solar* (ELP Ticonderoga Solar LLC)	F	ELP Ticonderoga Solar LLC	S	8/1/2022	20	
759	KCE NY 6* (KCE NY 6, LLC)	A	Gardenville - Bethlehem Steel Wind 115kV	ES	04/2022	20	
769	North County Energy Storage (New York Power Authority)	D	Willis 115kV	ES	03/2022	20	
807	Hilltop Solar (SunEast Hilltop Solar LLC)	E	Eastover - Schaghticoke 115kV	S	07/2023	20	
848	Fairway Solar (SunEast Fairway Solar LLC)	E	McIntyre - Colton 115kV	S	10/1/2023	20	
855	NY13 Solar (Bald Mountain Solar LLC)	F	Mohican - Schaghticoke 115kV	S	11/1/2023	20	

**Notes:**

\*Only these proposed small generators obtained Capacity Resource Interconnection Service (CRIS) and therefore are modeled for the resource adequacy Base Cases.

All proposed large generators obtained, or are assumed to obtain, both Energy Resource Interconnection Service (ERIS) and CRIS and are modeled in both transmission security and resource adequacy Base Cases, unless otherwise noted as "ERIS only," in which case they are modeled only for the transmission security assessments.

**Figure 18: 2022 RNA Generation Deactivations<sup>6</sup> Assumptions**

2022 GB Table	Owner/ Operator	Plant Name	Zone	Summer Capability	2022 RNA Base Case Status	2020 RNA Base Case Status
Table IV-3: Deactivated Units with Unexpired CRIS Rights Not Listed in Existing Capacity Table III-2	International Paper Company	Ticonderoga <sup>(4)</sup>	F	9.5	out	out
	Helix Ravenswood, LLC	Ravenswood 2-4	J	30.7	out	out
	Helix Ravenswood, LLC	Ravenswood 3-1	J	31.9	out	out
	Helix Ravenswood, LLC	Ravenswood 3-2	J	29.4	out	out
	Helix Ravenswood, LLC	Ravenswood 3-4	J	31.2	out	out
	Exelon Generation Company LLC	Monroe Livingston	B	2.4	out	out
	Innovative Energy Systems, Inc	Steuben County LF	C	3.2	out	out
	Consolidated Edison Co. of NY, Inc	Hudson Ave 4	J	14	out	out
	New York State Elec& Gas Corp.	Auburn - State St	C	4.1	out	out
	Cayuga Operating Company, LLC	Cayuga 1	C	151	out	out
	Albany Energy LLC	Albany LFGE	F	5.6	out	out
	Somerset Operating Company, LLC	Somerset	A	676.4	out	out
	Entergy Nuclear Power Marketing, LLC	Indian Point 2	H	1011.5	out	out
	Astoria Generating Company L.P.	Gowanus 1-8 <sup>(5)</sup>	J	16	out	out
Table IV-4: Deactivated Units Listed in Existing Capacity Table III-2	Entergy Nuclear Power Marketing, LLC	Indian Point 3	H	1036.3	out	out
	Helix Ravenswood, LLC	Ravenswood 01 <sup>(3)</sup>	J	7.7	out	out
		Ravenswood 11 <sup>(3)</sup>	J	16.1	out	out
Table IV-5: Notices of Proposed Deactivations as of March 15, 2020	National Grid	West Babylon 4	K	41.2	out	out
	Long Island Power Authority	Glenwood GT 01	K	13	out	out
	Seneca Power Partners. L.P.	Allegheny Cogen	B	62	out	in
		Sithe Batavia	B	48.7	out	in
		Sithe Sterling	B	49.2	out	in
	ENGIE Energy Marketing NA, Inc.	Nassau Energy Corporation	K	38.5	out	in
	Astoria Generating Company, L.P.	Gowanus 1-1 through 1-7	J	117.1	out	out
		Gowanus 4-1 through 4-8	J	138.8	out	out
	NRG Power Marketing LLC	Astoria GT 2-1 through 2-4	J	141.6	out	out
		Astoria GT 3-1 through 3-4	J	140.5	out	out
		Astoria GT 4-1	J	138.3	out	out
	Total			4005.9		
	Changes since CRP			198.4		

**Figure 19: Existing Plants Impacted by DEC's Peaker Rule (Additional Details on Peakers Status by Ozone Season are in Section 4)**

2022 GB Table	Owner/ Operator	Plant Name	Zone	Summer Capability	2022 RNA Base Case Status	2020 RNA Base Case Status
Table IV-6: Proposed Staus Change to Comply with DEC Peaker Rule**	Central Hudson Gas & Elec. Corp.	Coxsackie GT	G	19.2	out	out
		South Cairo	G	18.9	out	out
	Consolidated Edison Co. of NY, Inc.	74 St. GT 1 & 2	J	39.3	out	out
		Hudson Ave 3	J	13.6	out	out
		Hudson Ave 5	J	12.3	out	out
		59 St. GT 1	J	15.3	out	out
	Helix Ravenswood, LLC	Ravenswood 10	J	16.0	out	out
	National Grid	Northport GT	K	12.0	out	out
		Port Jefferson GT 01	K	12.6	out	out
		Shoreham 1	K	44.7	out	in
		Shoreham 2	K	15.7	out	in
		Glenwood GT 03	K	44.7	out	in
	NRG Power Marketing, LLC	Arthur Kill GT 1	J	13.1	out	out
	Astoria Generating Company, L.P.	Astoria GT 01	J	12.1	out	out
		Gowanus 2-1 through 2-8	J	145.5	out	out
		Gowanus 3-1 through 3-8	J	137.4	out	out
		Narrows 1-1 through 2-8	J	291.5	out	out
	Total			863.9		
	Changes since CRP			105.1		

Note: NYSDEC's Part 227-3 applies to all simple cycle gas turbines with nameplates equal to or greater than 15 MW. Thus, all simple cycle generators are subject to the rule and all owners of these machines were required to submit compliance plans to the NYSDEC. The compliance plans consist of statements that the generator; (i) already complies with the new NOx limits, (ii) will retire, (iii) will limit operation during the ozone season, and/or (iv) will retrofit emission control technology to meet the emission limits of the new rule. If the plant owners submitted compliance plans that state that the generator will be able to operate within the new NOx limits during the ozone season, these generators remain in service in the RNA base case.

<sup>6</sup> Note that the Allegany and Batavia generators subsequently withdrew their deactivations notices and West Babylon 4 and Glenwood GT 01 indicated behind the meter operation. Updated assumptions are captured in subsequent reliability assessments such as the STARS.



In addition to the projects that met the 2022 RNA inclusion rules (listed in Figure 17), numerous other projects are progressing through the NYISO's interconnection process. Some of these additional generation resources either have accepted their cost allocation as part of a prior Class Year Facilities Study process, are included in the *Class Year 2021 Facilities Study*, or are candidates for future interconnection facilities studies. These projects are listed in the *2022 Gold Book* and also in **Appendix D**.

### **Bulk Transmission Projects**

The notable bulk transmission projects that met the inclusion rules and continue to be modeled in the *2022 RNA* Base Case are:

- The NextEra Empire State Line Project that was selected by the NYISO Board of Directors in October 2017 to address the Western New York Public Policy Transmission Need. This project includes a new 345 kV circuit and phase angle regulator (PAR) that will alleviate constraints in the Niagara area. The planned in-service date for this project is June 2022.
- The Segment A, AC Transmission joint project, by LS Power and New York Power Authority (NYPA) that was selected by the NYISO Board of Directors in April 2019. The project includes a new double-circuit 345 kV line between Edic and New Scotland substations, two new 345 kV substations at Princetown and Rotterdam, two new 345 kV lines between Princetown to Rotterdam substations, and retirement of the existing Porter to Rotterdam 230 kV lines. The planned in-service date is December 2023.
- The New York Transco Segment B, AC Transmission project, also was selected by the NYISO Board of Directors in April 2019. The project includes a new double-circuit 345/115 kV line from a new Knickerbocker 345 kV switching station to the existing Pleasant Valley substation, 50% series compensation on the Knickerbocker to Pleasant Valley 345 kV line, and retirement of 115 kV lines between Greenbush and Pleasant Valley substations. The planned in-service date is December 2023.
- Additionally, new proposed projects that passed the inclusion rules for the 2022 RNA Base Case are:
  - Champlain Hudson Power Express (CHPE) 1250 MW HVDC project from Hydro Quebec to Astoria Annex 345 kV in Zone J (awarded under NYSERDA's Tier 4 REC program)
  - NYPA/National Grid's Northern New York Priority Transmission Project proposed under the New York State Accelerated Renewable Energy Growth and Community Benefit Act (AREA), which seeks to accelerate siting and construction of large-scale clean energy

projects. The project is expected to increase the capacity of transmission lines in northern New York, where significant wind and hydro capacity exists and constraints on existing lines contribute to curtailment of these resources.

### Local Transmission Plans

As part of the NYISO's Local Transmission Planning Process, the New York TOs present their Local Transmission Owner Plans (LTPs) to the NYISO and stakeholders during ESPWG and TPAS meetings. The firm transmission plans presented in the LTPs and reported as firm in the *2022 Gold Book* are included in the 2022 RNA Base Case, with consideration for their in-service dates. A summary of these projects is reported in **Appendix D** of this report.

### Base Case Comparison of Peak Load to Resources

The 2022 RNA Base Case models the existing generation as adjusted for the unit deactivations listed in the *2022 Gold Book*, and along with the new resource additions that met the base case inclusion rules set forth in Section 3 of the Reliability Planning Process Manual. The total capacity, taking into account additions and deactivations is summarized in Figure 20, along with the baseline peakload, capacity net purchases and the special case resources (SCRs) from the 2022 Gold Book.

The 2022 RNA special case resource<sup>7</sup> (SCR) MW levels are based on the *2022 Gold Book* value of 1,164.1 MW, adjusted for their performance for the resource adequacy evaluations. Transmission security analysis, which evaluates normal transfer criteria, does not consider SCRs.

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<sup>7</sup> The term "Special Case Resource" is defined in Section 2.19 of Market Services Tariff and also in the Appendix A of this report (Glossary).

**Figure 20: NYCA Peak Load and Resources 2026 through 2030**

Year		2026	2027	2028	2029	2030	2031	2032
Peak Load (MW) - Gold Book 2022 NYCA Baseline								
	NYCA*	31,339	31,292	31,317	31,468	31,684	31,946	32,214
	Zone J*	10,778	10,804	10,864	10,986	11,140	11,303	11,441
	Zone K*	4,746	4,768	4,806	4,857	4,907	4,956	5,007
	Zone G-J*	14,936	14,959	15,027	15,173	15,360	15,560	15,735
Resources ICAP (MW)								
NYCA	Capacity**	37,625	37,625	37,625	37,625	37,625	37,625	37,625
	Net Purchases & Sales (Transaction)	3,188	3,188	3,188	3,188	3,188	3,188	3,188
	SCR	1,164	1,164	1,164	1,164	1,164	1,164	1,164
	Total Resources	41,977	41,977	41,977	41,977	41,977	41,977	41,977
	Capacity/Load Ratio	120.1%	120.2%	120.1%	119.6%	118.8%	117.8%	116.8%
	Cap+NetPurch/Load Ratio	130.2%	130.4%	130.3%	129.7%	128.8%	127.8%	126.7%
	Cap+NetPurch+SCR/Load Ratio	133.9%	134.1%	134.0%	133.4%	132.5%	131.4%	130.3%
Zone J								
	Capacity**	8,183	8,183	8,183	8,183	8,183	8,183	8,183
	Cap+fullUDR+SCR/Load Ratio	94.2%	94.0%	93.5%	92.4%	91.2%	89.8%	88.8%
Zone K								
	Capacity**	5,094	5,094	5,094	5,094	5,094	5,094	5,094
	Cap+fullUDR+SCR/Load Ratio	129.0%	128.4%	127.4%	126.0%	124.7%	123.5%	122.2%
Zone G-J								
	Capacity**	13,052	13,052	13,052	13,052	13,052	13,052	13,052
	Cap+fullUDR+SCR/Load Ratio	101.2%	101.0%	100.5%	99.6%	98.4%	97.1%	96.0%

Year		2026	2027	2028	2029	2030	2031	2032
Resources (UCAP MW)								
NYCA	Capacity**	32,670	32,670	32,670	32,670	32,670	32,670	32,670
	Cap+NetPurch+SCR/Load Ratio	117.0%	117.2%	117.1%	116.5%	115.7%	114.8%	113.8%
Zone J								
	Capacity**	7,968	7,968	7,968	7,968	7,968	7,968	7,968
	Cap+fullUDR+SCR/Load Ratio	89.2%	89.0%	88.5%	87.5%	86.3%	85.1%	84.0%
Zone K								
	Capacity**	4,702	4,702	4,702	4,702	4,702	4,702	4,702
	Cap+fullUDR+SCR/Load Ratio	118.5%	117.9%	117.0%	115.8%	114.6%	113.5%	112.3%
Zone G-J								
	Capacity**	12,356	12,356	12,356	12,356	12,356	12,356	12,356
	Cap+fullUDR+SCR/Load Ratio	94.0%	93.8%	93.4%	92.5%	91.4%	90.2%	89.2%

**Notes:**

\***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 the G-J locality peak. Baseline load represents coincident summer peak demand and includes the reductions due to projected energy efficiency programs, building codes and standards, behind-the-meter (BtM) storage impacts at peak, distributed energy resources and BtM solar photovoltaic resources; it also reflects expected impacts (increases) from projected electric vehicle usage and electrification.

\*\*NYCA Capacity values include resources electrically internal to NYCA, additions, re-ratings, and retirements (including proposed retirements, mothballs, and peaker rule impacts). 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 full Unforced Capacity Deliverability Rights (UDRs) for those capacity zones.

- SCR: forecasted MW ICAP value from the 2022 Gold Book.
- Wind, solar, run-of-river and landfill gas summer capacity is counted as 100% of nameplate rating.

\*\*\* For UCAP calculation, EFORD from GE-MARS output file are used for thermal units. For renewables, installed capacity intermittent resources derating factors are used.

**Figure 21: Total Capacity/ Load Ratios(%) ICAP vs UCAP for 2032**

Total Capacity vs Load Ratio (%) for 2032			
Zone	ICAP	UCAP	Delta
NYCA	130.3%	113.8%	16.5%
J	88.8%	84.0%	4.7%
K	122.2%	112.3%	9.9%
G-J	96.0%	89.2%	6.8%

Notes:

1. Total Capacity = Capacity\* + full UDR + SCR
2. \*Capacity = lesser of (CRIS, DMNC). NYCA resources include the net purchases and sales as per the Gold Book.
3. ICAP = Installed Capacity
4. UCAP = Unforced Capacity (takes into consideration generation unavailability)
5. UCAP calculation:
  - For thermal units, average capacity derating factors from the MARS output are used
  - For renewables, installed capacity intermittent resources derating factors are used

As shown in the Figure 20, the total NYCA capacity margin, which is defined as capacity above the baseline load forecast, varies between 30% and 33%. Figure 21 shows a comparison between the total ICAP and total UCAP for 2032; the difference reflects generation unavailability for the resource mix assumed in the RNA Base Case for study year 2032.

Figure 22 shows the relative increase in the capacity margin, by comparing the details of the capacity margins for year 10 between the 2020 RNA(2030) and the 2019-2028 CRP (2028). The analysis reveals two observations:

- Positive net margin shows improvement in the relative capability to serve load, when comparing the two studies assumptions; and
- While the baseline load is 605 MW higher compared to the *2021-2030 CRP*, the total resources are 2,190 MW higher leading to the system having 1,585 MW more overall net resources (1,585= 2190-605).

**Figure 22: NYCA Load and Resources Comparison with the 2021 - 2030 CRP**

NYCA Study Year 10	2022 RNA Y10 (2032)	2021-2030 CRP Y10 (2030)	Net Delta =TotalResDelta minus TotalLoadDelta
Baseline Load <sup>1</sup>	32,214	31,609	605
Total Resources <sup>2</sup>	41,977	39,787	2,190
Net Margin: Change in (netCapacity - netLoad)			<b>1,585</b>

Notes:

1. Baseline Load represents baseline coincident summer peak demand and includes the reductions due to projected energy efficiency programs, building codes and standards, behind-the-meter (BtM) storage impacts at peak, distributed energy resources and BtM solar photovoltaic resources impacts at peak. It also reflects expected impacts (increases) from projected electric vehicle usage and electrification.
2. NYCA total capacity include resources electrically internal to NYCA, additions, re-ratings, and deactivations (including proposed retirements, mothballs, and peaker rule impacts). Capacity values reflect the lesser of CRIS and DMNC summer MW values. NYCA resources include the net purchases and sales from the Gold Book. Net purchases and sales (transactions) include the election of Unforced Capacity Deliverability Rights (UDRs), External CRIS Rights, Existing Transmission Capacity for Native Load (ETCNL) elections, estimated First Come First Serve Rights (FCFSR), and grandfathered exports.

## 5. Base Case Reliability Assessments

### Overview

This section provides the methodology and results for the resource adequacy and transmission security of the New York BPTF over the RNA Study Period. If any reliability criteria violations are identified, the NYISO identifies Reliability Needs. Violations of the criteria are translated into MW or MVar amounts to provide a relative quantification of the Reliability Needs, and to support the development of solutions in the CRP. *Enhancements to the application of the reliability criteria were added to the 2022 RNA and are noted below.*

### 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. The BPTF 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. 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 resource and transmission adequacy of the system, subject to the security constraints.

For this 2022 RNA, *enhancements to the application of reliability rules* were employed for both

transmission security and resources adequacy. For transmission security, to represent that not all generation would be available at any given time, *a derating factor is applied to thermal units*. For resource adequacy, to ensure that some level of operating reserves is maintained, *the Emergency Operating Procedure (EOP) step will retain 350 MW of operating reserves at the time of a load shedding event*.

### **Transmission Security**

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. The analysis for the transmission security assessment is conducted in accordance with NERC Reliability Standards, NPCC Transmission Design Criteria, and the NYSRC Reliability Rules. 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, which are explicitly defined in the reliability criteria. The impacts resulting from applying these design criteria contingencies are assessed to determine whether 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"<sup>8</sup> describes the methodology for that analysis.

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. Transmission security analysis includes the assessment of various combinations of credible system conditions intended to stress the system. As transmission security analysis is deterministic, these various credible combinations of system conditions are evaluated throughout the study period to identify Reliability Needs.<sup>9</sup> Intermittent generation is represented based on expected output during the modeled system conditions.<sup>10</sup> For the purposes of identifying transmission security-based Reliability Needs on the BPTF through the use of transmission security margin calculations, thermal generation MW capability will be considered available based on NERC five-year class averages for the relevant type of units.

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<sup>8</sup> Attachment I of Transmission, Expansion and Interconnection Manual.

<sup>9</sup> NYSRC Reliability Rule B.1 R.1.1 states, "Credible combinations of system conditions which stress the system shall be modeled, including load forecast, internal NYCA and inter-Area and transfers, transmission configuration, active and reactive resources, generation availability, and other dispatch scenarios."

<sup>10</sup> The RNA assumptions matrix is posted under the July 1, 2022 TPAS/ESPWG meeting materials and also in Appendix xx: <https://www.nyiso.com/tpas?meetingDate=2022-07-01> .

Transmission security margins are also included in this assessment to identify plausible changes in conditions or assumptions that might adversely impact the reliability of the Bulk Power Transmission Facilities (“BPTF”) or “tip” the system into violation of a transmission security criterion. The transmission security margin is the ability to meet load plus losses and system reserve (*i.e.*, total capacity requirement) against the NYCA generation, interchanges, and temperature-based generation de-rates (total resources). This assessment is performed using a deterministic approach through a spreadsheet-based methods based on the RNA study assumptions. For this assessment, “tipping points” are evaluated for the New York Control Area as well as Lower Hudson Valley, New York City, and Long Island localities. For this evaluation, the system tips when the transmission security margin is less than zero. A BPTF reliability need is identified when the transmission security margin under expected weather conditions in the Lower Hudson Valley, New York City, and Long Island localities is less than zero. Additional details regarding the impact of heatwave or extreme heatwave conditions are provided for informational purposes.

### **Resource Adequacy**

Resource adequacy is the ability of the electric system 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. The NYISO performs resource adequacy assessments 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 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 analyzed 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 NYISO 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.

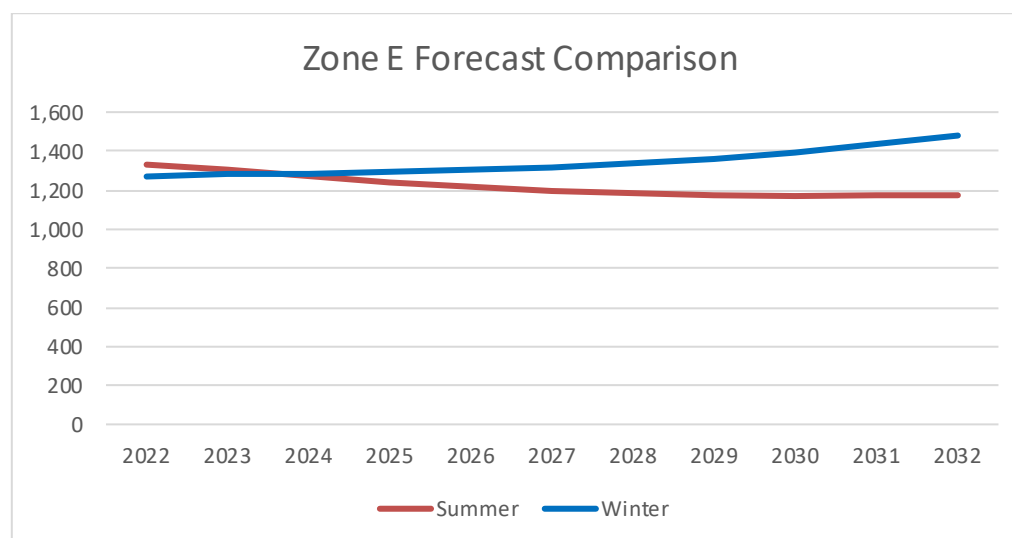
The procedure to quantify compensatory MW for BPTF transmission security violations is a separate process from calculating compensatory MW for resource adequacy violations. This quantification is performed by first calculating transfer distribution factors on the overloaded facilities. The power transfer 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.

### **Transmission Security Base Case Assessments**

To assist in the assessment, the NYISO reviewed previously completed transmission security assessments. The transmission security analysis evaluated expected *summer* peak, *winter* peak, and *light load* conditions. While past RNAs have looked at various system conditions, they focused mainly on summer peak conditions as these were the most stressful conditions that would occur over the whole year. However, with the load forecast showing that upstate regions will be winter peaking within the RNA 10-year horizon, winter peak analysis was performed. For instance, Zone E becomes winter peaking in winter 2024-25.



**Figure 23: Zone E Summer and Winter Forecast Comparison**



Additionally, the amount of solar DER has recently been forecasted to increase to over 10,000 MW nameplate. During spring daytime conditions where the load is very light and solar output could be heavy, the amount of other resources needed to serve load may not be significant. To capture any potential reliability issues with this condition, transmission security analysis was performed on this case.

**Figure 24: Expected Load and Solar Generation Under Daytime Light Load Conditions**

	Final Gross Load	BTM Solar Generation	Net Load Forecast
2022	14,990	2,755	12,235
2023	15,261	3,329	11,932
2024	15,345	3,986	11,359
2025	15,297	4,656	10,641
2026	15,310	5,283	10,027
2027	15,383	5,872	9,511
2028	15,468	6,415	9,053
2029	15,621	6,878	8,743
2030	15,801	7,247	8,554
2031	16,021	7,487	8,534
2032	16,258	7,655	8,603

### Potential Reliability Needs

A potential steady-state transmission security Related Need was identified for the Study Period under expected winter peak conditions. No other steady-state transmission security related reliability needs were observed under other system conditions. Additionally, no stability or short-circuit reliability needs

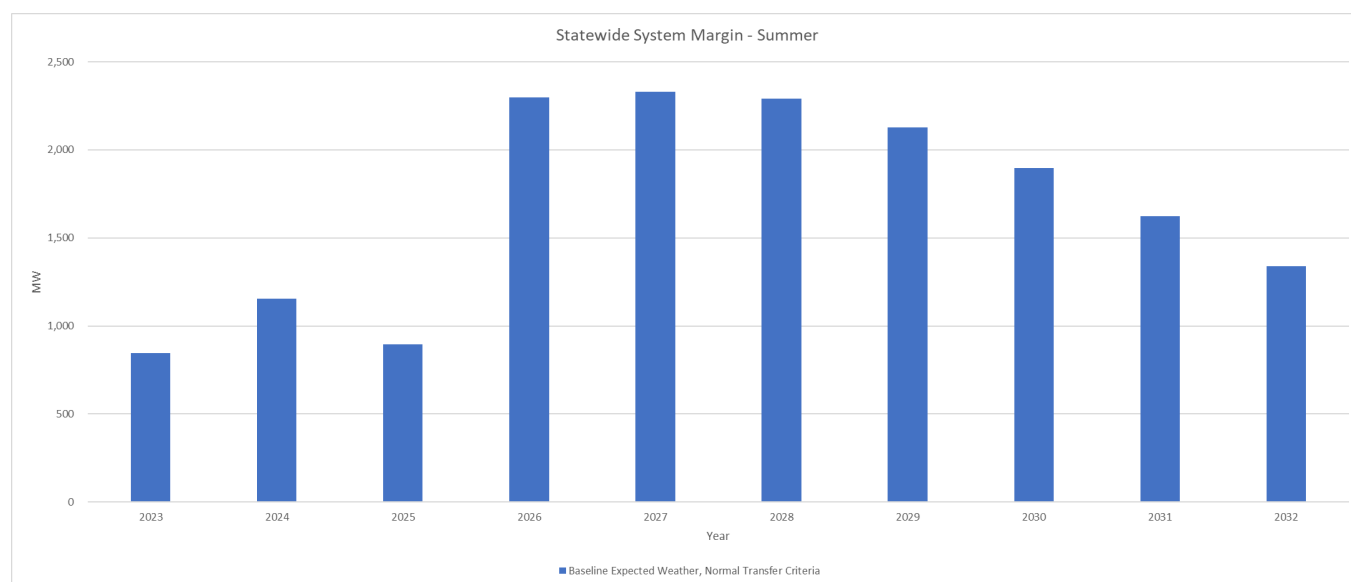
were observed for any system conditions.

The transmission security Reliability Need is a low voltage at the Porter 115 kV bus following various contingency combinations resulting in the loss of both Edic-to-Porter 345/115 kV transformers under expected winter peak conditions. The low voltage at the Porter 115 kV bus is observed starting in winter 2025-26 due to the confluence of the retirement of the two Porter 230/115 kV buses which is planned to occur that winter with the Smart Path Connect Project (Q1125) along with increasing load in Zone E observed in winter. The low voltages at the Porter 115 kV bus are not observed under summer peakload conditions as the load forecast for Zone E is higher in winter than in summer. *However, As the low voltages observed at the Porter 115 kV bus occur due to the planned changes with Q1125, this issue will be addressed in the interconnection process.*

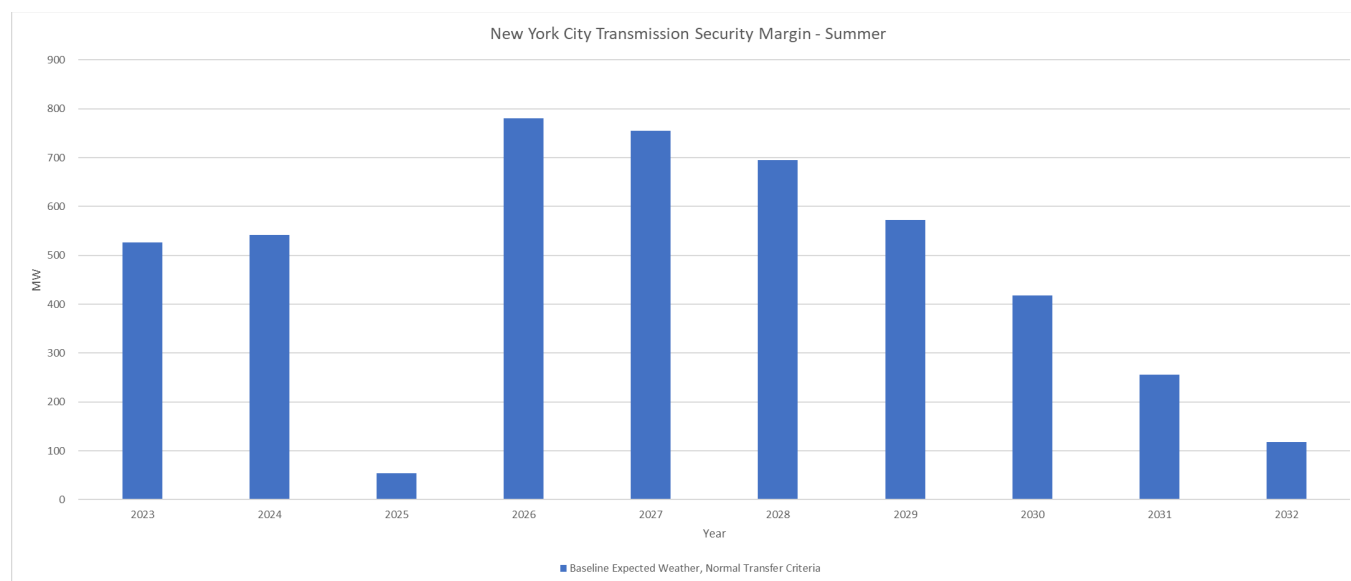
#### **Transmission Security Margins (Tipping Points)**

Within the Lower Hudson Valley and Long Island localities, the BPTF system is designed for the occurrence of two non-simultaneous outages (N-1-1). Within the Con Edison service territory, the 345 kV transmission system along with specific portions of the 138 kV transmission system are designed for the occurrence of two non-simultaneous outages and a return to normal ratings (N-1-1-0). The transmission security margins for the Lower Hudson Valley, New York City, and Long Island localities are observed to be sufficient for all study years. Figure 25 shows the statewide system margin under baseline expected weather. Figure 26 shows the New York City transmission security margin under baseline expected weather. As seen in Figure 26, while the margins are sufficient in New York city the margins are very narrow in 2025 (about 50 MW) and then increase with the planned in-service of CHPE. However, by the end of the study period the margin reduces to just over 100 MW. Additional details of the transmission security margins are provided in Appendix XX.

**Figure 25: Statewide System Margin – Summer**



**Figure 26: New York City Transmission Security Margin - Summer**



## Resource Adequacy Base Case Assessments

The following discussion reviews the main findings of the *2022 RNA* resource adequacy assessments applicable to the Base Case conditions for the Study Period.

### Resource Adequacy Model

The NYISO conducts its resource adequacy analysis using the GE-MARS software package, which performs probabilistic simulations of outages of capacity and select transmission resources. The program

employs a sequential Monte Carlo simulation method and calculates expected values of reliability indices such as LOLE (event-days/year) and includes load, generation, and transmission representation. Additional modeling details and links to various stakeholders' presentations are in the assumptions matrix, Appendix D. In determining the reliability of a system, there are several types of randomly occurring events that are taken into consideration. Among these are the forced outages of generation and transmission, and deviations from the forecasted loads.

#### **Generation Model**

The NYISO models the generation system in GE-MARS using several types of units. Thermal units considerations include: random forced outages as determined by Generator Availability Data System (GADS) — calculated EFORd and the Monte Carlo draw, scheduled and unplanned maintenance, and thermal derates; minimum between CRIS and DMNC MW from the 2022 Gold Book is used for both summer and winter. Renewable resource units (*i.e.*, both utility and behind the meter solar PV, wind, run-of-river hydro and landfill gas) are modeled using five years of historical production data. Co-generation units are also modeled using a capacity and load profile for each unit.

#### **Load Model**

The load model in the NYISO GE-MARS model consists of historical load shapes and load forecast uncertainty (LFU). The NYISO uses three historical load shapes (8,760 hourly MW) in the GE-MARS model in seven different load levels using a normal distribution. The load shapes are adjusted on a seasonal (summer and winter) basis to meet peak forecasts while maintaining the energy target. LFU is applied to every hour of these historical shapes and each hour of the seven load levels is run through the GE-MARS model for each replication for resources availability evaluations. The historical shapes used in the past (2002, 2006 and 2007) were replaced by 2013, 2017, 2018 based on detailed analysis performed<sup>11</sup> by the NYISO.

#### **External Areas Model**

The NYISO models the four external Control Areas interconnected to the NYCA; (ISO-New England, PJM, Ontario and Quebec). The transfer limits between the NYCA and the external areas are set in collaboration with the NPCC CP-8 Working Group and are shown in the MARS Topology Figure 27. Additionally, the probabilistic model used in the RNA to assess resource adequacy employs a number of methods aimed at preventing overreliance on support from the external systems. These include imposing a

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<sup>11</sup> As presented at the March 24, 2022 LFTF/TPAS/ESPGWG:

[https://www.nyiso.com/documents/20142/29418084/07%20LFU%20Phase%202\\_Recommendation.pdf](https://www.nyiso.com/documents/20142/29418084/07%20LFU%20Phase%202_Recommendation.pdf)

[https://www.nyiso.com/documents/20142/29418084/08%20MARS\\_PlanningModel-NewLoadShapes.pdf](https://www.nyiso.com/documents/20142/29418084/08%20MARS_PlanningModel-NewLoadShapes.pdf)

limit of 3,500 MW to the total emergency assistance from all neighbors, modeling simultaneous peak days, and modeling the long-term purchases and sales with neighboring control areas. Furthermore, the external areas are kept within a Loss of Load Expectation (LOLE) range of 0.10 to 0.15 event-days/year.

#### **MARS Topology**

The NYISO models the amount of power that could be transferred during emergency conditions across the system in GE-MARS using interface transfer limits applied to the connections between the NYCA 11 Areas (“bubble-and-pipe” model), and with the four neighboring systems (Ontario, Quebec, New England, and PJM). No generation pockets in Zone J and Zone K are modeled in detail in MARS.

#### **Emergency Operating Procedures (EOPs)**

The New York model evaluates the need to implement in sequential order a number of emergency operating procedures such as operating reserves, Special Case Resources (SCRs), manual voltage reduction, public appeals, 10-minute reserve, 30-minute reserve, emergency assistance from external areas.

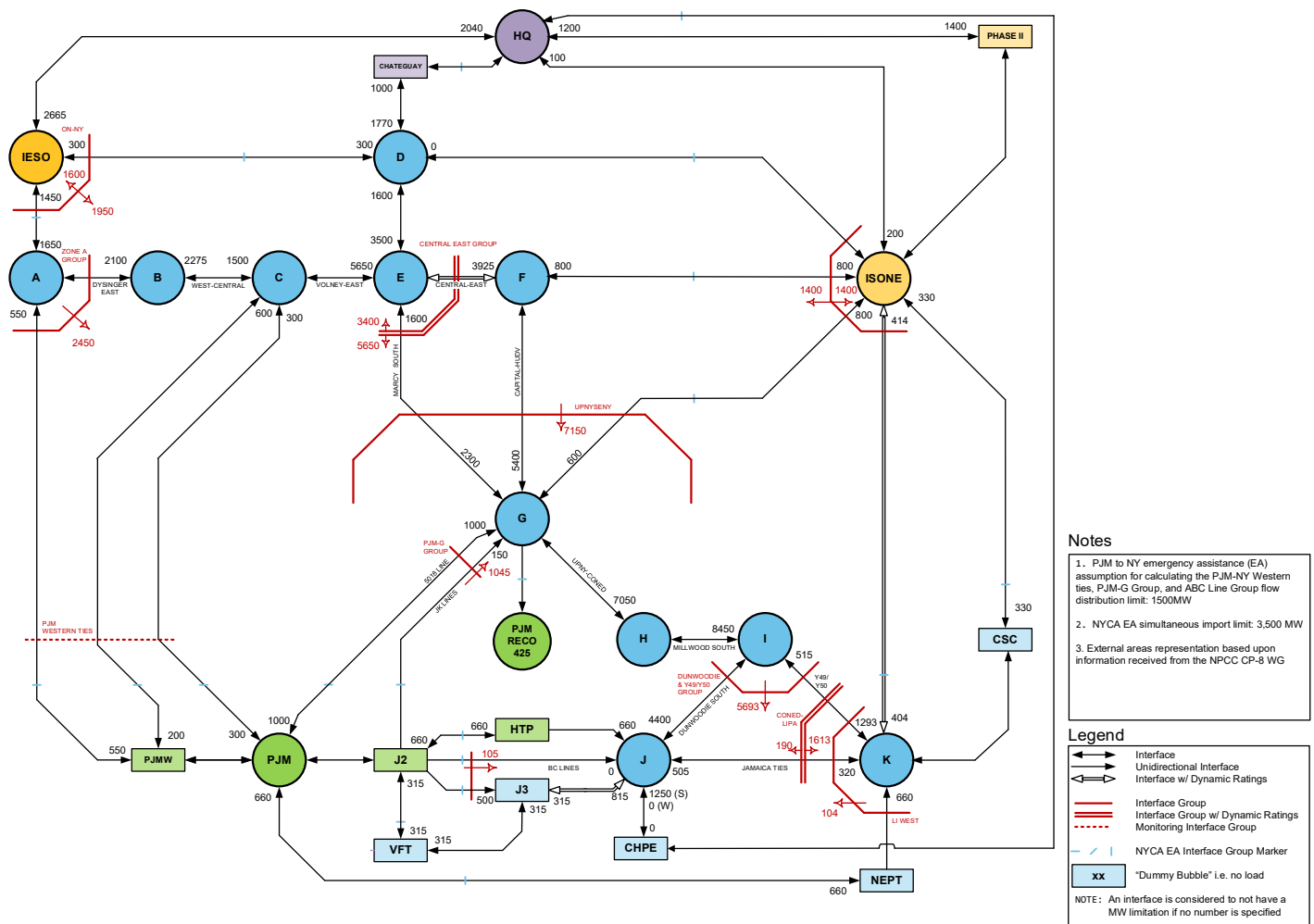
A change was implemented for this RNA to maintain (*i.e.*, no longer deplete) 350 MW of the 1,310 MW 10-min operating reserves as part of the MARS EOPs and as presented at the May 5, 2022 ESPWG/TPAS<sup>12</sup>.

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<sup>12</sup> Details presented at the May 5, 2022 ESPWG/TPAS:

[https://www.nyiso.com/documents/20142/30451285/08\\_Reliability\\_Practices\\_TPAS-ESPWG\\_2022-05-05.pdf](https://www.nyiso.com/documents/20142/30451285/08_Reliability_Practices_TPAS-ESPWG_2022-05-05.pdf)

**Figure 27: 2022 RNA Topology Years 4-10 (2026-2032)**



## Resource Adequacy Base Case Results

The 2022 RNA Base Case resource adequacy studies shows that the LOLE for the NYCA is below its 0.1 event-days/year criterion throughout the entire study period. *Therefore, the NYISO identifies no resource adequacy Reliability Needs.* The NYCA LOLE results are presented in Figure 28 below.

**Figure 28: NYCA Resource Adequacy Results**

Study Year		Baseline Forecast Load (MW)	RNA Base Case LOLE (days/year)
y1	2023	32,018	0.025
y2	2024	31,778	0.018
y3	2025	31,505	0.024
y4	2026	31,339	0.004
y5	2027	31,292	0.005
y6	2028	31,317	0.004
y7	2029	31,468	0.005
y8	2030	31,684	0.006
y9	2031	31,946	0.010
y10	2032	32,214	0.022

**Notes:**

- NYCA load values represent baseline coincident summer peak demand from the 2022 Gold Book.
- 2022 RNA Study Years are year 4 (y4) through year 10 (y10). Year 1 through 3 are for information.

LOLE accounts for events but does not account for the magnitude (MW) or duration (hours) of the deficit. Therefore, two additional reliability indices are added for information purposes: loss of load hours (LOLH in hours/year) and expected unserved energy (EUE in MWh/year).<sup>13</sup>

LOLE is generally defined as the expected (weighted average) number of days in a given period (*e.g.*, one study year) when for at least one hour from that day the hourly demand is projected to exceed the zonal resources (event day). Within a day, if the zonal demand exceeds the resources in at least one hour of that day, this will be counted as one event day. The criterion is that the LOLE not exceed one day in 10 years, or  $LOLE < 0.1$  days/year.

LOLH is generally defined as the expected number of hours per period (*e.g.*, one study year) when a system's hourly demand is projected to exceed the zonal resources (event hour). Within an hour, if the

<sup>13</sup> NYSRC's "Resource Adequacy Metrics and their Application":  
[https://www.nysrc.org/PDF/Reports/Resource%20Adequacy%20Metric%20Report%20Final%204-20-2020\[6431\].pdf](https://www.nysrc.org/PDF/Reports/Resource%20Adequacy%20Metric%20Report%20Final%204-20-2020[6431].pdf)

zonal demand exceeds the resources, this will be counted as one event hour.

EUE, also referred to as loss of energy expectation (LOEE), is generally defined as the expected energy (MWh) per period (*e.g.*, one study year) when the summation of the system's hourly demand is projected to exceed the zonal resources. Within an hour, if the zonal demand exceeds the resources, this deficit will be counted toward the system's EUE.

While the resource adequacy reliability criterion of 0.1 days/year established by the NYSRC and the NPCC is compared with the loss of load expectation (LOLE in days/year) calculation, currently there is no criterion for determining a reliable system based on the LOLH and EUE reliability indices.

**Figure 29: NYCA Resource Adequacy Results**

Study Year		LOLE	LOLH	LOEE
		event-days/year	event-hours/year	MWh/year
y1	2023	0.025	0.061	23.860
y2	2024	0.018	0.035	11.538
y3	2025	0.023	0.048	18.399
y4	2026	0.004	0.008	1.734
y5	2027	0.005	0.010	2.529
y6	2028	0.004	0.008	1.626
y7	2029	0.005	0.009	1.799
y8	2030	0.006	0.013	3.051
y9	2031	0.010	0.020	5.095
y10	2032	0.022	0.045	11.382

## 6. Base Case Variation Scenarios

The NYISO, in conjunction with stakeholders and Market Participants, developed reliability scenarios pursuant to Section 31.2.2.5 of Attachment Y of the OATT. Scenarios are variations on the preliminary (1<sup>st</sup> pass) RNA Base Case to assess the impact of possible changes in key study assumptions which, if they occurred, could change the timing, location, or degree of violations of reliability criteria on the NYCA system during the Study Period, and are presented for information only. There were no changes between the preliminary RNA Base Case and the final Base Case. RNA scenarios are provided for information only, and do not lead to Reliability Needs identification or mitigation. The NYISO evaluated the following scenarios as part of this RNA, with an identification of the type of assessment performed:

### 1. High Load Forecast Scenario – Resource Adequacy

- The 2022 Gold Book High Load forecast were used for the resource adequacy analysis.



## 2. Zonal Resource Adequacy Margins (ZRAM) - Resource Adequacy

- Identification of the maximum level of zonal MW capacity that can be removed without either causing NYCA LOLE violations, or exceeding the zonal capacity.

## 3. “Status-quo” Scenario - Transmission Security and Resource Adequacy

- Removal of proposed major transmission and generation projects assumed in the RNA Base Case.

## 4. CLCPA Scenarios – based on the 2021 Outlook Policy Case Scenario #2 for study year 2030

The results of the scenarios 1-3 are summarized in the following sections the CLCPA scenarios are in **Section 8** below.

### High Load Forecast Scenario – Resource Adequacy

The RNA Base Case forecast includes impacts associated with projected energy reductions coming from statewide energy efficiency and behind-the-meter solar PV programs. The High Load Forecast scenario excludes these energy efficiency program impacts from the peak forecast, resulting in the higher forecast levels. The comparison of the High and Baseline forecasted loads is provided in the Figure 30 below. There is an increase of 3,484 MW in the peak load in 2032, as compared to the Base Case forecast. Given that the peak load in the High Load forecast is higher than in the Base Case, the probability of violating the LOLE criterion increases, and violations would occur starting in 2030. The NYCA LOLE results are in Figure 31.

**Figure 30: 2022 Gold Book NYCA High Load vs. Baseline Summer Peak Forecast**

Study Year		Baseline Load (BL)	High Load (HL)	Delta MW (HL-BL)
y1	2023	32,018	32,780	762
y2	2024	31,778	32,849	1,071
y3	2025	31,505	32,854	1,349
y4	2026	31,339	32,946	1,607
y5	2027	31,292	33,133	1,841
y6	2028	31,317	33,464	2,147
y7	2029	31,468	33,915	2,447
y8	2030	31,684	34,475	2,791
y9	2031	31,946	35,080	3,134
y10	2032	32,214	35,698	3,484

**Figure 31: 2022 RNA Resource Adequacy High Load Scenario NYCA LOLE Results**

Study Year		RNA Base Case LOLE (days/year)	High Load Scenario LOLE (days/year)	Delta LOLE
y1	2023	0.025	0.044	0.018
y2	2024	0.018	0.039	0.021
y3	2025	0.024	0.068	0.045
y4	2026	0.004	0.027	0.023
y5	2027	0.005	0.035	0.030
y6	2028	0.004	0.052	0.047
y7	2029	0.005	0.079	0.074
y8	2030	0.006	0.149	0.143
y9	2031	0.010	0.342	0.332
y10	2032	0.022	0.676	0.654

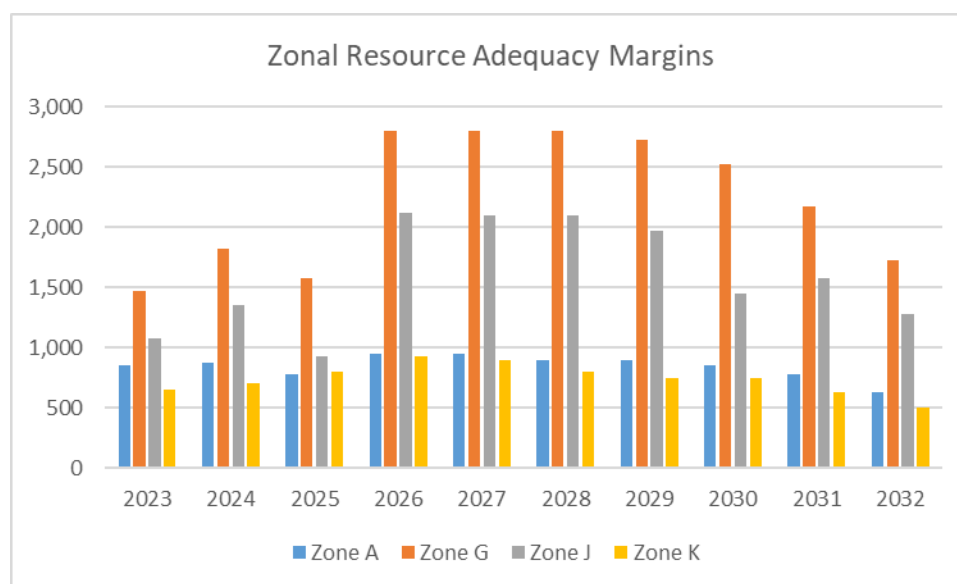
This scenario indicates that if expected energy efficiency and peak load reduction programs do not materialize at expected levels, there could be criterion violations starting in 2030 for a load level that is 2,791 MW higher than the baseline load.

### **Zonal Resource Adequacy Margin (ZRAM) – Resource Adequacy**

Resource adequacy simulations were performed on the RNA base cases<sup>14</sup> to determine the amount of “perfect” capacity” in each zone that could be removed before the NYCA LOLE reaches 0.1 event-days/year (one-event-day-in-ten-years), and to offer another relative measure of how close the system is from not having adequate resources to reliably serve load. As shown in Figure 32, this analysis continues to find tightening margins across the New York grid through time, with a margin of only 500 MW in Long Island (Zone K) and only 650 MW in western New York (Zone A) by 2032. In 2023 the margins are 650 MW in Zone K, and 850 MW in western NY.

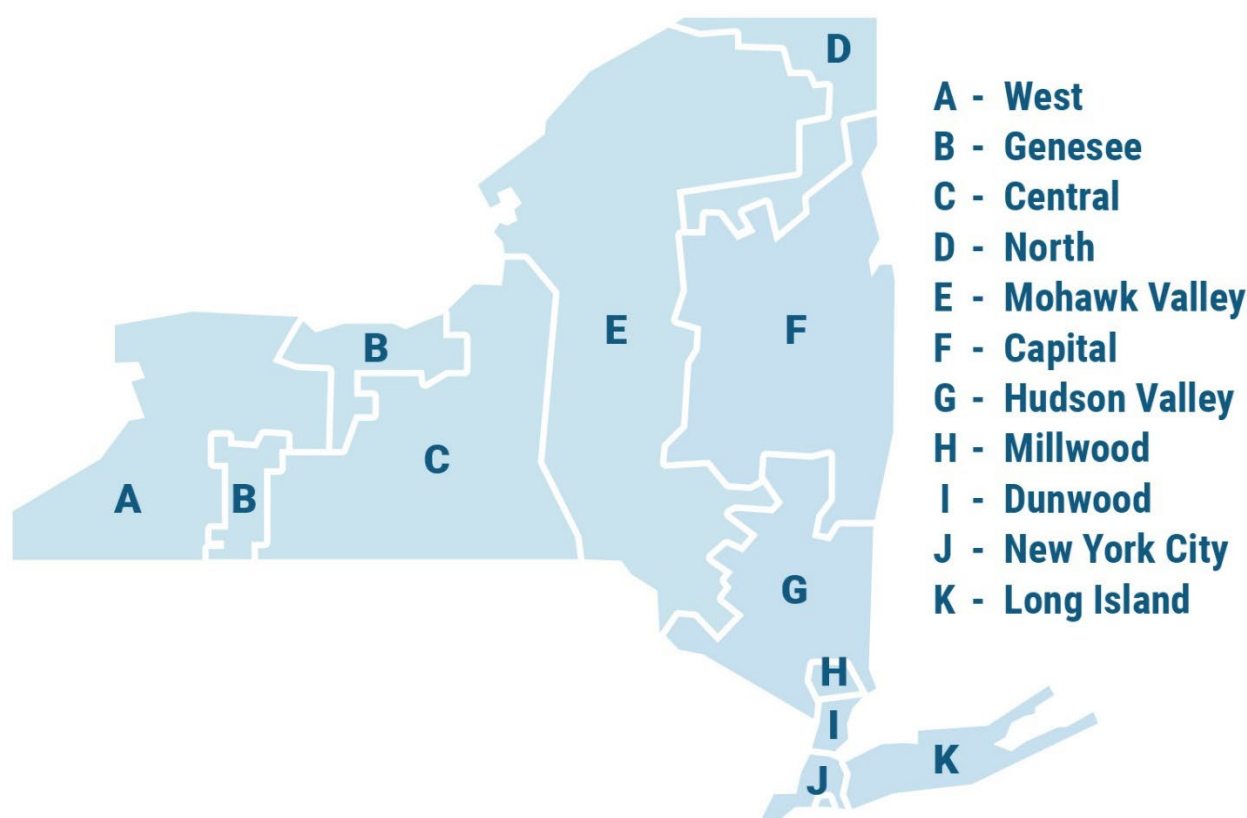
<sup>14</sup> The CRP base cases already reflect the DEC Peaker Rule compliance plans submitted by the affected generation owners to DEC; summarized in the assumption’s tables from Appendix B of this report.

**Figure 32: Summary of Key Zonal Resource Adequacy Margins**



Resource capacity is reduced one zone at a time to determine when violations occur, in the same manner as the compensatory “perfect” MW are added to mitigate resource adequacy violations, but with the opposite impact. “Perfect capacity” is capacity that is not derated (*e.g.*, due to ambient temperature or unit unavailability), not subject to energy durations limitations (*i.e.*, available at maximum capacity every hour of the study year), and not tested for transmission security or interface impacts. A map of NYISO zones is shown in Figure 33, and the zonal resource margin analysis (ZRAM) is summarized in Figure 34.

**Figure 33: NYISO Load Zone Map**



**Figure 34: Zonal Resource Adequacy Margins (MW)**

Study Year	RNA Base Case LOLE (days/year)	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Zone H	Zone I	Zone J	Zone K
2023	0.025	-850	-850	-1,475	-1,425	-1,500	-1,500	-1,475	-1,375	-1,375	-1,075	-650
2024	0.018	-875	-875	-1,800	-1,675	-1,800	-1,800	-1,825	-1,700	-1,700	-1,350	-700
2025	0.024	-775	-775	-1,475	-1,475	-1,550	-1,550	-1,575	-1,475	-1,475	-925	-800
2026	0.004	-950	-950	-2,625	-1,925	-2,800	-2,800	-2,800	-2,575	-2,600	-2,125	-925
2027	0.005	-950	-950	-2,600	-1,925	-2,800	-2,800	-2,800	-2,575	-2,575	-2,100	-900
2028	0.004	-900	-900	-2,600	-1,925	-2,800	-2,800	-2,800	-2,575	-2,575	-2,100	-800
2029	0.005	-900	-900	-2,500	-1,925	-2,700	-2,700	-2,725	-2,450	-2,450	-1,975	-750
2030	0.006	-850	-850	-2,325	-1,925	-2,525	-2,525	-2,525	-2,175	-2,175	-1,450	-750
2031	0.010	-775	-775	-2,050	-1,775	-2,175	-2,175	-2,175	-1,975	-1,975	-1,575	-625
2032	0.022	-625	-625	-1,700	-1,450	-1,725	-1,725	-1,725	-1,625	-1,625	-1,275	-500

**Notes:**

- Negative numbers indicate the amount of “perfect MW” that can be removed from a zone without causing a violation.
- EZR - Exceeds Zonal Resources (all generation can be removed without causing a violation).
- The generation pockets in Zone J and Zone K are not modeled in detail for this analysis and the margins identified here may be smaller as a result.

The ZRAM assessment identifies a maximum level of “perfect capacity” that can be removed from each zone without causing NYCA LOLE criterion violations. However, the impacts of removing capacity on the

reliability of the transmission system and on transfer capability are highly location dependent. Thus, lower amounts of capacity removal are likely to result in reliability issues at specific transmission locations. These simulations did not attempt to assess a comprehensive set of potential scenarios that might arise from specific unit retirements. Therefore, actual proposed capacity removals from any of these zones would need to be further studied in light of the specific capacity locations in the transmission network to determine whether any additional violations of reliability criteria would result. Additional transmission security analysis, such as N-1-1 steady-state analysis, transient stability, and short circuit, would be necessary under the applicable process for any contemplated plant retirement in any zone.

### Binding Interfaces

To determine whether a specific transmission interface impacts system resource adequacy, ‘free-flow’ simulations were performed for targeted interfaces. This analysis removes the limit on various transmission interfaces in resource adequacy models, either one at the time, or in various combinations (*i.e.*, “free flow”). A decrease in the NYCA LOLE resulting from removal of an interface limit is an indication that the flow of power across the interface is “binding” due to transmission constraints. The results of these simulations shown in Figure 35:

**Figure 35: Binding Interface Analysis**

Study Year		2022 RNA Base Case NYCA LOLE	Free Flow NYCA LOLE	Delta LOLE
y4	2026	0.004	0.003	-0.001
y5	2027	0.005	0.003	-0.002
y6	2028	0.004	0.003	-0.002
y7	2029	0.005	0.002	-0.002
y8	2030	0.006	0.004	-0.002
y9	2031	0.010	0.005	-0.005
y10	2032	0.022	0.010	-0.012

The results show that while NYCA LOLE is below its 0.1 event-days/year criterion, further increasing transmission system limits can allow more power to come across the state.

### Status-Quo Scenario – Resource Adequacy and Transmission Security

This scenario evaluates the reliability of the system under the assumption that no major transmission or generation projects come to fruition within the RNA Study Period. This includes the removal of all proposed transmission and generation projects that have met 2022 RNA Base Case inclusion rules and removal of generators that require modifications to comply with the DEC’s Peaker Rule. The AC Public Policy Transmission Project (ACPPTPP) and the Western NY Public Policy (WNYPPTPP) were not removed for this exercise due to their advancement in development. The results of this scenario are in the Figure 36:

**Figure 36: 2022 RNA Resource Adequacy Status-quo Scenario NYCA LOLE Results**

		2022 RNA 1 <sup>st</sup> Pass Base Case vs Status-Quo Scenario LOLE (days/year)			2022 RNA 1 <sup>st</sup> Pass Base Case vs Remove CHPE Sensitivity LOLE (days/year)			
Study Year		RNA Base Case	Status Quo	Delta	Study Year	RNA Base Case	TDI/CHPE Removed	Delta
y1	2023	0.025	0.028	0.003	2023	0.025	0.025	0.000
y2	2024	0.018	0.024	0.007	2024	0.018	0.018	0.000
y3	2025	0.024	0.033	0.010	2025	0.024	0.024	0.000
y4	2026	0.004	0.022	0.018	2026	0.004	0.015	0.011
y5	2027	0.005	0.026	0.021	2027	0.005	0.016	0.011
y6	2028	0.004	0.020	0.015	2028	0.004	0.014	0.010
y7	2029	0.005	0.021	0.017	2029	0.005	0.015	0.011
y8	2030	0.006	0.042	0.036	2030	0.006	0.033	0.026
y9	2031	0.010	0.041	0.031	2031	0.010	0.033	0.023
y10	2032	0.022	0.068	0.046	2032	0.022	0.047	0.025

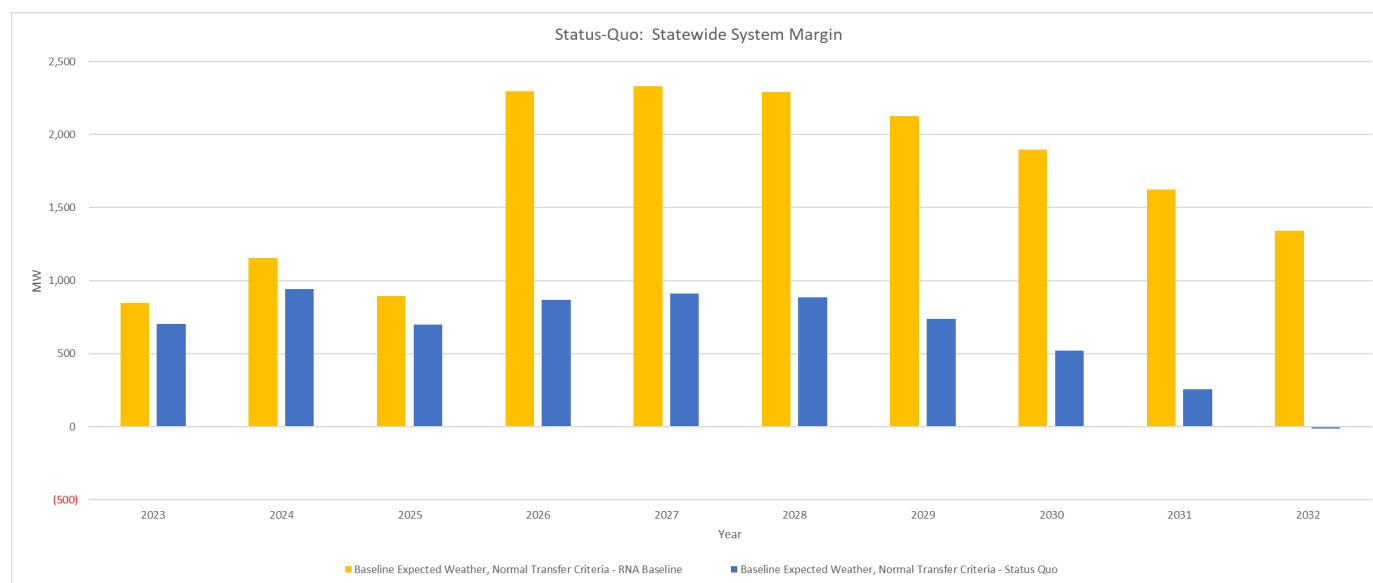
From a resource adequacy perspective, this scenario indicates that even if the LOLE is still below its 0.1 event-days/year criterion, there is a significant impact if the expected generation and transmission projects are not built. Additionally, an additional sensitivity was performed with removing just the proposed, 1250 MW HVDC from Quebec to Zone J, and the results indicate that most of the NYCA LOLE impact is due to this project's removal.

The steady state transmission security results show, as compared to the RNA base case, overloads are observed under N-1-1 conditions in the NYSEG, National Grid, Con Edison, and PSEG-LI service territories. The results of the steady state transmission security N-1-1 evaluation of the BPTF for this scenario are shown in Figure 37. Figure 38 provides a comparison of the statewide system margin under the status quo scenario assumptions to the RNA baseline conditions. Similarly, Figure 39 and Figure 40 show the New York City and Long Island transmission security margins for the status quo scenario compared to the RNA baseline assumptions. The status quo assumptions show that the statewide system margin would tip in 2032 by about 10 MW. The New York City transmission security margin under status quo assumptions tip in year 2028 (about 25 MW) with 2032 being deficient by about 600 MW. The New York City transmission security margin analysis includes the removal of CHPE. The Long Island transmission security margin under the status quo assumptions tips as early as 2023. Additional transmission security margin details under the status quo scenario are provided in Appendix XX.

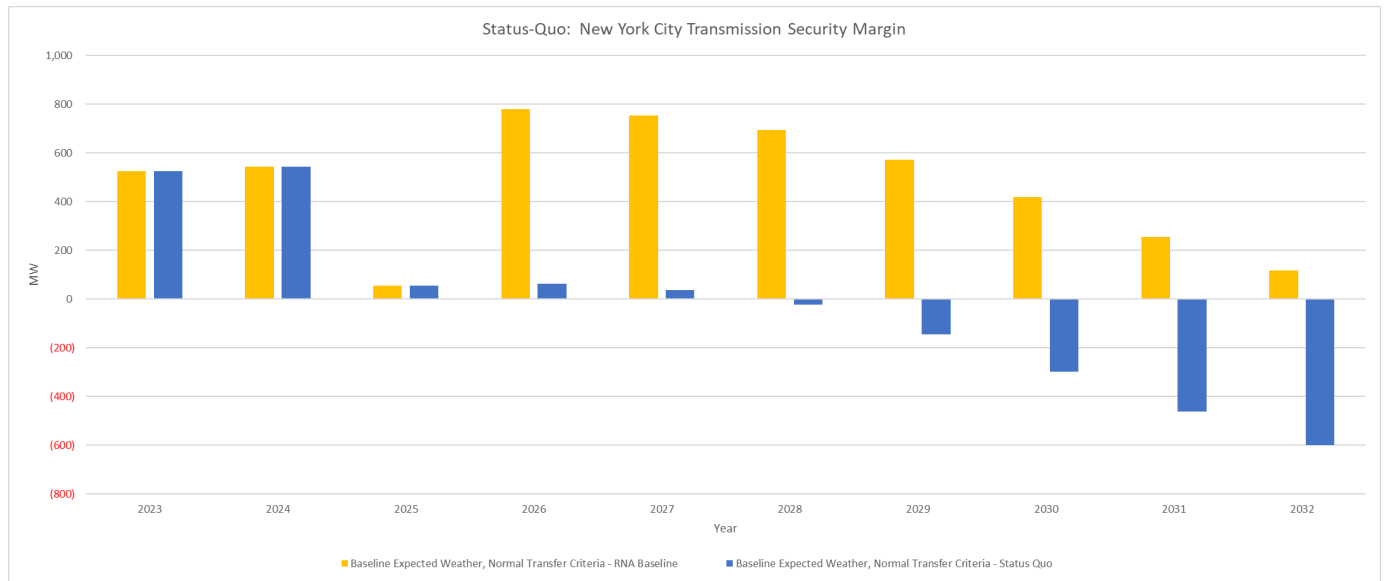
**Figure 37: 2022 RNA Transmission Security Status-quo Scenario Results**

Zone	Owner	Circuit
A	NYSEG	North Gardenville 230/115/34.5
C	NGRID	Clay - Volney 345kV (6)
I/K	ConEd/LIPA	Dunwoodie - Shore Rd 345kV (Y50)
I/K	NYPA	Sprainbrook - East Garden City 345kV (Y49)
J	ConEd	Fresh Kills - Fresh Kills PAR 138kV (21192)
J	ConEd	Fresh Kills 345/138 (TA1)
J	ConEd	Fresh Kills 345/138 (TB1)
J	ConEd	Fresh Kills PAR 138kV (R1)
J	ConEd	Fresh Kills PAR 138kV (R2)
J	ConEd	Gowanus 345/138 (T14)
J	ConEd	Gowanus 345/138 (T2)
J	ConEd	Rainey West - Farragut East 345kV (61)
K	LIPA	Carle Pl - East Garden City 138kV (361)
K	LIPA	Edwards Avenue - Riverhead 138kV (893)
K	LIPA	Elwood - Northport 138kV (678)
K	LIPA	Glenwood - Shore Rd 138kV (365)
K	LIPA	Northport - Pilgrim 138kV (672)
K	LIPA	Northport - Pilgrim 138kV (677)
K	LIPA	Northport - Pilgrim 138kV (679)
K	LIPA	Shore Rd 345/138kV (Bank #1)
K	LIPA	Shore Rd 345/138kV (Bank #2)

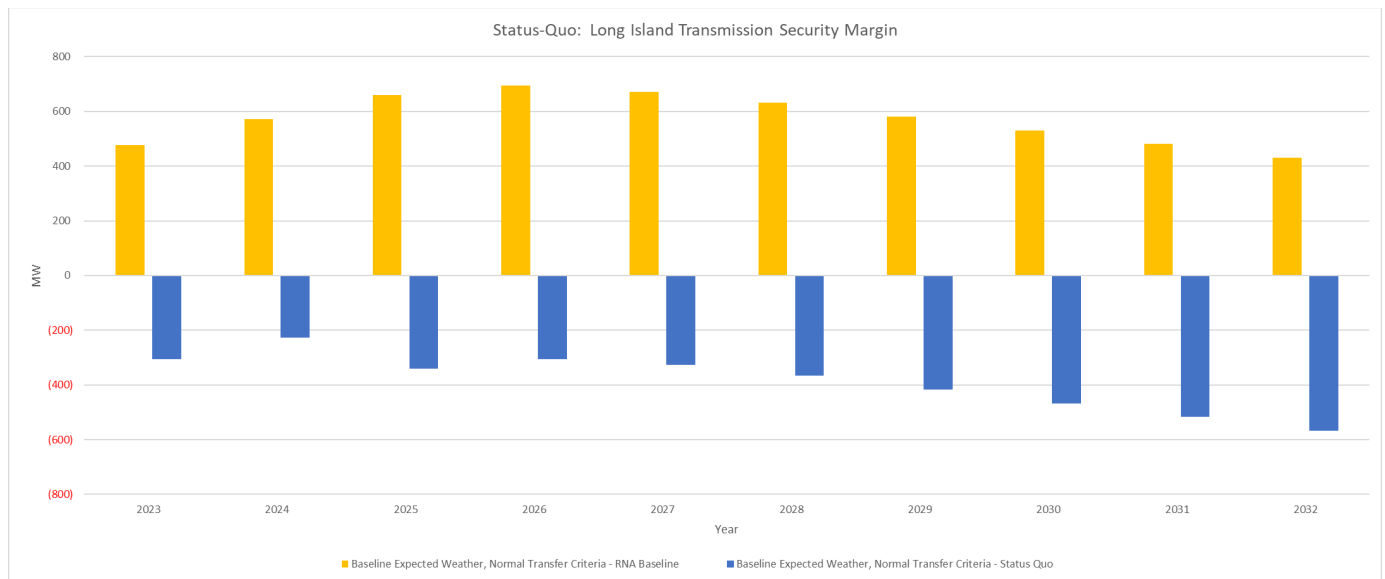
**Figure 38: Status Quo Scenario Statewide System Margin**



**Figure 39: Status Quo Scenario New York City Transmission Security Margin**



**Figure 40: Status Quo Scenario Long Island Transmission Security Margin**





## 7. Policy Case Scenario – Placeholder for Draft 2 (RA only)

## 8. Reliability Compliance Obligations and Activities

The Reliability Needs Assessment is not the only NYISO work product or activity related to reliability planning. The purpose of this section is to discuss the NERC Planning Coordinator and Transmission Planner obligations fulfilled by the NYISO as well as the other NPCC and NYSRC planning compliance obligations. The NYISO has various compliance obligations under NERC, NPCC, and the NYSRC. The periodicity of these requirements varies amongst the standards and requirements. While achieving compliance with all NERC, NPCC, and NYSRC obligations is critical to ensuring the continued reliability of the transmission system, this section primarily discusses in some detail the planning compliance requirements that closely align with this Reliability Needs Assessment. The full details of the compliance obligations are found within the reliability standards and requirements themselves. Publicly available results for the compliance activities listed below are found on the NYISO website under Planning – Reliability Compliance<sup>15</sup>.

The purpose of the NERC Reliability Standards is to “define the reliability requirements for planning and operating the North American bulk power system and are developed using a results-based approach that focuses on performance, risk management, and entity capabilities.” The objective of NPCC Directory #1 and the NYSRC Reliability Rules and Compliance Manual are to provide a “design-based approach” to design and operate the bulk power system to a level of reliability that will not result in the loss or unintentional separation of a major portion of the system from any of the planning and operations contingencies with the intent of avoiding instability, voltage collapse and widespread cascading outages. Figure 41 shows the various NERC Standards with requirements applicable to the NYISO as a NERC registered Planning Coordinator and/or Transmission Planner. The NPCC planning compliance obligations are primarily located in NPCC Regional Reliability Reference Directory #1 Design and Operation of the Bulk Power System. The NYSRC planning compliance obligations are located in the Reliability Rules and Compliance Manual.

Fundamental to any reliability study is the accuracy modeling data provided by the entities responsible for providing the data. The data requirements for the development of the steady state, dynamics, and short circuit models is provided in the NYISO Reliability Analysis Data Manual (RAD Manual).<sup>16</sup> This data primarily comes from compliance with NERC MOD standards. Much of this data is collected through the annual database update process outlined in the RAD Manual and the annual FERC Form 715 filing to which the transmitting utilities certify, to the best of their knowledge, the accuracy of the

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<sup>15</sup> <https://www.nyiso.com/planning-reliability-compliance>

<sup>16</sup> <https://www.nyiso.com/documents/20142/2924447/rel-anl-data-mnl.pdf>

data. Additional compliance obligations provide for the accuracy of the modeling data through comparison to actual system events (*e.g.*, MOD-026, MOD-026, and MOD-033).

Following the completion of the annual database update, these databases are used for study work such as the Reliability Planning Process, and for many other compliance obligations such as those listed in Figure 41. Planning studies similar to the Reliability Planning Process include the NPCC/NYSRC Area Transmission Reviews (ATRs) and the NERC TPL-001 assessments.

**Figure 41: List of NERC Standards for Planning Coordinators and Transmission Planners**

Standard Name	Title	Purpose
FAC-002	Facility Interconnection Studies	To study the impact of interconnecting new or materially modified Facilities to the Bulk Electric System.
FAC-010	System Operating Limits Methodology for the Planning Horizon	To ensure that System Operating Limits (SOLs) used in the reliable planning of the Bulk Electric System (BES) are determined based on an established methodology or methodologies.
FAC-014	Establish and Communicate System Operating Limits	To ensure that System Operating Limits (SOLs) used in the reliable planning and operation of the Bulk Electric System (BES) are determined based on an established methodology or methodologies.
IRO-017	Outage Coordination	To ensure that outages are properly coordinated in the Operations Planning time horizon and Near-Term Transmission Planning Horizon.
MOD-026	Verification of Models and Data for Generator Excitation Control System or Plant Volt/VAR Control Functions	To verify that the generator excitation control system or plant volt/var control function model (including the power system stabilizer model and the impedance compensator model) and the model parameters used in dynamic simulations accurately represent the generator excitation control system or plant volt/var control function behavior when assessing Bulk Electric System (BES) reliability.
MOD-027	Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions	To verify that the turbine/governor and load control or active power/frequency control model and the model parameters, used in dynamic simulations that assess Bulk Electric System (BES) reliability, accurately represent generator unit real power response to system frequency variations.
MOD-031	Demand and Energy Data	To provide authority for applicable entities to collect Data, energy and related data to support reliability studies and assessments to enumerate the responsibilities and obligations of requestors and respondents of that data.
MOD-032	Data for Power System Modeling and Analysis	To establish consistent modeling data requirements and reporting procedures for development of planning horizon cases necessary to support analysis of the reliability of the interconnected transmission system.
MOD-033	Steady State and Dynamic System Model Validation	To establish consistent validation requirements to facilitate the collection of accurate data and building of planning models to analyze the reliability of the interconnected transmission system.
PRC-002	Disturbance Monitoring and Reporting Requirements	To have adequate data available to facilitate analysis of Bulk Electric System (BES) Disturbances

Standard Name	Title	Purpose
PRC-006	Automatic Underfrequency Load Shedding	To establish design and documentation requirements for automatic underfrequency load shedding (UFLS) programsto arrest declining frequency, assist recovery of frequency following underfrequency events and provide last resort system preservation measures.
PRC-006-NPCC	Automatic Underfrequency Load Shedding	The NPCC Automatic Underfrequency Load Shedding (UFLS) regional Reliability Standard establishes more stringent and specific NPCC UFLS program requirements than the NERC continent-wide PRC-006 standard. The program is designed such that declining frequency is arrested and recovered in accordance with established NPCC performance requirements stipulated in this document.
PRC-010	Undervoltage Load Shedding	To establish an integrated and coordinated approach to the design, evaluation, and reliable operation of Undervoltage Load Shedding Programs (UVLS Programs).
PRC-012	Remedial Action Schemes	To ensure that Remedial Action Schemes (RAS) do not introduce unintentional or unacceptable reliability risks to the Bulk Electric System (BES).
PRC-023	Transmission Relay Loadability	Protective relay settings shall not limit transmission loadability; not interfere with system operators' ability to take remedial action to protect system reliability and; be set to reliably detect all fault conditions and protect the electrical network from these faults.
PRC-026	Relay Performance During Stable Power Swings	To ensure that load-responsive protective relays are expected to not trip in response to stable power swings during non-Fault conditions.
TPL-001	Transmission System Planning Performance Requirements	Establish Transmission system planning performance requirements within the planning horizon to develop a Bulk Electric System (BES) that will operate reliably over a broad spectrum of System conditions and following a wide range of probable Contingencies.
TPL-007	Transmission System Planned Performance for Geomagnetic Disturbance Events	Establish requirements for Transmission system planned performance during geomagnetic disturbance (GMD) events.

### NPCC/NYSRC Area Transmission Reviews

The NPCC/NYSRC Area Transmission Reviews (ATRs) are performed on an annual basis to demonstrate that conformance with the performance criteria specified in NPCC Directory #1 and the NYSRC Reliability Rules. The ATR is prepared in accordance with NPCC and NYSRC procedures that require the assessment to be performed annually, with a Comprehensive Area Transmission Review performed at least every five years. Either an Interim or an Intermediate review can be conducted between Comprehensive reviews, as appropriate. In an Interim review, the planning coordinator summarizes the changes in planned facilities and forecasted system conditions since the last Comprehensive review and assesses the impact of those changes. No new analyses are required for an Interim review. An Intermediate review covers all the elements of a Comprehensive review, but the analysis may be limited to addressing

only significant issues, considering the extent of the system changes. In the ATRs, the NYISO assesses the BPTF for a period four to six years in the future (the NYISO evaluates year five of the Study Period). The 2021 ATR<sup>17</sup> (which is the most recently completed ATR) evaluated study year 2026 and found that the planned system through year 2026 conforms to the reliability criteria described in the NYSRC Reliability Rules and NPCC Directory #1. The next ATR is planned to be completed in the latter part of 2022 or early 2023. Seven assessments are required as part of each ATR.

The first assessment evaluates the steady state and dynamics transmission security. For instances where the transmission security assessments results indicate that the planned system does not meet the specified criteria, a corrective action plan is incorporated to achieve conformance. The most recent ATR found that with the identified corrective action plans identified in the reliability planning process, the system meets the applicable performance criteria.

For the second assessment, steady state and dynamics analysis are conducted to evaluate the performance of the system for low probability extreme contingencies. The purpose of the extreme contingency analysis is to examine the post contingency steady state conditions, as well as stability, overload, cascading outages, and voltage collapse, to obtain an indication of system robustness and to determine the extent of any potential widespread system disturbance. In instances where the extreme contingency assessment concludes there are serious consequences, the NYISO evaluates implementing a change to design or operating practices to address the issues.

The extreme contingency analysis included in the most recent ATR concludes that most events are stable and showed no thermal overloads over Short-Term Emergency (STE) ratings or significant voltage violations on the BPTF. For the events that did show voltage, thermal, or dynamics issues, these events were local in nature (loss of local load or reduction of location generation) and do not result in a widespread system disturbance.

The third assessment evaluates extreme system conditions that have a low probability of occurrence such as high peak load conditions (*e.g.*, 90<sup>th</sup> percentile load) resulting from extreme weather or the loss of fuel supply from a given resource (*e.g.*, loss of all gas units under winter peak load). The extreme system conditions evaluate various design criteria contingencies to evaluate the post contingency steady state conditions, as well as stability, overload, cascading outages and voltage collapse. The evaluation of extreme contingencies indicate system robustness and determine the extent of any potential widespread system disturbance. In instances where the extreme contingency assessment concludes that there are serious

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<sup>17</sup> [2021 Interim Area Transmission Review of the New York State Bulk Power Transmission System](#)

consequences, the NYISO evaluates implementing a change to design or operating practices to address the issues. For the extreme system conditions evaluated in the most recent ATR, the assessment found no steady state or dynamics transmission security criteria violations.

The fourth assessment evaluates the breaker fault duty at BPTF buses. The most recent ATR found no over-dutied breakers on BPTF buses.

The fifth assessment evaluates other requirements specific to the NYSRC Reliability Rules including an evaluation of the impacts of planned system expansion or configuration facilities on the NYCA System Restoration Plan and Local Area Operation Rules for New York City Operations, loss of gas supply – New York City, and loss of gas supply – Long Island.

The sixth assessment is a review of Special Protection Systems (SPSs). This review evaluates the designed operation and possible consequences of failure to operate or mis-operation of the SPS within the NYCA.

The seventh assessment is a review of requested exclusions to the NPCC Directory #1 criteria.

### NERC Planning Assessments (TPL-001)

The NERC TPL-001 assessment (Planning Assessment) is performed annually. The purpose of the Planning Assessment is to demonstrate conformance with the applicable NERC transmission system planning performance requirements for the NYCA Bulk Electric System (BES). The Planning Assessment is a coordinated study between the NYISO and New York Transmission Owners.

The required system conditions to evaluate for this assessment include planned system representations over a 10-year study period for a variety of system conditions. Figure 42 provides a description of the steady state, dynamics, and short circuit cases required to be evaluated in the Planning Assessment.

**Figure 42: Description of NERC TPL-001 Planning Assessment Study Cases**

Case Description	Steady State	Dynamics	Short Circuit
System Peak Load (Year 1 or 2)	x		
System Peak Load (Year 5)	x	x	x
System Peak Load (Year 10)	x	x <sup>1</sup>	
System Off-Peak Load (One of the 5 years)	x	x	
System Peak Load (Year 1 or 2) Sensitivity	x		
System Peak Load (Year 5) Sensitivity	x	x	
System Off-Peak Load (One of the 5 years) Sensitivity	x	x	

Notes:

1. Only required to be assessed to address the impact of proposed material generation additions or changes in that timeframe.

The steady state and dynamics transmission security analyses evaluate the New York State BES to meet the applicable criteria. As part of this assessment, the unavailability of major transmission equipment with a lead time of more than a year is also assessed. The fault duty at BES buses are evaluated in the short-circuit representation. When the steady state, dynamics, or short circuit analysis indicates an inability of the system to meet the performance requirements in the standard, a corrective action plan is developed addressing how the performance requirements will be met. Corrective action plans are reviewed in subsequent Planning Assessments for continued validity and implementation status.

For each steady state and dynamics case, the Planning Assessment evaluates the system response to extreme contingencies. Similar to the ATR, when the Planning Assessment extreme contingency analysis concludes that there is cascading caused by an extreme contingency, the NYISO evaluates possible actions designed to reduce the likelihood or mitigate the consequences and adverse impacts.

The most recent NERC Planning Assessment for compliance with TPL-001 was completed in July 2022. As this study contains Critical Energy Infrastructure Information (CEII), it is not posted on the NYISO website. Generally, the results of this study are consistent with the ATR studies. Given that the study scope of this assessment is different from the ATR is different because the ATR evaluates the BPTF while the TPL evaluates the BES, criteria violations were observed. The corrective action plans for criteria violations are generally addressed in the affected Transmission Owner's LTP and/or the proposed transmission facilities listed in Section 7 of the Load and Capacity Data Report.

### **Resource Adequacy Compliance Efforts**

NPCC's [Directory 1](#) defines a compliance obligation for the NYISO, as Resource Planner and Planning Coordinator, to perform a resource adequacy study evaluating a five-year planning horizon. The NYISO delivers a report every year under this study process to verify the system against the one-day-in-ten-years loss of load expectation (LOLE) criterion, usually based on the latest available RNA/CRP results and assumptions. The New York Area Review of Resource Adequacy completed reports are available at: <https://www.nyiso.com/planning-reliability-compliance>.

NYSRC [Reliability Rules](#) require<sup>18</sup> that the NYISO deliver a Long Term Resource Adequacy Assessment report every RNA year, and an annual update in the non-RNA years. The NYISO first implemented this

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<sup>18</sup> NYSRC Reliability Rule A.3, R.3.

requirement after finalizing the 2020 RNA<sup>19</sup>.

The NYISO is also actively involved in other activities such as the NERC's annual Long Term Reliability Assessment ([LTRA](#)), along with its biennial Probabilistic Assessment (ProbA), performed by NERC with the input from all the NERC Regions and Areas, as well as NPCC's Long Range Adequacy Overview ([LROA](#)).

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<sup>19</sup> Links to the latest available 2021 report and presentation:

[https://www.nysrc.org/PDF/MeetingMaterial/RCMSMeetingMaterial/RCMS%20Agenda%20262/2021NYSRCLongTermResourceAdequacyAssessment-InterveningYear\\_Feb3-2022RCMS\\_Report.pdf](https://www.nysrc.org/PDF/MeetingMaterial/RCMSMeetingMaterial/RCMS%20Agenda%20262/2021NYSRCLongTermResourceAdequacyAssessment-InterveningYear_Feb3-2022RCMS_Report.pdf)

[https://www.nysrc.org/PDF/MeetingMaterial/RCMSMeetingMaterial/RCMS%20Agenda%20262/2021NYSRCLongTermResourceAdequacyAssessment-InterveningYear\\_Feb3-2022RCMS\\_Presentation%20\(1\).pdf](https://www.nysrc.org/PDF/MeetingMaterial/RCMSMeetingMaterial/RCMS%20Agenda%20262/2021NYSRCLongTermResourceAdequacyAssessment-InterveningYear_Feb3-2022RCMS_Presentation%20(1).pdf)



## 9. New York Grid Assessments and Initiatives – placeholder for Draft 2

## **11. Observations and Recommendations – Placeholder for Draft 2**

## 12. Next Steps

Since the 2022 Reliability Needs Assessment did not find any Reliability Needs, there will be no need to update the RNA Base Case or solicit for solutions. In 2023, the NYISO will issue the 2022-2032 Comprehensive Reliability Plan, and will continue to perform quarterly STARS.

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